Population Aging, Intergenerational Transfers, and the Economy

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Background and Motivation

• Changes in population age structure
  – Decreasing total fertility and rising life expectancy.

• Economic lifecycle
  – Extended periods of dependency.

• Complex and varied intergenerational economic systems
  – Families, firms, markets, the state, and civil society all play a role.
  – Important implications for poverty, economic growth, and generational equity.
Objectives

• Develop a system of economic accounts that quantifies intergenerational flows in a comprehensive fashion.
• Estimate the accounts with historical depth for economies with different cultures, levels of development, economic systems and policies.
• Analyze and explain
  – variation in the economic lifecycle and the intergenerational economic systems.
  – macroeconomic effects of population aging.
• Improve policy related to pensions, health care, education, and fertility.
Importance of National Transfer Accounts

• Goal: Develop policies that respond effectively to the population age transition
• Requirement: a comprehensive and deep understanding of the generational economy:
  – Social and economic institutions
  – Economic flows across age groups
  – System of public and private obligations
Outline

I. National Transfer Account
   • Basic Concepts
   • Economic Lifecycle
   • Age reallocations

II. Changes in Age Structure and Economic Growth: Demographic Dividends
I. National Transfer Account
National Transfer Accounts

- Measure economic flows across age groups in a systematic and comprehensive way.
- Flows are identified by the economic mechanisms and the mediating institutions.
- Accounts complement the UN System of National Accounts and are constructed in a manner consistent with macroeconomic aggregates.
The Flow Account Identity

• **Inflows**
  - Labor Income
  - Asset Income
  - Transfer Received

\[
Y^l(a) + Y^a(a) + \tau^+(a) = C(a) + S(a) + \tau^-(a)
\]

• **Outflows**
  - Consumption
  - Saving
  - Transfers Paid

\[
C(a) - Y^l(a) = Y^a(a) - S(a) + \tau^+(a) - \tau^-(a)
\]
Data


3. Data for the population by age are from population estimates and projections by the United Nations (UN): 1950-2050.
## National Income Account of Thailand in 1996 (Billions of Baht)

<table>
<thead>
<tr>
<th>Income Approach</th>
<th>Expenditure Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation of Employees</td>
<td>Public Consumption Expenditure</td>
</tr>
<tr>
<td>Operating Surplus</td>
<td>Education</td>
</tr>
<tr>
<td>Income from Unincorporated Enterprises</td>
<td>1,353</td>
</tr>
<tr>
<td>Income from Private Corporations and Property</td>
<td>Education</td>
</tr>
<tr>
<td>Property Income</td>
<td>Health</td>
</tr>
<tr>
<td>Less: Interest Payment on Consumer Debt</td>
<td>1,065</td>
</tr>
<tr>
<td>Less: Interest Payment on Public Debt</td>
<td>846</td>
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<tr>
<td>Saving of Private Corporations</td>
<td>Other</td>
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<tr>
<td>Corporate Income Tax</td>
<td>476</td>
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<tr>
<td>Corporate Transfer Payment</td>
<td>Private Consumption Expenditure</td>
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<tr>
<td>Income from Public Enterprises and Property</td>
<td>2,041</td>
</tr>
<tr>
<td>Government Income from Property and Entrepreneurship</td>
<td>62</td>
</tr>
<tr>
<td>Saving of Government Enterprises</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td>Health</td>
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<td></td>
<td>Other</td>
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<tr>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>Households</td>
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<tr>
<td></td>
<td>Corporations</td>
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<tr>
<td></td>
<td>General Government</td>
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<tr>
<td></td>
<td>Government Enterprises</td>
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<tr>
<td></td>
<td>Less: Indirect Taxes</td>
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<tr>
<td></td>
<td>Subsidies</td>
</tr>
<tr>
<td></td>
<td>Less: Net Public Current Transfers from ROW</td>
</tr>
<tr>
<td></td>
<td>Less: Net Private Current Transfers from ROW</td>
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<tr>
<td>National Income</td>
<td>National Expenditure</td>
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<td>3,394</td>
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</table>
### Micro Data: the Socio-economic Surveys (SES)

