



United Nations

Department of
Economic and
Social Affairs



UNITED NATIONS

ESCAP

Economic and Social Commission for Asia and the Pacific

Asia-Pacific Workshop on Measuring Population Ageing and Assessing its Economic and Fiscal Consequences

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United Nations

Department of
Economic and
Social Affairs

Session 7:

Forecasting the economic consequences of population ageing

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Economic impacts

Because economic activities vary by age, changing age structure will have important economic impacts.

New plan for today's activities

- » We will present the concepts simultaneously with the worksheets.

OUTLINE

- » Age structure transition
- » Aged Economy
- » Demographic dividend and tax
- » GDP per capita forecast

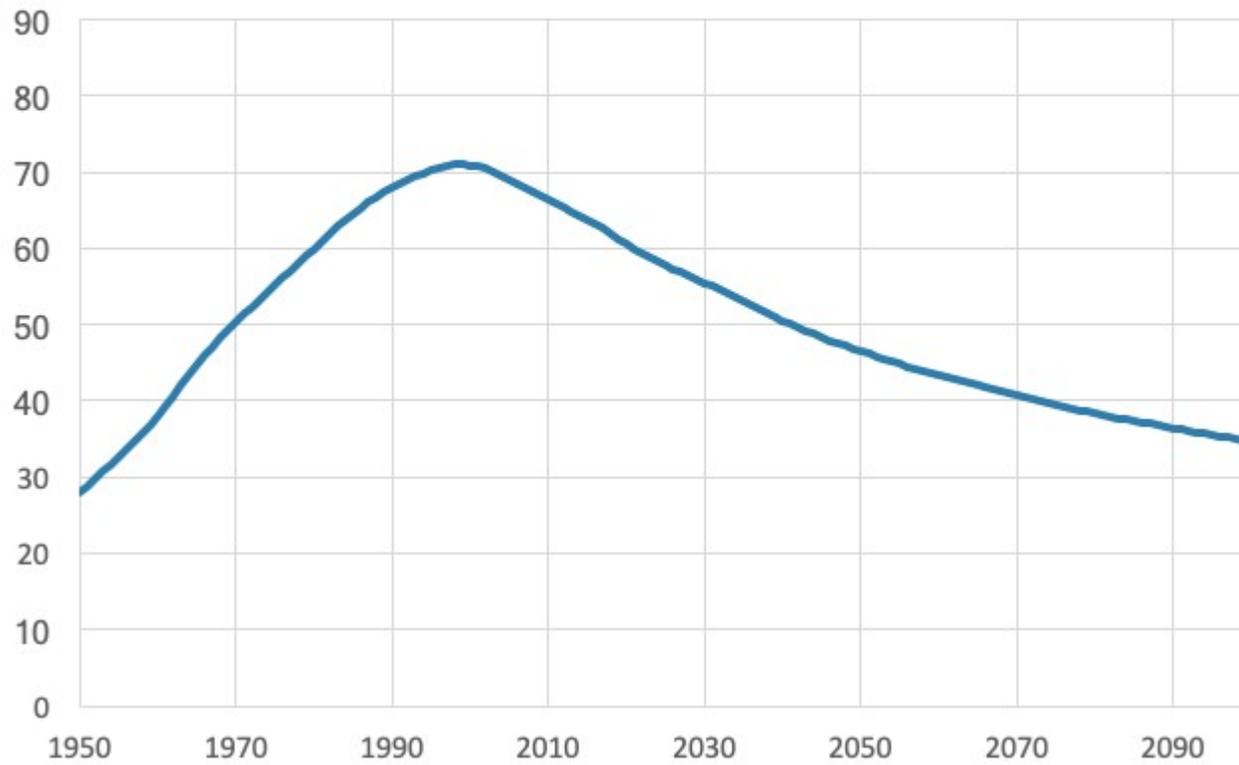
AGE STRUCTURE TRANSITION

Demographic Revolution:

