How future population change will affect the global economy: some lessons from NTA

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Based on Andrew Mason, Ronald Lee, **and 71 members of the NTA network** (2022) "Six Ways Population Change Will Affect the Global Economy", *Population and Development Review*, v.48, n.1 (March) http://dx.doi.org/10.1111/padr.12469

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Introduction

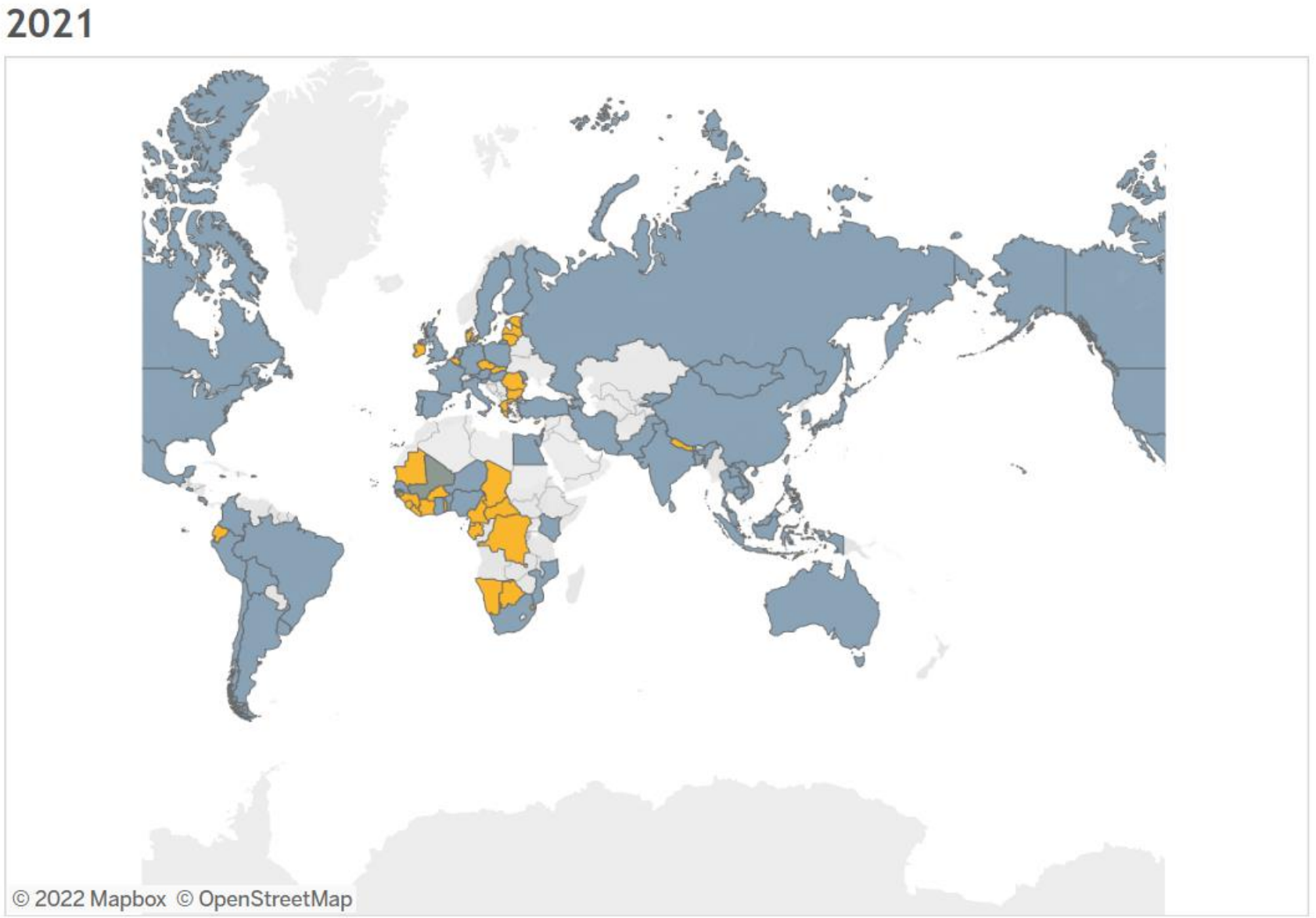
- These days causal analysis through natural experiments of one sort or another is very popular and sometimes seems to be viewed as the only credible source of insight and understanding of social processes.
- Certainly this approach is increasingly used in demography, and I welcome and applaud this development.
- However, demography can provide insights in many other ways as well, some of them very old fashioned.
- In this talk I will use some of these old fashioned methods to draw important lessons from the most basic NTA age profiles for labor income and consumption, combined with UN population estimates and projections.

NTA project

70+ country members (grey)

99 countries with direct ests (+orange)

85% of world pop



Countries belonging to the NTA network are represented by blue.