#### Household Characteristics

<table>
<thead>
<tr>
<th>Survey Years</th>
<th>Age of Head (years)</th>
<th>Consumption (Baht/Month)</th>
<th>No. of Households</th>
<th>Household Size (persons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Education</td>
<td>Health</td>
<td>Total</td>
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</tr>
<tr>
<td>1981</td>
<td>44.4</td>
<td>66.5</td>
<td>127.3</td>
<td>3,757.8</td>
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<td>1986</td>
<td>45.0</td>
<td>76.4</td>
<td>141.9</td>
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<td>1988</td>
<td>45.5</td>
<td>53.0</td>
<td>135.7</td>
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<td>1990</td>
<td>46.3</td>
<td>78.6</td>
<td>181.4</td>
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<tr>
<td>1992</td>
<td>46.2</td>
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<td>221.5</td>
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<td>1994</td>
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<td>260.6</td>
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<td>1996</td>
<td>47.8</td>
<td>165.9</td>
<td>331.2</td>
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<td>1998</td>
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<td>244.8</td>
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<td>2002</td>
<td>48.6</td>
<td>252.5</td>
<td>249.3</td>
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<td>2004</td>
<td>49.7</td>
<td>263.8</td>
<td>262.1</td>
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<tr>
<td>Mean</td>
<td>47.04</td>
<td>153.62</td>
<td>218.75</td>
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#### Individuals Characteristics

<table>
<thead>
<tr>
<th>Survey Years</th>
<th>Age of Individuals (years)</th>
<th>Income (Baht/Month)</th>
<th>No. of Observations</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Wage</td>
<td>Farm</td>
<td>Non-farm</td>
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<tr>
<td>1988</td>
<td>27.5</td>
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</tr>
<tr>
<td>1990</td>
<td>28.3</td>
<td>516.4</td>
<td>253.8</td>
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<td>1992</td>
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<td>1994</td>
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<td>1996</td>
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<tr>
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<td>362.0</td>
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<tr>
<td>2002</td>
<td>32.5</td>
<td>1,677.5</td>
<td>439.3</td>
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<tr>
<td>2004</td>
<td>33.6</td>
<td>1,922.4</td>
<td>515.1</td>
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<tr>
<td>Mean</td>
<td>29.87</td>
<td>1,002.19</td>
<td>312.55</td>
</tr>
</tbody>
</table>
Method: Constructing NTA

• Private Consumption
  – Education: regression
  – Health: regression and use individual health report of SES 2002
  – Other: equivalence scale

• Public Consumption
  – Education: enrollment rate & unit cost
  – Health: inpatient of public hospital (to be revised using NHA)
  – Other: per capita
Method (2)

• Labor Income (tabulate from SES)
  – Earnings
  – Profits from farm & non-farm (2/3)

• Asset Income (assign to Head – tabulate from SES)
  – Profits from farm & non-farm (1/3)
  – Property income: rent, dividend, interest
  – Other: proportional to property income
Method (3)

• Public Transfers
  – Inflows: in-kind & cash (assign to recipients of benefits)
  – Outflows: taxes (based on income and consumption)

• Private Transfers
  – Inter-household transfers
    • inflows: tabulate from the SES
    • outflows: tabulate from the SES
  – Intra-household transfers
    • Inflows: disposable inc < cons
    • outflows: disposable inc > cons
Example: Public Education Consumption of Thailand in 1996

<table>
<thead>
<tr>
<th></th>
<th>Formal Education</th>
<th>Informal Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary</td>
<td>Secondary</td>
</tr>
<tr>
<td>Education Consumption (Million Baht)</td>
<td>71,832</td>
<td>41,798</td>
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<tr>
<td>Number of Students (Thousands)</td>
<td>7,935</td>
<td>3,927</td>
</tr>
<tr>
<td>Unit Cost (Baht)</td>
<td>9,052</td>
<td>10,644</td>
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</table>
Aggregate Public Education Consumption for Thailand in 1996 (Millions of Baht)

Public formal education consumption by age is estimated by summing unit cost per student per level weighted by the number of students by age in each level.
Per capita consumption and labor income, Thailand, 2004

The Economic Lifecycle

- Lifecycle surplus
- Lifecycle deficit

Age

Labor Income

Consumption

Baht

Per capita consumption and labor income, Thailand, 2004
Lifecycle deficit is the difference between consumption and labor production at each age.