Shift from youth-dominant to elderly-dominant populations

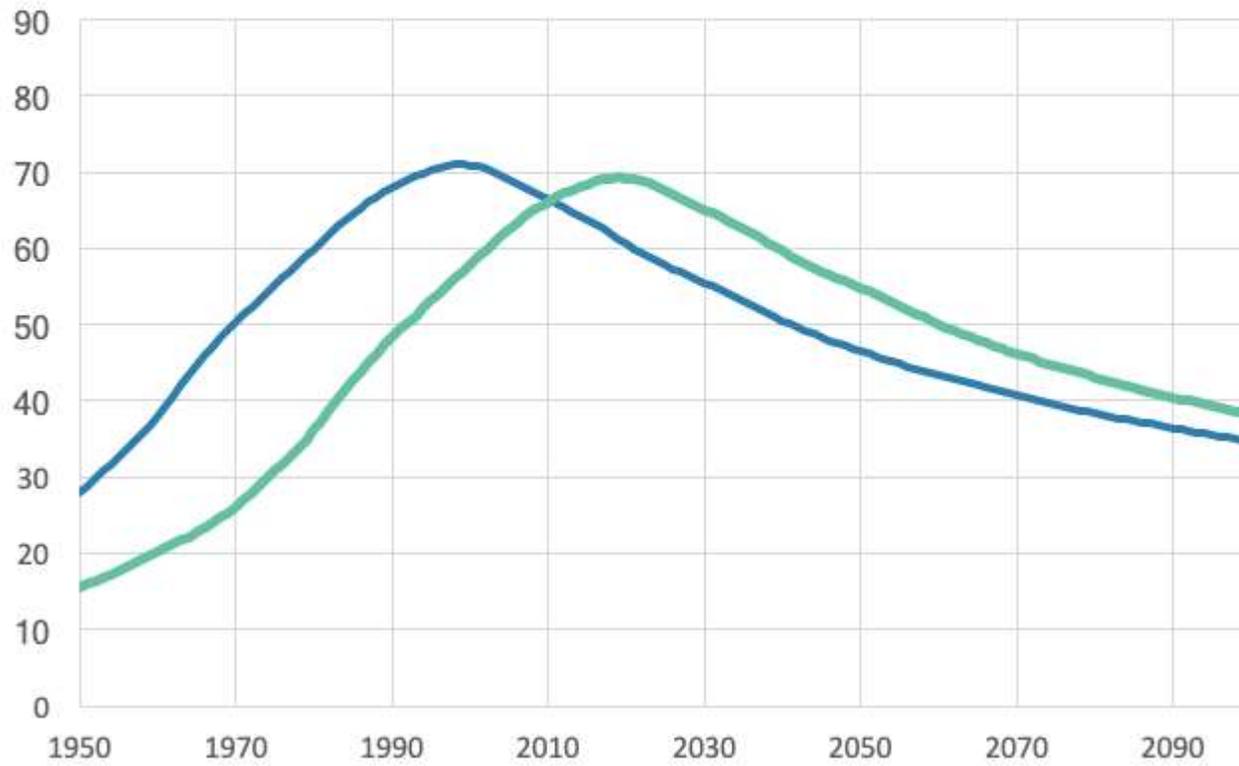
MILLIONS OF BRAZILIANS

— 0-19 20-39 40-59 60+



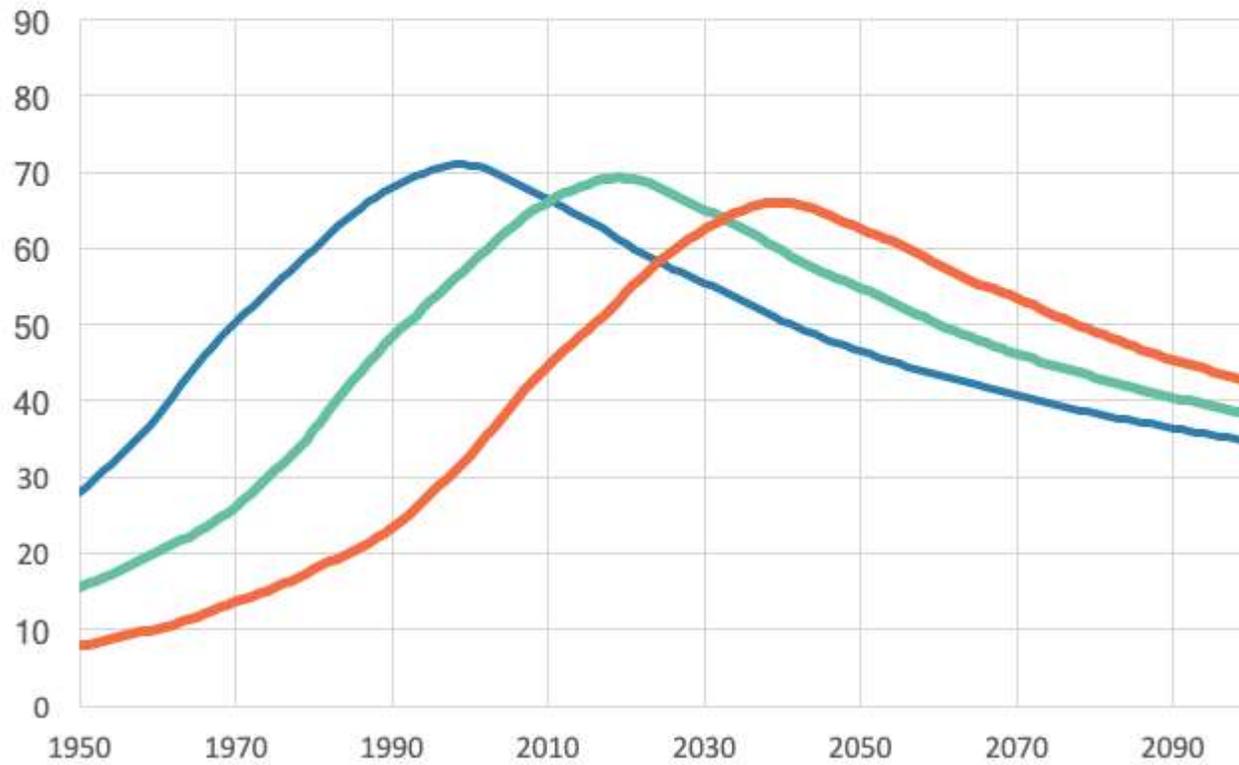
MILLIONS OF BRAZILIANS

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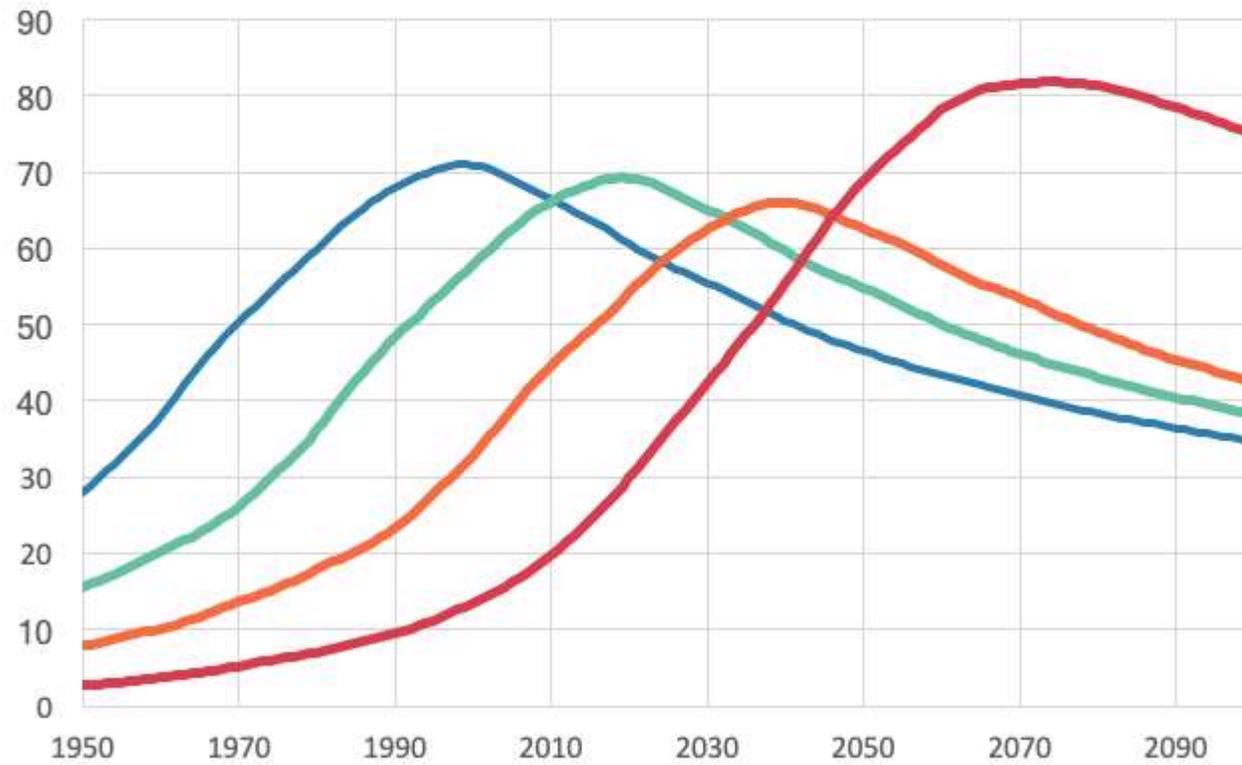
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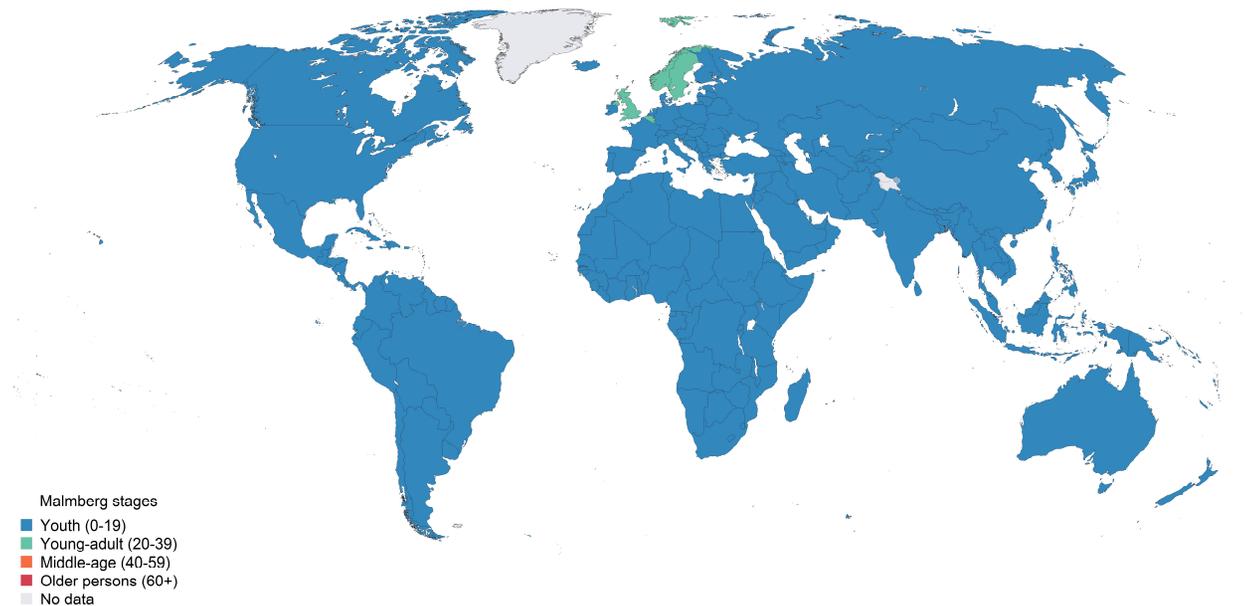
MILLIONS OF BRAZILIANS