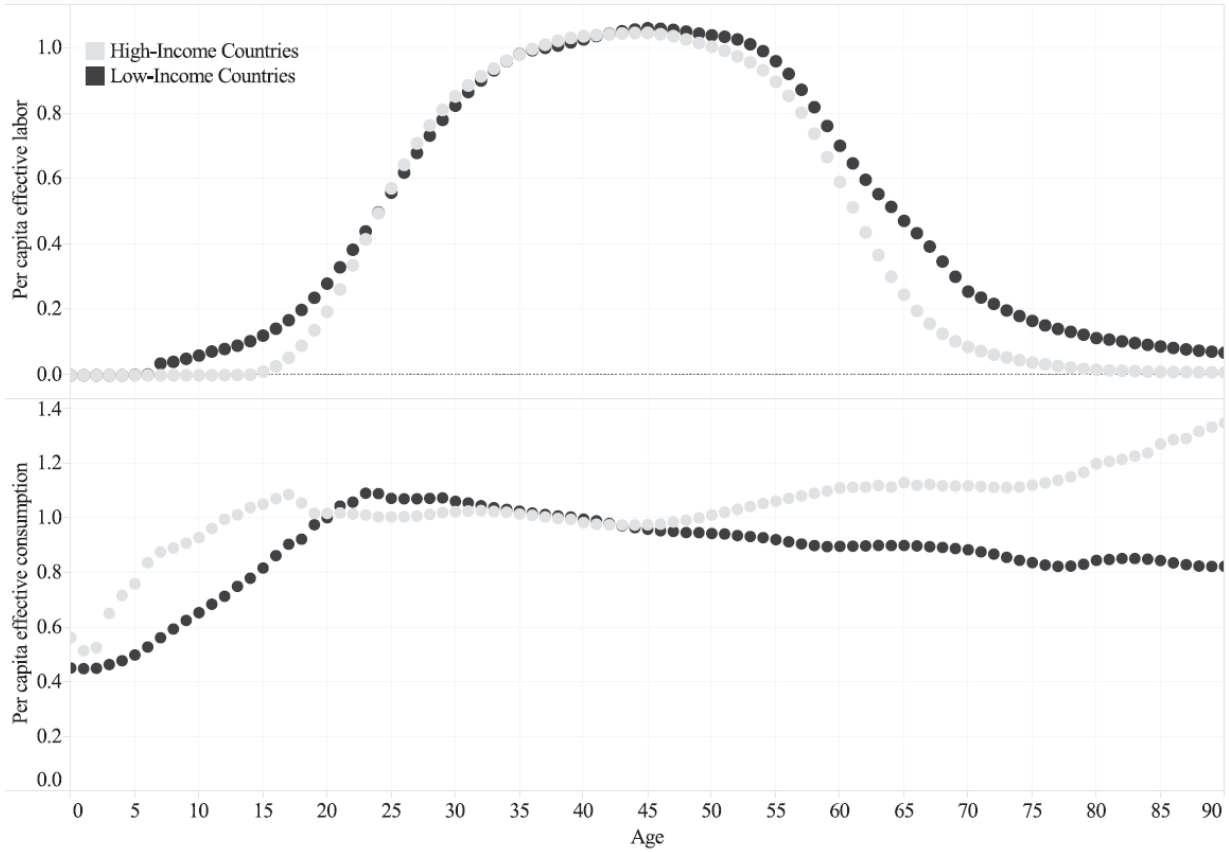
NTA includes many variables, here use most basic: labor income and consumption.

- NTA Labor income is average across all individuals at each age, men and women, including zeros:
  - wages and salaries plus fringe benefits
  - labor's share of self-employment income
  - value of unpaid family labor.
- NTA consumption is allocated to individuals in each household, then averaged across pop by age
  - household consumption expenditures
  - public in-kind transfers (public education, health care, long-term care, prorated public goods)

NTA age profiles for high and lower inc countries

- Each profile is divided by average of consumption and labor income respectively of those in the 30-49 age range.
- Unweighted averages of country profiles.

FIGURE 1 Age profiles of consumption and labor income for high- and low-income countries



NOTES: Values are standardized by dividing by the average of values for the 30–49 age range. Averages are simple averages of the country values. Graph with four income groups available online in the SI. (www.ntaccounts.org)