Lifecycle Surplus
Ages: 26-57
Per capita private consumption, Thailand, 2004

The diagram illustrates the per capita private consumption across different lifestyle categories in Thailand for the year 2004. The x-axis represents age categories ranging from 0 to 90+, while the y-axis shows Baht, a unit of currency in Thailand.

- **Private Consumption**: This category shows a steady increase as age increases, peaking around the age of 50 and then stabilizing.
- **Other Consumption**: This category also increases with age but at a slower rate compared to private consumption.
- **Health**: This category shows a consistent but low level across all age groups.
- **Education**: This category has a sharp peak in young age groups, followed by a decline and stabilization.
- **Housing**: This category remains low and stable across all age groups.

The graph indicates that private consumption is the highest among all categories, followed by other consumption and health. Education and housing consume the least per capita across age groups.
Per capita public consumption, Thailand, 2004
Classification of Inter-age Flows

• Economic form
  – Asset-based
  – Transfers

• Mediating institution
  – Public flows are mediated by the government
  – Private flows are mediated by households, families, NGOs, private individuals, etc.
Per capita age reallocations, Thailand, 2004
Per capita net transfers received, Thailand, 2004
Per capita net intra-household transfers, Thailand, 2004

The graph shows the net transfers, inflows, and outflows in Baht as a function of age. The net transfers line indicates the difference between inflows and outflows. The graph highlights the age groups with the highest and lowest net transfers.
Per capita net intra-household education transfers, Thailand, 2004
Per capita net intra-household health care transfers, Thailand, 2004

![Graph showing per capita net intra-household health care transfers in Thailand, 2004. The graph plots age on the x-axis and net inflows, outflows, and net transfers on the y-axis. The data ranges from 0 Baht to 8,000 Baht, with notable peaks and troughs at different age groups.](image-url)
Per capita net public transfers, Thailand, 2004
Per capita net public education transfers, Thailand, 2004
Per capita net public health care transfers, Thailand, 2004
Research on NTA and Social Protection

• NTA can be used to improve understanding on the area of social protection
  – How much children and the elderly consume; what types of consumption
  – Human capital development

• Mechanisms that children and, particularly, the elderly use to finance their consumption
  – Variation of social protection across countries
Intergenerational transfers are large and important for most countries.
Per Capita Lifecycle Deficits, Japan, 1984-2004

The diagram illustrates the changes in per capita lifecycle deficits for Japan from 1984 to 2004. The x-axis represents years, ranging from 1984 to 2004, with increments of 5 years. The y-axis shows the deficits, ranging from -0.80 to 1.20. The lines represent different years:
- 1984 (dark blue)
- 1989 (orange)
- 1994 (green)
- 1999 (red)
- 2004 (light blue)

The deficits show a pattern of increase and decrease over the years, with a noticeable peak around the mid-1990s.
Source: Tung forthcoming.
Changes in Economic Lifecycle and Support System

Thailand

1981-2004
Changes in Economic Lifecycle

- No change in the first crossing age: young adults start to generate lifecycle surplus at around age 25
- Gradual change in the second crossing age: individuals turn back to have lifecycle deficit at younger ages (61 in 1981 to 58 in 2004)
- Shorter lifecycle surplus period, declining from 36 years in 1981 to 33 years in 2004
Support Systems

• Three mechanisms used to close the gap between consumption and production
  – Public Transfers
  – Private Transfers
  – Asset-based Reallocations

• Emphasize on Youth and the Elderly
Public Transfers

- Public Transfers Inflows less Outflows
- Children receive significantly larger public education transfers
- The elderly receive slightly increase public sector health transfers
- The working ages pay larger taxes!
Per Capita Net Public Transfers Received

Relative to Y1 (30-49)

1981

2004

0 10 20 30 40 50 60 70 80 90+
Private Transfers

• Slightly increase in private transfers to children
• Largely increase in private transfers to the elderly
Per Capita Net Private Transfers Received