0-19 20-39 40-59 60+



1950: Youth-dominant populations

1950

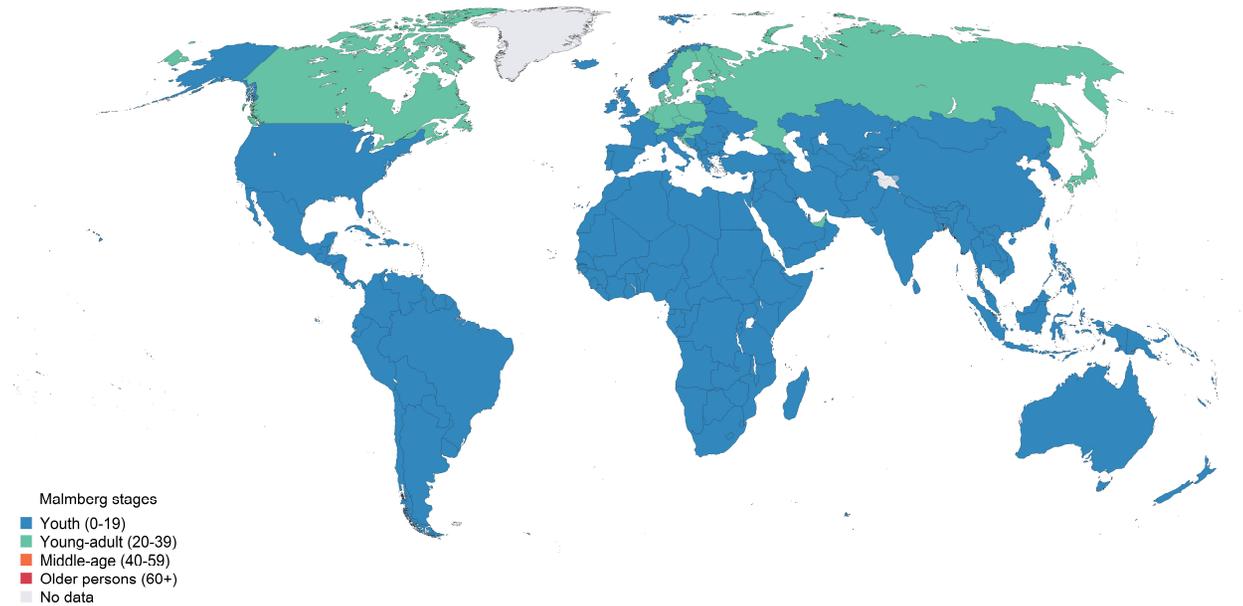


Data source: World Population Prospects 2017

The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

1980: Young-adult populations in the north

1980

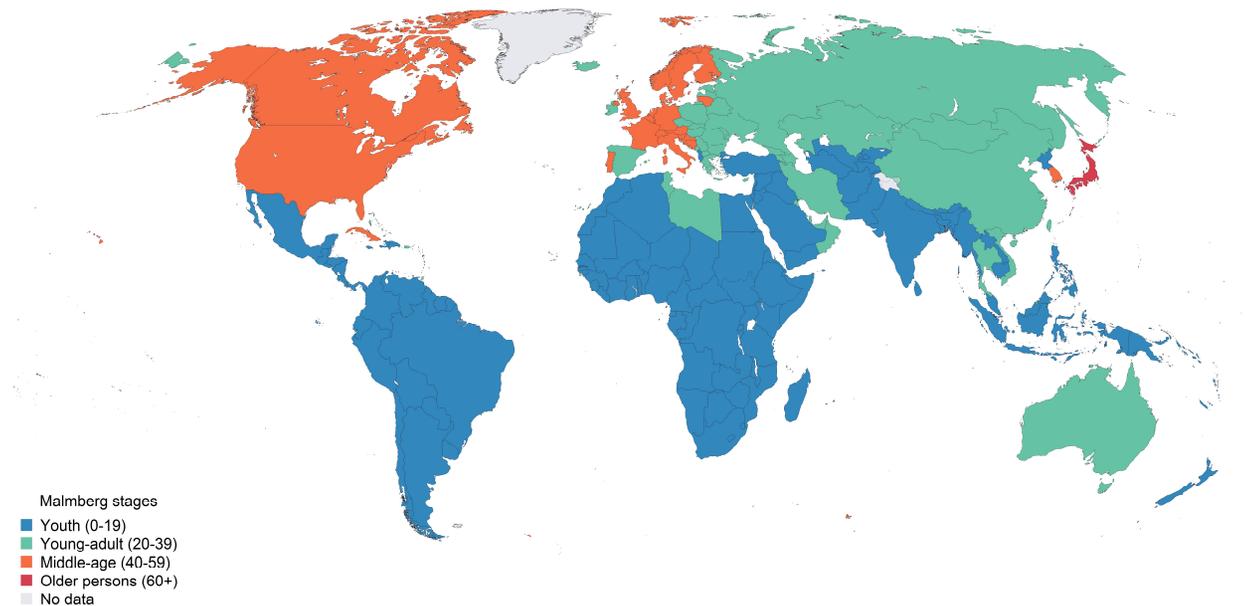


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2010: Middle-age populations emerge