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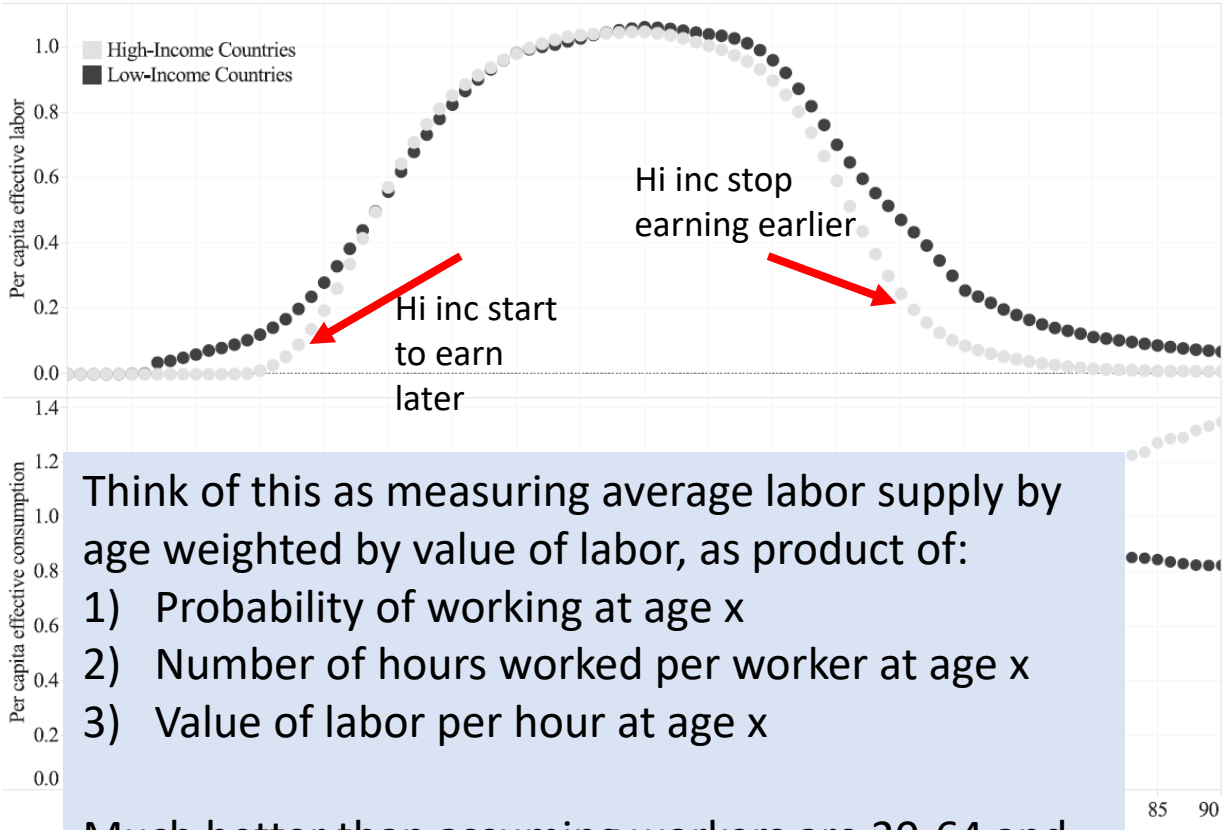

Think of this as measuring average labor supply by age weighted by value of labor, as product of:

1) Probability of working at age x
2) Number of hours worked per worker at age x
3) Value of labor per hour at age x

Much better than assuming workers are 20-64 and otherwise 0 labor supply.

NOTE
simpl
(www.ntaccounts.org)

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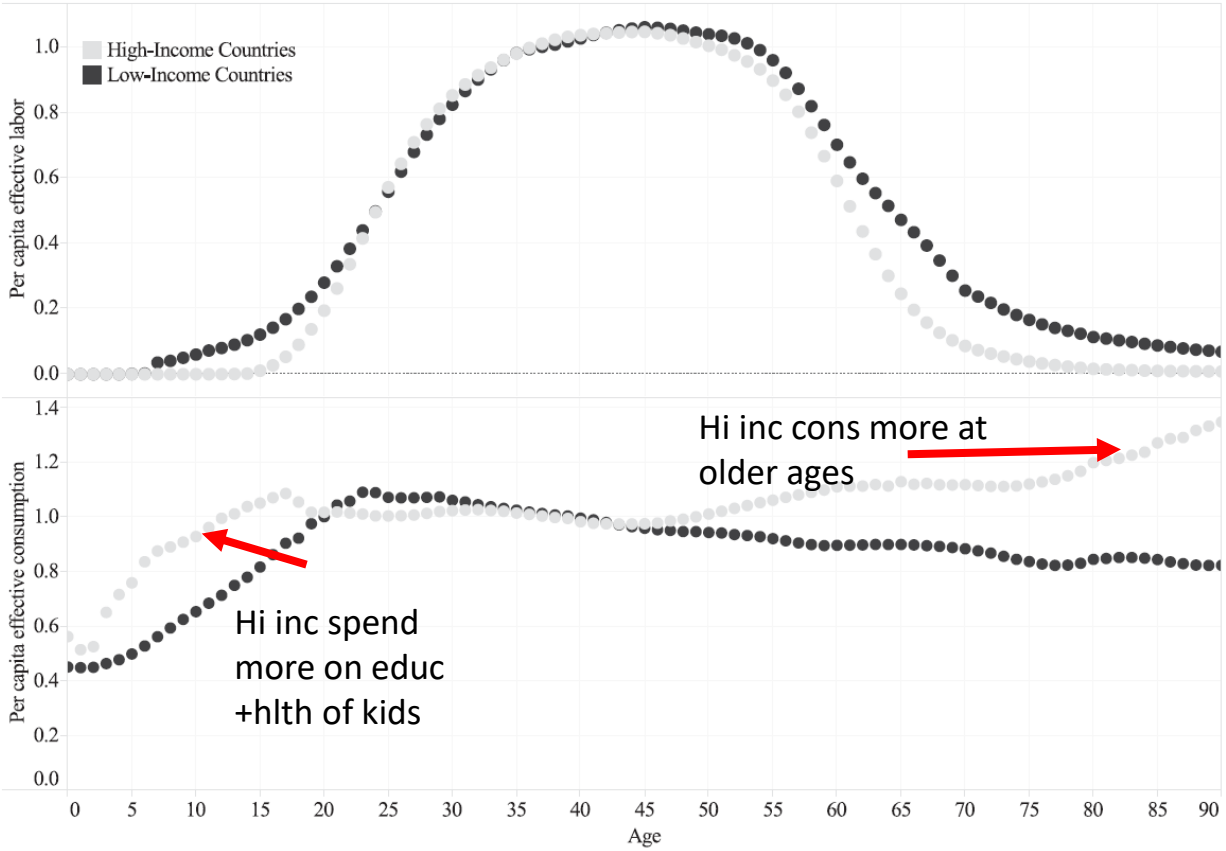