Relative to Y1 (30-49)

2004

1981
Asset-based Reallocations

• Asset income - saving
• Age profiles of asset income and saving are fluctuated during the past decades
  – Before the economic crisis in 1997: the elderly rely heavily on asset income to support their consumption
  – After 1997: less reliance on asset income
• Age profiles are younger during 2000-2004
Per Capita Asset Income

Relative to Y1 (30-49)

1990

1992

1994

1996

1998

90+
Per Capita Asset Income

Relative to YL (30-49)

2000
2002
2004

0 10 20 30 40 50 60 70 80 90+
Summary: Child Support Systems

• In general, children rely more on familial transfers than public transfers
• Transfers change overtime: children in Thailand rely less on the family and more on the public sector
• Public education transfers are larger and more important in Thailand
Summary: Old age Support Systems

• Reallocations through assets are major source of support for the elderly
• The elderly rely less on labor income overtime
• The public sector does not provide much support for the elderly
• The elderly rely more and more on the family
  – “familial support is not deteriorating despite economic development”
II. Changes in Age Structure and Economic Growth: Demographic Dividends
Macroeconomic Effects of Demographic Changes

• Declining fertility leads to a larger share of working-age adults
  – *More production and higher economic growth*

• Continual decline in fertility and mortality rates leads to population aging
  – *Smaller share of labor force, lower production, slower economic growth*

• Population aging may not adversely affect economic growth
  – *Need prudent policy to prepare for this coming demographic change*
Demographic Dividends

• Changes in population age structure interact with the economic lifecycle, affecting economic growth

• Two demographic dividends
  – Changes in the economic support ratio
  – Changes in lifecycle wealth
Demographic Dividends (2)

Changes in output per effective consumers

= Changes in productivity +

Changes in the economic support ratio

\[ \frac{Y(t)}{N(t)} = \frac{Y(t)}{L(t)} \times \frac{L(t)}{N(t)} \]

Second demographic dividend
First demographic dividend
The First Demographic Dividend

• Change in the economic support ratio or the first demographic dividend is influenced by the economic lifecycle
• The economic lifecycle begins and ends with the dependency periods when consumption exceeds earnings (lifecycle deficit), requiring economic flows from working-age adults (the lifecycle surplus ages) to close the gap.
Economic Lifecycles

Consumption, Japan
Consumption, Thailand
Labor Income, Japan
Labor Income, Thailand
Lifecycle Surplus
Lifecycle Deficit

relative to mean labor income ages 30–49

0 0.2 0.4 0.6 0.8 1.0 1.2 1.4
0 10 20 30 40 50 60 70 80 90+
Modeling the First Dividend

• Given constant productivity, changes in population age structure affects the economic support ratio

\[ N(t) = \sum_a \alpha(a)P(a,t) \]

\[ L(t) = \sum_a \gamma(a)P(a,t) \]

where \( \alpha(a) \) and \( \gamma(a) \) are the age profiles of consumption and labor income, and \( P(a,t) \) is the population
Economic Support Ratio

Effective workers relative to effective consumers

- China
- India
- Indonesia
- Thailand
- Japan
- Korea

First Demographic Dividend

Note: Growth rate of the economic support ratio is the first demographic dividend
Summary of the First Dividend

• Declining fertility leads to a larger share of effective producers, allowing the economy to grow
• However, the first dividend is transitory; continual decline in fertility leads to population aging
• The first dividend in Thailand is depleted in 2010, whereas some countries could enjoy the first dividend for several more decades
• Will population aging unfavorably affect economic growth in the future?
Preparation for Population Aging

• In order to avoid the adverse effect of population aging on economic growth, two approaches can be applied:
  – Physical capital accumulation (the second demographic Dividend)
  – Human capital accumulation (Raising productivity of the future labor force)
The Second Demographic Dividend

• Definition: The growth in productivity induced by an increase in the demand for lifecycle wealth.