2010

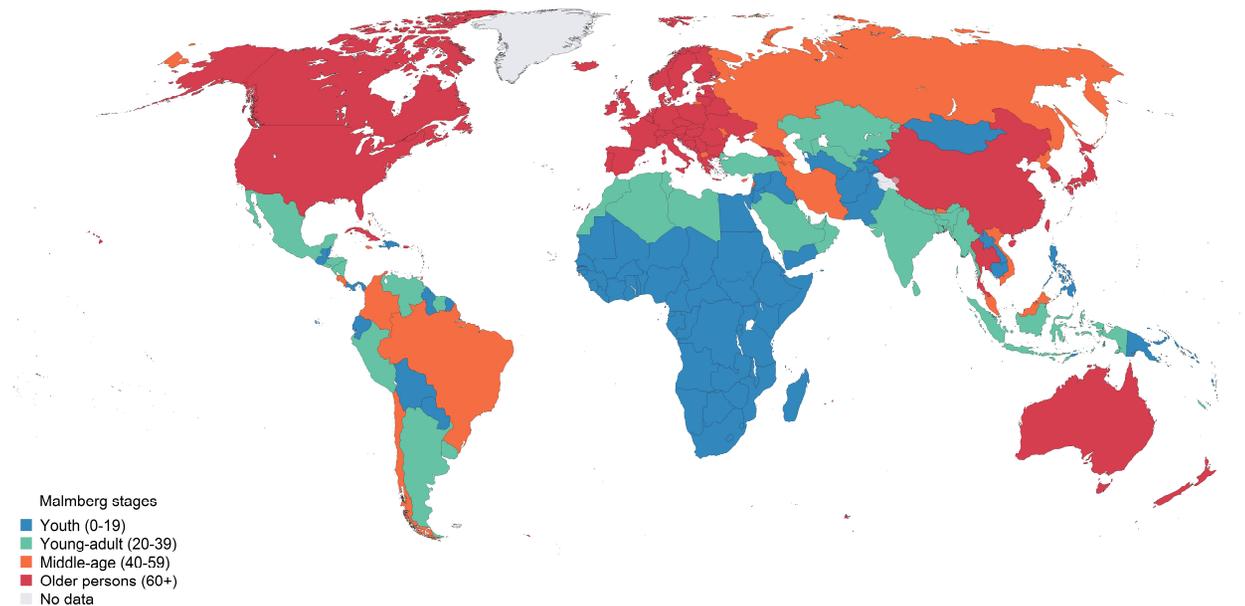


Data source: World Population Prospects 2017

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2040: Aged populations emerge

2040

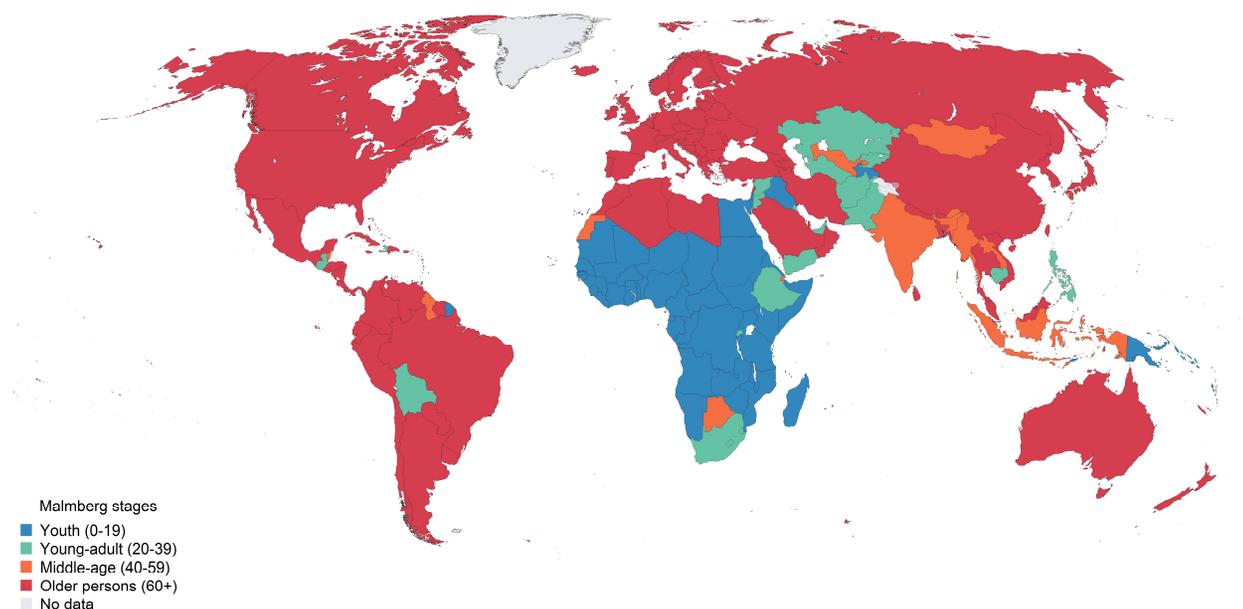


Data source: World Population Prospects 2017

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2070: Aged populations spread

2070



Malmberg stages

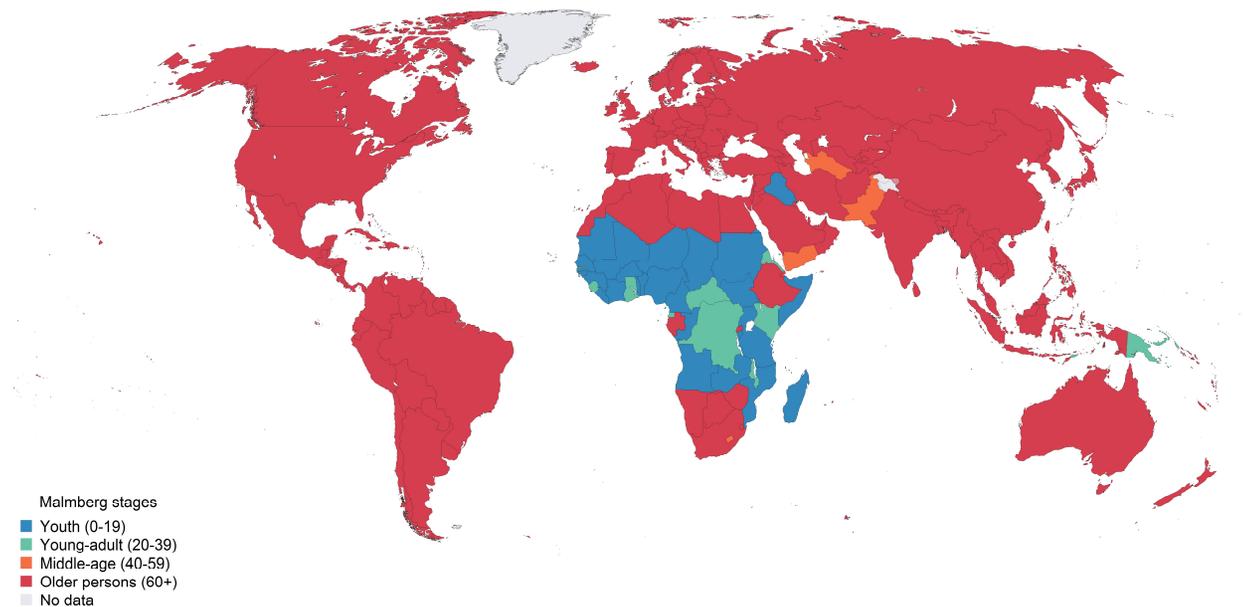
- Youth (0-19)
- Young-adult (20-39)
- Middle-age (40-59)
- Older persons (60+)
- No data