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Pretty pictures, but how can we use them?

- Many, many possibilities.
- Here do simple other-things-equal projections that exploit international heterogeneity in
  - Population size, growth, and age distribution.
  - The age distribution of labor supply
  - The productivity of labor

1) Global GDP growth rate will drop by 1%.

Define some variables

$L_j(t) = \text{"effective labor" in country j}$ = sum of population age distribution in year t times the ***standardized*** labor inc profile for j.

$L(t)$= global "effective labor" = sum of country level effective labor.

$w_b(j) = GDP_j(2020)/L(j,2020)$ = productivity of labor in j in 2020.

$w_b(j)L(j,2020) = GDP(j,2020)$

Using pop projections to calculate $L_j(t)$ for future years shows effect of demography on future GDP, assuming no productivity growth.

More realistically, we can assume some future productivity growth rate.

Growth rates for global aggregates (in percent)

	Annual growth rate (Gr)					Gr(wL)/ Gr(GDP)
	Pop	L	$w_b L$	GDP	Prod	
	(A)	(B)	(C)	(D)	(E)	(F)
1950-75	1.92%	1.65%	1.27%	4.65%	3.34%	0.27
1975-00	1.65%	2.21%	1.80%	3.20%	1.38%	0.56
2000-20	1.20%	1.44%	1.14%	3.58%	2.42%	0.32
2020-60	0.66%	0.62%	0.23%	2.65%	2.42%	0.09

NOTES: All global aggregates are based on values for 186 economies. Population data from the UN . L is effective labor, population weighted by standardized country-specific age profiles of per capita labor income. The equation wbL(t) = j wb(j)L(j, t) is effective labor in economy j in year t weighted by productivity, wb(j), measured as GDP per effective worker, in economy j in 2010. GDP from 1960 to 1999 from Maddison (2001), from 2000 to 2018 from World Bank (2019), and 2019 to 2060 based on growth rate of wbL plus assumed continuation of 2.46 percent productivity growth (SI). Column F is the ratio of C to D, the share of GDP growth accounted for by growth of weighted effective labor.

Effective number of workers (sum of pop x age profile) for each country summed over 186 countries to get global. (ratios to 30-49)

	Annual growth rate (Gr)					Gr(wL)/ Gr(GDP)
	Pop (A)	L (B)	$w_b L$ (C)	GDP	Prod	
1950-75	1.92%	1.65%	1.27%			
1975-00	1.65%	2.21%	1.80%			
2000-20	1.20%	1.44%	1.14%			
2020-60	0.66%	0.62%	0.23%	2.65%	2.42%	0.09

Quite different than the population growth rate, due to changing pop age distribution.

When Pop grows faster than L, total dependency rises, due either to pop aging or rising child dependency.

When L grows faster than Pop dependency is falling: Demographic Dividend.

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Now take international differences in labor productivity into account by using the un-standardized labor inc age profiles (in purchasing power parity adjusted US dollars)

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Gr of productivity weighted labor supply.

Different once again. Why?

Most of growth in L is in sub-Saharan Africa where productivity is very low, so has little effect on the growth of total labor weighted by value.

Countries with high labor productivity mostly have declining effective labor (Europe and E. Asia).

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Growth rates for global aggregates (in percent)

1950 to 2020 is actual historical GDP growth rate

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2020 to 2060 is projected assuming productivity growth rate of 2000-2020 continues.