• Compositional effect: population is concentrated at older, high wealth ages

• Behavioral effect: increase in duration of life and retirement lead to greater accumulation of wealth
Modeling the Second Demographic Dividend

• **Demand for capital** is proportional to lifecycle wealth of those 50+
  - Lifecycle wealth of those 50+
    - \( W(50+) = PV[C(50+)] - PV[YI(50+)] \)
    - Cross-sectional age profiles of consumption and production shift proportionately over time
    - Productivity growth is constant
    - Assumptions: interest rate: 3%; productivity growth: 1.5%; elasticity of output wrt capital: 0.33
Wealth Ratio

![Wealth Ratio Graph](image-url)
Second Demographic Dividend

Note: growth rate of lifecycle wealth influences the second demographic dividend
Summary of the Second Demographic Dividend

• The second demographic dividend is larger and more important to the economic growth than the first dividend in several countries.

• The second dividend is not automatic; it requires policy that encourages capital accumulation rather than relies on pension wealth to finance consumption during retirement ages.

• Population aging could benefit economic growth if capital accumulation is encouraged rather than PAYGO pension program.

<table>
<thead>
<tr>
<th>Demographic Dividends</th>
<th>Actual growth in GDP/N</th>
<th>Actual Dividend</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First</td>
<td>Second</td>
</tr>
<tr>
<td>China</td>
<td>0.78</td>
<td>0.70</td>
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<tr>
<td>India</td>
<td>0.27</td>
<td>0.85</td>
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<tr>
<td>Indonesia</td>
<td>0.50</td>
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<tr>
<td>Iran</td>
<td>0.42</td>
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<tr>
<td>Japan</td>
<td>0.21</td>
<td>1.51</td>
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<td>Korea</td>
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<td>Mongolia</td>
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<tr>
<td>Philippine</td>
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<td>Singapore</td>
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<tr>
<td><strong>Thailand</strong></td>
<td><strong>0.99</strong></td>
<td><strong>0.35</strong></td>
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<tr>
<td>Vietnam</td>
<td>0.40</td>
<td>0.09</td>
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</table>

Notes: based on method by Mason (2005)
Summary

• Intergenerational flows are large
• Magnitude and direction of IG flows are changing in unprecedented ways
• IG systems vary widely and are changing
• Important implications for
  – Generational equity
  – Standards of living
  – Investment in human and physical capital
  – Fiscal sustainability
Summary

• Inter-age flows are an inevitable consequence of the economic lifecycle
• Flows constraint provides an organizing principle
  – Transfers
  – Asset-based reallocations
• Complete accounting by sector
  – Public (education, health, pensions, public debt)
  – Private (especially family)
  – Rest of the world (remittances, international capital flows)
• Complete NTA
  – Relationship between stocks and flows
  – Asset transfers, asset revaluations, and other net changes in assets
Further Reading

Conceptual Foundations

Empirical Studies
Further Reading (Cont)

Simulation Studies

NTA Fundamentals
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Research Teams for 30 Economies

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Cecilia Rodriguez

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An, Chong-Bum, Country Leader
Chun, Young-Jun
Lim, Byung-In
Kim, Cheol-Hee
Jeon, Seung-Hoon
Gim, Eul-Sik
Seok, Sang-Hun
Kim, Jae-Ho
Austria
Key Institution: Vienna Institute of Demography
Fuernkranz-Prskawetz, Alexia, Country Leader
Sambt, Joze

Costa Rica
Key Institution: CCP, Universidad de Costa Rica
Rosero-Bixby, Luis, Country Leader
Maria Paola Zuniga

Slovenia
Sambt, Joze, Country Leader

Hungary
Key Institution: TARKI Social Research Institute
Gal, Robert
Medgyesi, Marton

Finland
Key institutions: The Finnish Center for Pensions
And the Finnish Pension Alliance
Vanne, Reijo
Gröhn, Jukka
Vaittinen, Risto
United States
Key Institution: Center for the Economics and Demography of Aging
Lee, Ronald, Country Leader
Miller, Tim
Ebenstein, Avi
Boe, Carl
Comelatto, Pablo
Donehower, Gretchen
Schiff, Eric
Langer, Ellen
Kenya
Mwabu, Germano

Nigeria
Soyibo, Adedoyin

Germany
Kluge, Fanny Annemarie

Spain
Patxot, Concepció, Country Leader
Renteria, Elisenda Perez
Thank you