Data source: World Population Prospects 2017

The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

2100: Aged populations throughout the world

2100



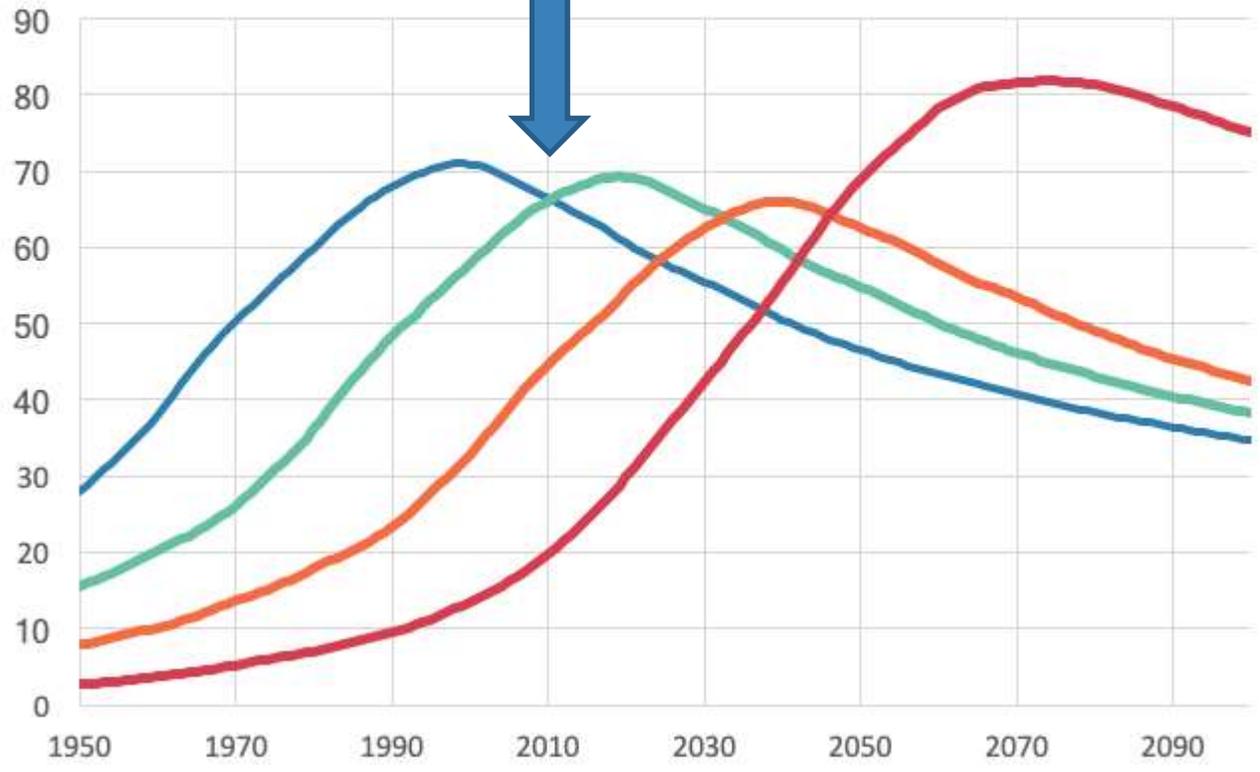
Data source: World Population Prospects 2017

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2010:
End of the
Youth
Society in
Brazil

MILLIONS OF BRAZILIANS

0-19 20-39 40-59 60+



AGE STRUCTURE TRANSITION

In what year, does the
Youth Society
end in your country?

AGED ECONOMY

One way of classifying economies... by income

Economy	Old group	New group
Cambodia	Low	Lower middle
Equatorial Guinea	High	Upper middle
Georgia	Lower middle	Upper middle
Guyana	Lower middle	Upper middle
Mongolia	Upper middle	Lower middle
Russian Federation	High	Upper middle
Senegal	Lower middle	Low
Tonga	Upper middle	Lower middle
Tunisia	Upper middle	Lower middle
Venezuela, RB	High	Upper middle

Nice features:

- Convenient short-hand.
- Milestones.

Source: World Bank

Another way of classifying economies... by consumption

Aged Economy

An economy in which more goods and services are consumed by older persons than by youth.

$$C_{65+} > C_{0-19}$$

Nice features:

- Convenient short-hand.
- Milestones.

How to derive estimates and forecasts of C_{65+}

$$\gg C_{65+} = \sum c_x * N_x$$

National Transfer
Accounts
(consumption
per older person)

Population Division
(number of older
persons)

$$C_{65+,t} = \sum c_{x,t} * N_{x,t}$$

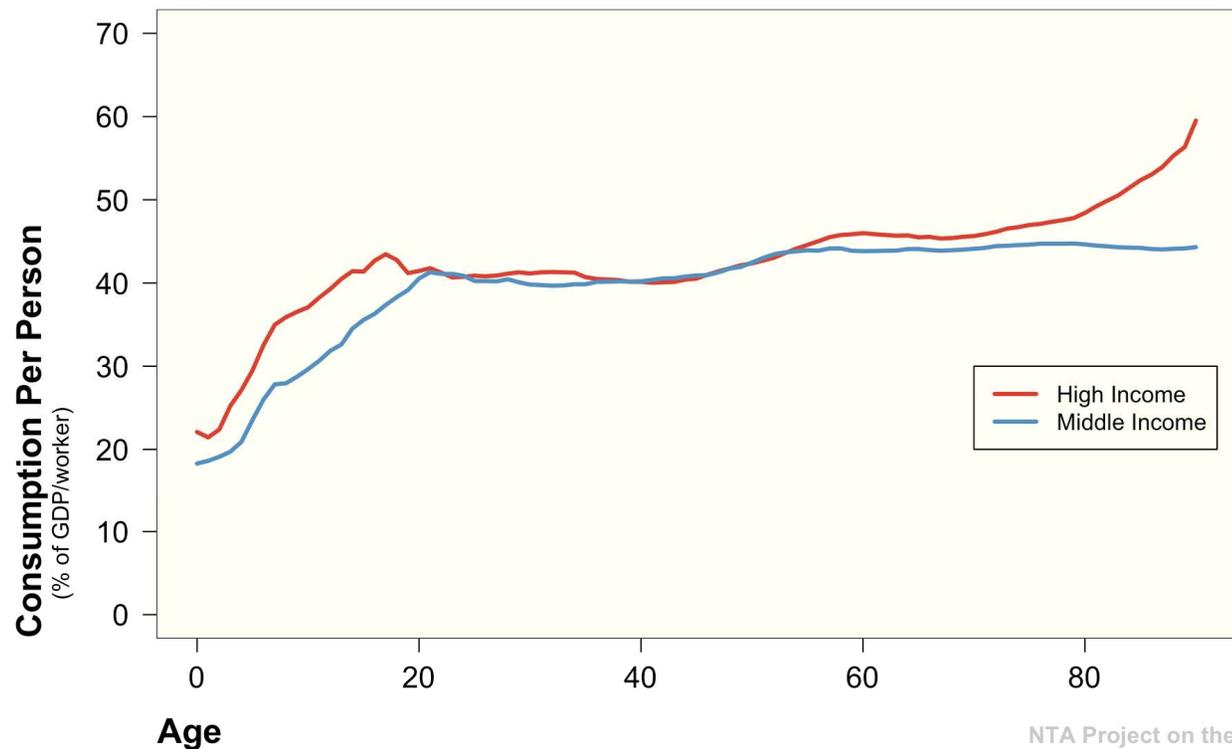
Reasonable
guess
(consumption
per older person)

Population Division
(number of older
persons)

For now,
Just use the NTA
consumption
profiles in the base
year.