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Growth rates for global aggregat

Productivity growth is GDP growth rate minus $w_b L$, i.e. (D)-(C)

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Growth rates for global aggregates (in percent)

Ratio of (C) to (D)

Share of population as driver of GDP growth drops from 56%in 1975-2000 to 9% in 2020-2060.

					Prod	Gr(wL)/ Gr(GDP)
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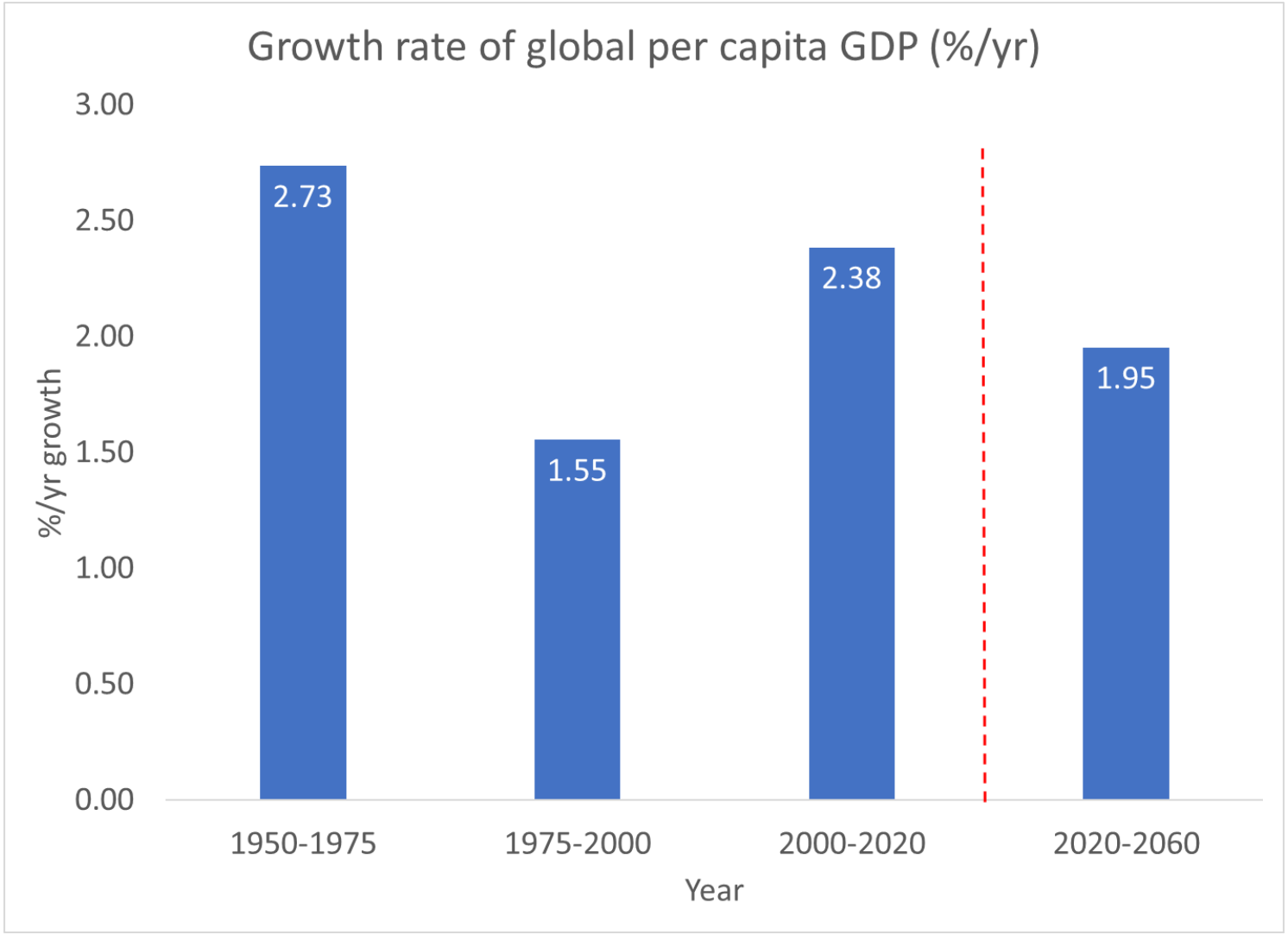
Era of population driven global economic growth is over!

GDP growth is slower, but per capita growth is only slightly lower.



(2) Population change will drive large regional shifts in economic activity

- decline in shares of global econ activity in East and Southeast Asia, Europe, and
  North America;
- Increase in shares of Central and South Asia and
  sub-Saharan Africa.
- Economic shifts should be greater than population shifts.

Effective labor and population classified into four groups based on the projected growth rates of effective labor

	Effective workers (millions)			Share			Growth rate	
	1950	2020	2060	1950	2020	2060	1950-2020	2020-2060
I. Eastern Asia and Europe	577	1,291	939	49.3	31.9	18.1	1.15	-0.45
II. Americas, Oceania except Melanesia	478	2,062	2,614	40.9	50.9	50.4	2.09	0.34
III. Melanesia, Western and Central Asia, Northern and Southern Africa	53	320	505	4.5	7.9	9.7	2.57	0.65
IV. Eastern, Middle, and Western Africa	62	377	1,128	5.3	9.3	21.7	2.57	1.57
Combined	1,169	4,051	5,185	100.0	100.0	100.0	1.77	0.35
	Population (millions)			Share			Growth rate	
	1950	2020	2060	1950	2020	2060	1950-2020	2020-2060
I. Eastern Asia and Europe	1,225	2,423	2,221	48.4	31.1	21.9	0.97	-0.12
II. Americas, Oceania except Melanesia	1,009	3,661	4,492	39.8	47.0	44.3	1.84	0.29
III. Melanesia, Western and Central Asia, Northern and Southern Africa	136	678	1,026	5.4	8.7	10.1	2.30	0.59
IV. Eastern, Middle, and Western Africa	163	1,026	2,404	6.4	13.2	23.7	2.63	1.22
Combined	2,534	7,788	10,143	100.0	100.0	100.0	1.60	0.38

Note: Groupings based on growth rates of effective labor, 2020 - 2060. The four ranges are <0.0, 0.0-0.49, 0.5-0.99, 1.0+.

Hi inc

Lo inc

3) Prime-age adults are being squeezed by population aging

Black dots for higher OADR (older countries)

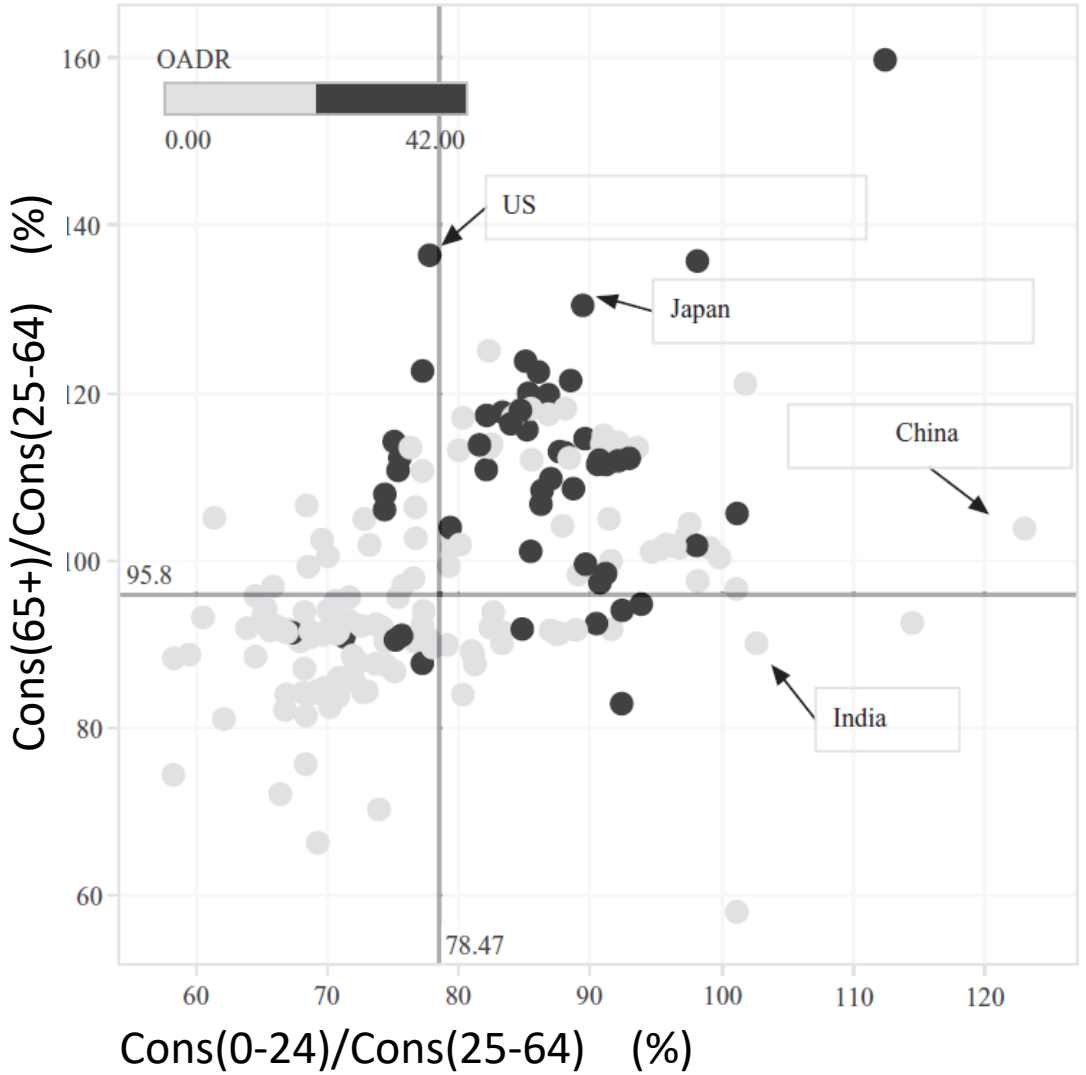
Older countries are in upper right quadrant.
Elderly and youth consume relatively more

Costs of aging are not born by the young.