In the future, using
a forecast of future
consumption profile
will improve the
accuracy of the
forecast.

Relative Consumption per Person in High and Middle Income Countries



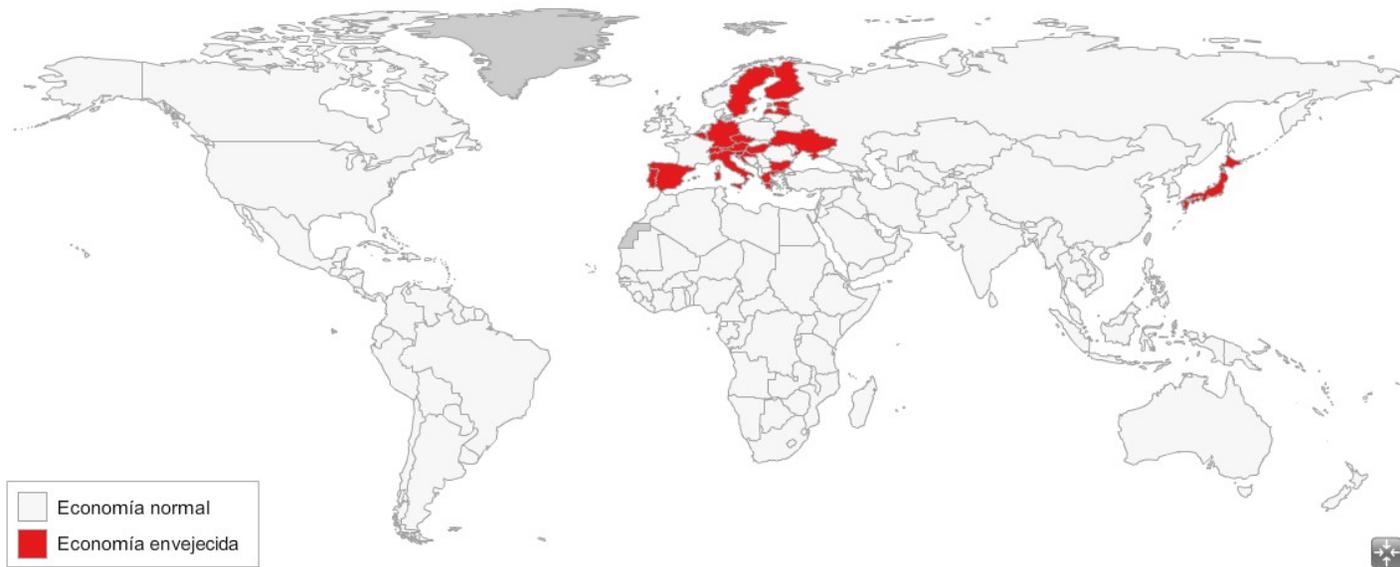
NTA Project on the
Generational Economy

1980

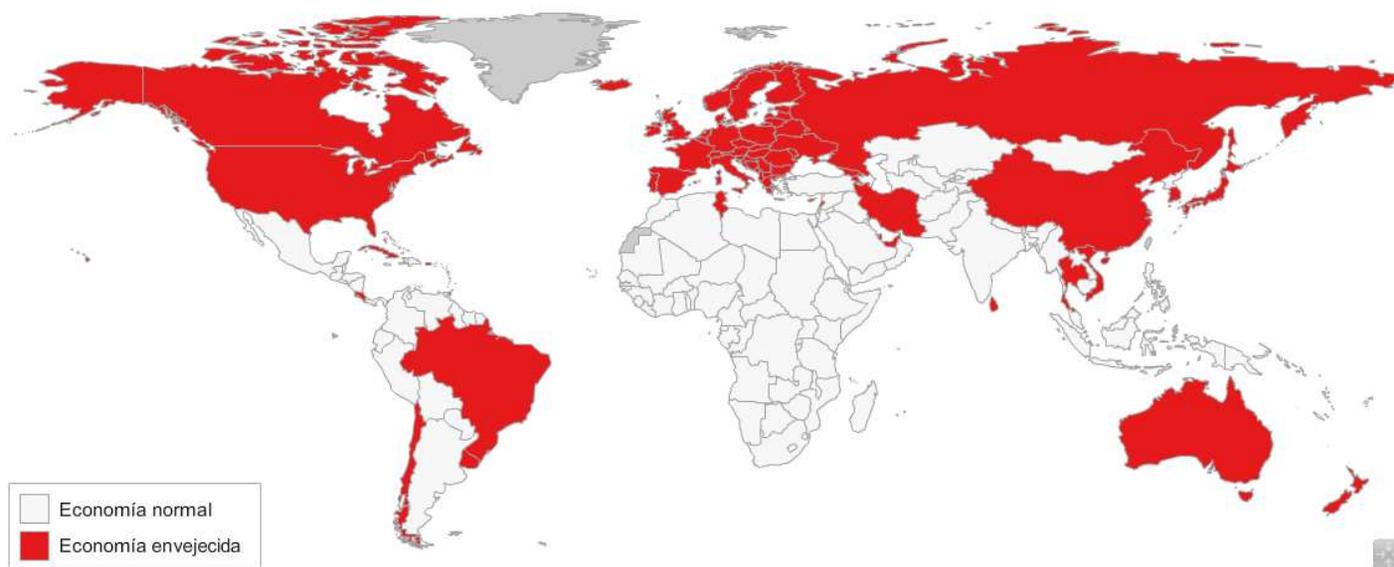
0 Economies