Low fertility reflects parental choice to have fewer children and invest more in each, so not surprising.

However population aging shifts resources to young and old squeezing prime-age adults

FIGURE 2 Per capita consumption for children (0–24) and the elderly (65+) as a percentage of values for those in the 25–64 age group, 186 economies, circa 2010, old and young countries



NOTE: Countries are classified by OADR, defined as the ratio of the population age 65+ to the population age 25–64.

4) Age structure changes will boost per capita econ growth in low and lower-mid-inc countries but slow it in high- and upper mid-inc countries.

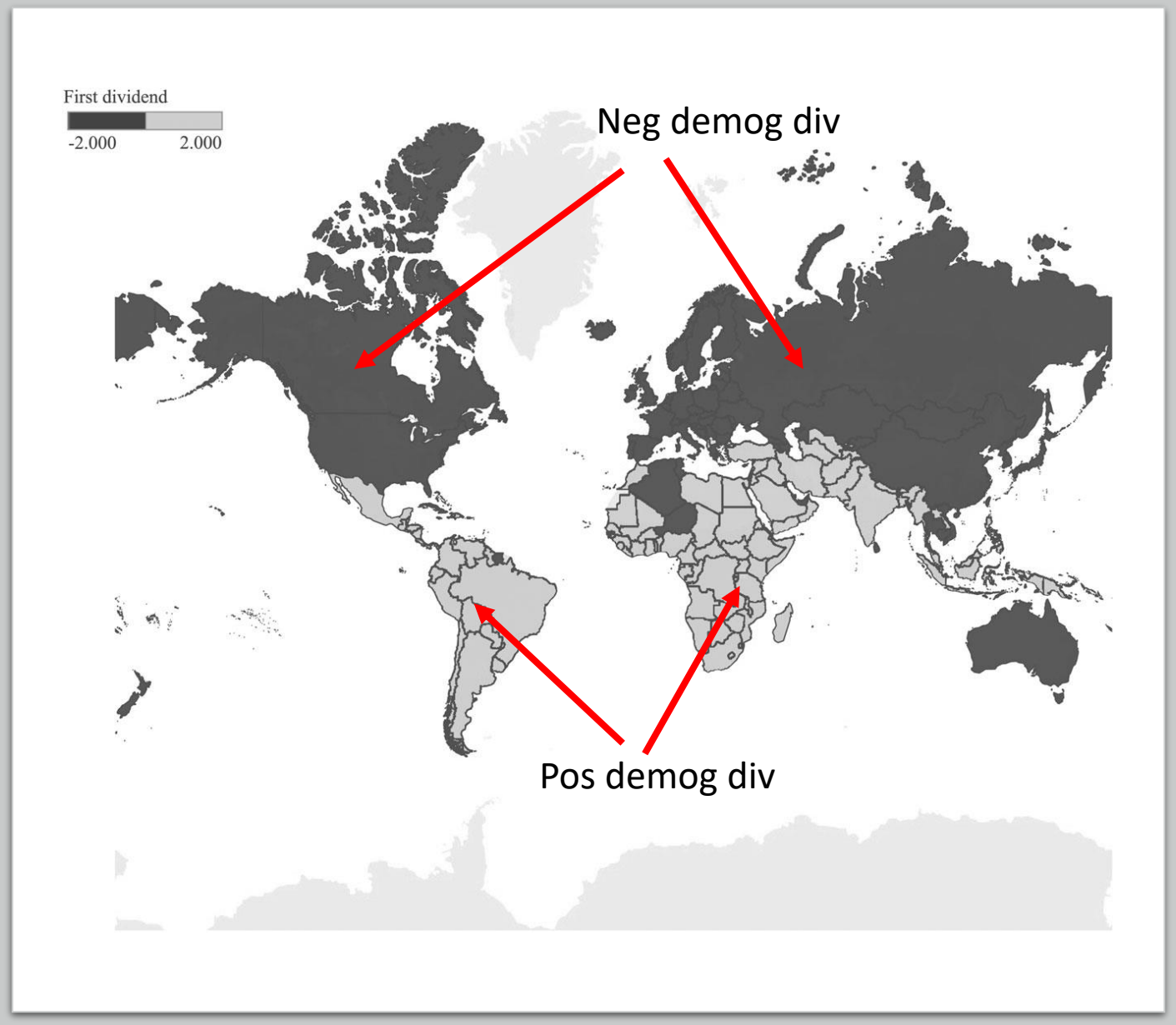
- "Standard of living" is total consumption C divided by effective consumers N, C/N (like per capita cons taking account of age structure.
  - N = population weighted sum of cons by age
  - L = population weighted sum of labor inc by age
  - L/N = support ratio (like dependency ratio)
- "Demographic Dividend" (or "First" demog div) is rate of change of the support ratio, Gr(L/N)