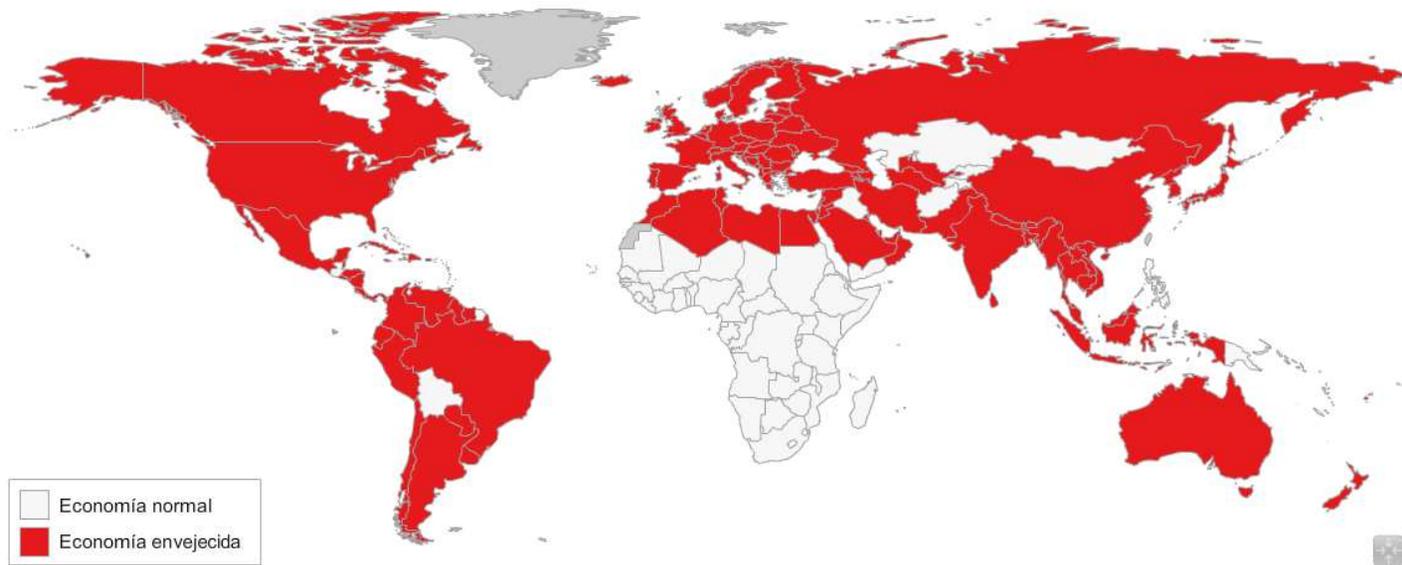
2010 23 Economies



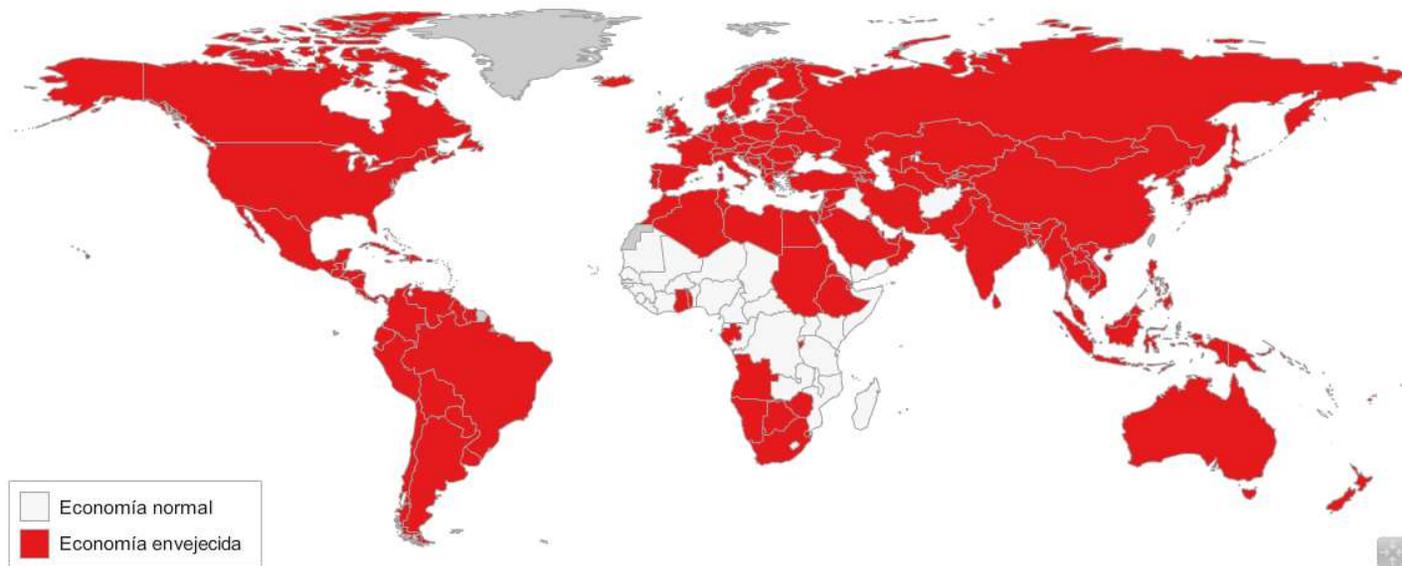
2040 89 Economies



2070 155 Economies



2100 193 Economies

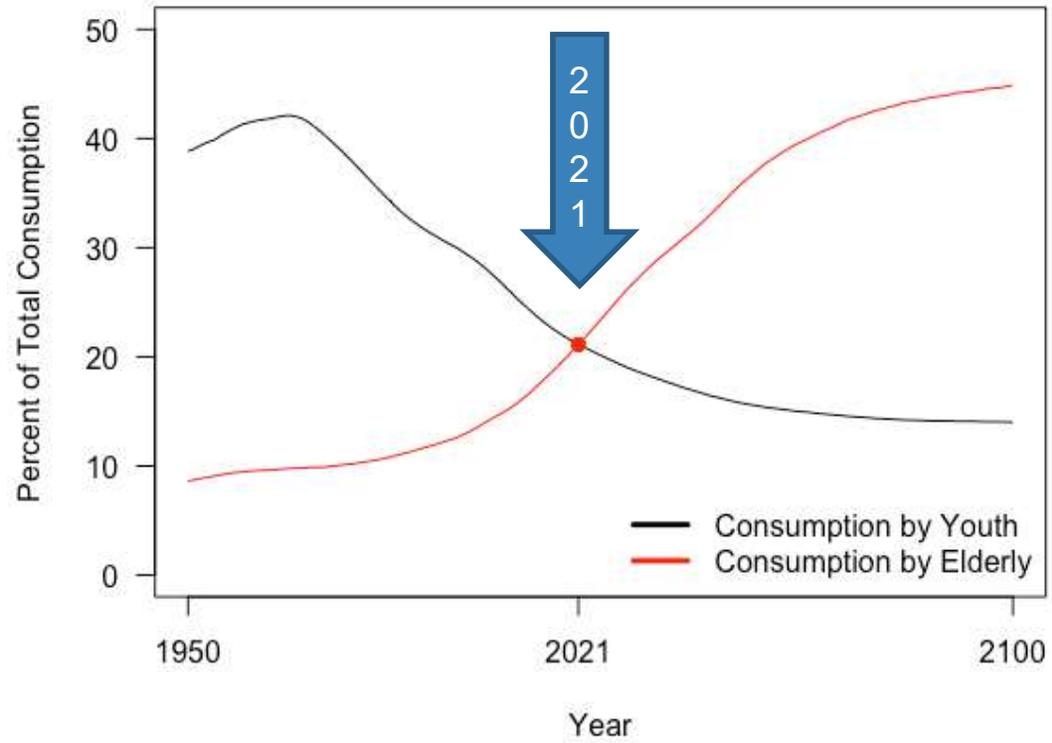


Conclusion:

The Aged Economy is a recent phenomenon which will come to dominate world economies in this century.

Chile becomes an Aged Economy in 2021

Chile: Consumption by Youth and Elderly



AGED ECONOMY

**In what year do you
predict your country will
become an Aged
Economy?**

DEMOGRAPHIC DIVIDEND AND DEMOGRAPHIC TAX

DEMOGRAPHIC DIVIDEND AND DEMOGRAPHIC TAX

**Impact of changing age structure on
economic growth**

DEMOGRAPHIC DIVIDEND AND DEMOGRAPHIC TAX

Because economic activities vary by age, shifts in the age distribution can be expected to have impacts on economic markets: labor markets, consumer markets, and financial markets.

DEMOGRAPHIC DIVIDEND AND DEMOGRAPHIC TAX

Of course, the story is more complex. The age pattern of economic activity will also change in response to these demographic changes. Changing economic behaviors and changing demographic behaviors are intertwined – they both shape and in turn are shaped by the economic-demographic environment they create. This evolution makes the study of economic demography so interesting. Nevertheless, it is **useful to take a simple approach** – abstracting from the complex interactions -- to grasp the general implications of this demographic revolution.

DEMOGRAPHIC DIVIDEND AND DEMOGRAPHIC TAX

We take a “weight-of-the-numbers” approach.

Aggregate economic variables of interest such as consumption or labor earnings are the sum of age-specific economic behavior (i.e., consumption per capita by age, or average labor earnings by age) weighted by the population age distribution.

Under the “weight-of-the numbers” approach, we explore the impact of shifting age composition on aggregate economic activity **under the simplifying assumption that economic behaviors at each age remain unchanged.**

Demographic Dividend and Demographic Tax

TWO METHODS:

Method 2: Using NTA data

Method 1: Simplified – not using NTA

GDP per capita: Method 2, using NTA data

1. Assuming a production function for national output such that GDP per capita = $k(t) * \text{wage bill} / \text{population}$; where $k(t)$ reflects the impact of non-labor factors such as capital and technology on output in year t .

$$O / P = k(t) * Y / P$$

GDP per capita: Method 2

2. If we assume that the age pattern of production maintains its shape over time and rises at the rate of labor productivity, then we have: GDP per capita = $k(t) * z(t) * \sum (p(x,t)*y(x)) / \sum p(x,t)$; where $p(x,t)$ is the population at age x in year t , taken from UN population estimates; $y(x)$ is the age shape of labor earnings taken from NTA data.

$$O / P = k(t) * \sum (p(x,t)*y(x,t)) / P$$

$$O / P = k(t) * \sum (p(x,t)*y(x)*z(t)) / P$$

$$O / P = k(t) * z(t) * \sum (p(x,t)*y(x)) / P$$

GDP per capita: Method 2

3. Hence, the contributions of the changing age distribution to changes in GDP per capita are the difference between the growth rate of the “effective worker population”, $\Sigma (p(x,t)*y(x))$; and the growth rate of the total population, P .

$$\underbrace{O / P}_{\text{GDP per capita}} = \underbrace{k(t) * z(t)}_{\text{Economic}} * \underbrace{\Sigma (p(x,t)*y(x)) / P}_{\text{Demographic}}$$

GDP per capita: Method 2

Demographic dividend and tax are measured as the change in the effective number of producers relative to the total population.

$$O / P = k(t) * z(t) * \sum (p(x,t) * y(x)) / P$$

GDP per capita

Economic

Demographic

GDP per capita: Method 1, without NTA data

1. Ignoring the age structure within the age group 20-64 enables us to simplify the method for forecasting GDP – **for use in country's without NTA data.**
2. GDP per capita is the product of output per worker, labor force participation rate, and the share of the population in the working ages.

$$\underbrace{O / P}_{\text{GDP per capita}} = \underbrace{O/L}_{\text{Output per worker}} * \underbrace{L/P_{20-64}}_{\text{LFPR}} * \underbrace{P_{20-64}/P}_{\text{Working-age pop}}$$

GDP per capita: Method 1

1. Ignoring the age structure within the age group 20-64 enables us to simplify the method for forecasting GDP – **for use in country's without NTA data.**
2. GDP per capita is the product of output per worker, labor force participation rate, and the share of the population in the working ages.

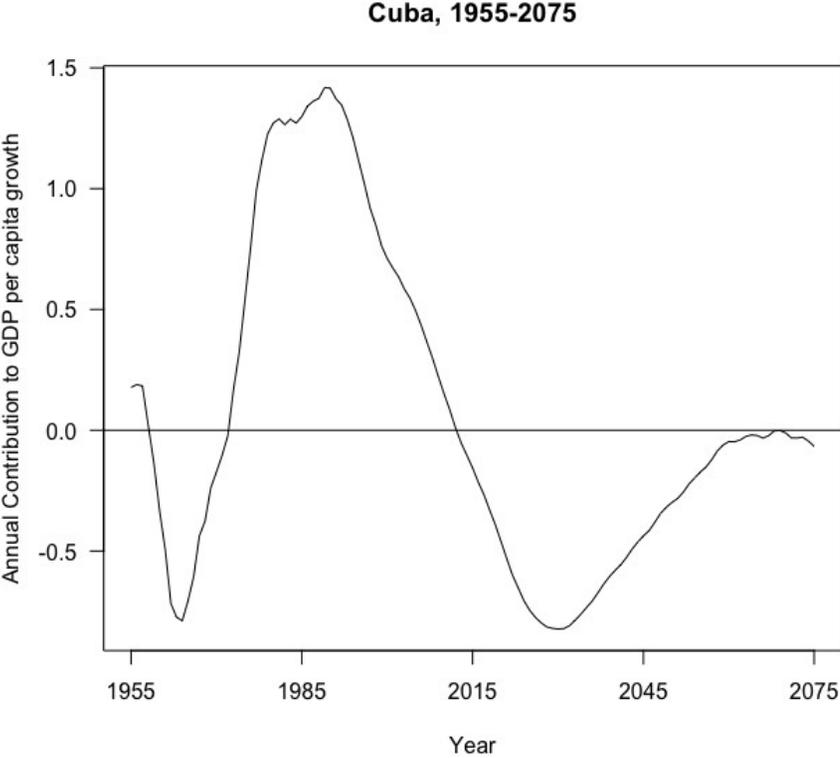
$$\underbrace{O / P}_{\text{GDP per capita}} = \underbrace{O/L * L/P_{20-64}}_{\text{Economic}} * \underbrace{P_{20-64}/P}_{\text{Demographic}}$$

GDP per capita: Method 1

Demographic dividend and tax are measured as the change in the percent of population in the working-ages.

$$\underbrace{O / P}_{\text{GDP per capita}} = \underbrace{O/L * L/P_{20-64}}_{\text{Economic}} * \underbrace{P_{20-64}/P}_{\text{Demographic}}$$

Demographic dividend and demographic tax



Dividends and taxes are transitory

The impacts of the changing age distribution on the economy are transitory – because the rapid changes in age distribution are transitory.



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Any questions?

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and laim@un.org

Next up

Session 8: Hands-on, Forecasting Economic Growth