$$C / N = (1 - s)\left(Y / L\right)\ \left(L / N\right)$$

$$Gr[C / N] = Gr[(1-s)\left(Y / L\right)] + Gr[L / N]$$

- Gr(L/N), the demog dividend, has an additive effect on Gr(C/N).

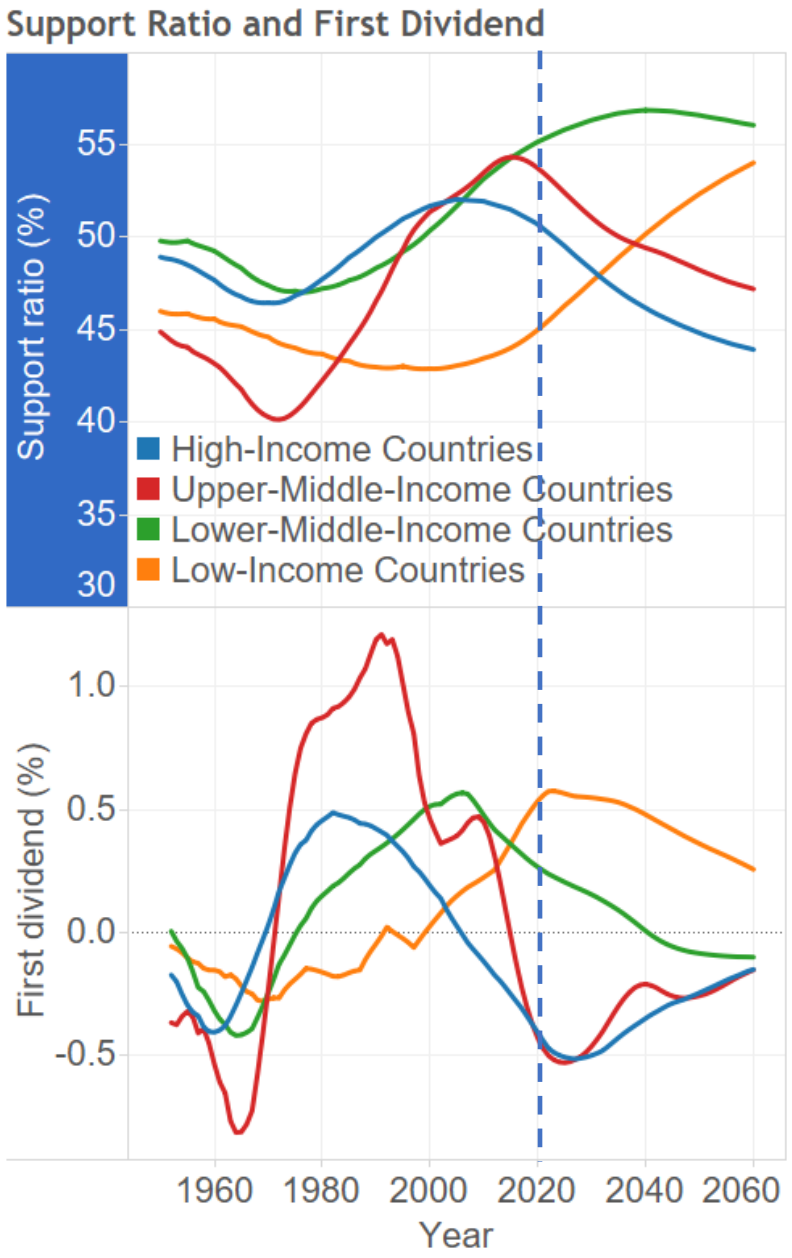
Demog dividend in each country in 2020



Support ratios and First Dividends for Income Groups

(Calculated for indiv countries, then aggregated).

Added to or subtracted from living standard changes due to productivity growth or change in savings.



5) Econ impact of population aging is accelerating in high-income and upper-middle-income countries.

- The OADR is a standard demographic old age dependency measure, e.g. Pop 65+/Pop 20-64.
- Here we use a new NTA based measure, the old-age gap (OAGAP).
- OAGAP is:

  (Consumption above age 65 – Labor inc above 65)/Total labor inc)

$$OAGAP(t) = \frac{\sum_{x=65}^{\omega} c(x,t_0)\,Pop(x,t) - \sum_{x=65}^{\omega} y_l(x,t_0)\,Pop(x,t)}{\sum_{0}^{\omega} y_l(x,t_0)\,Pop(x,t)}$$

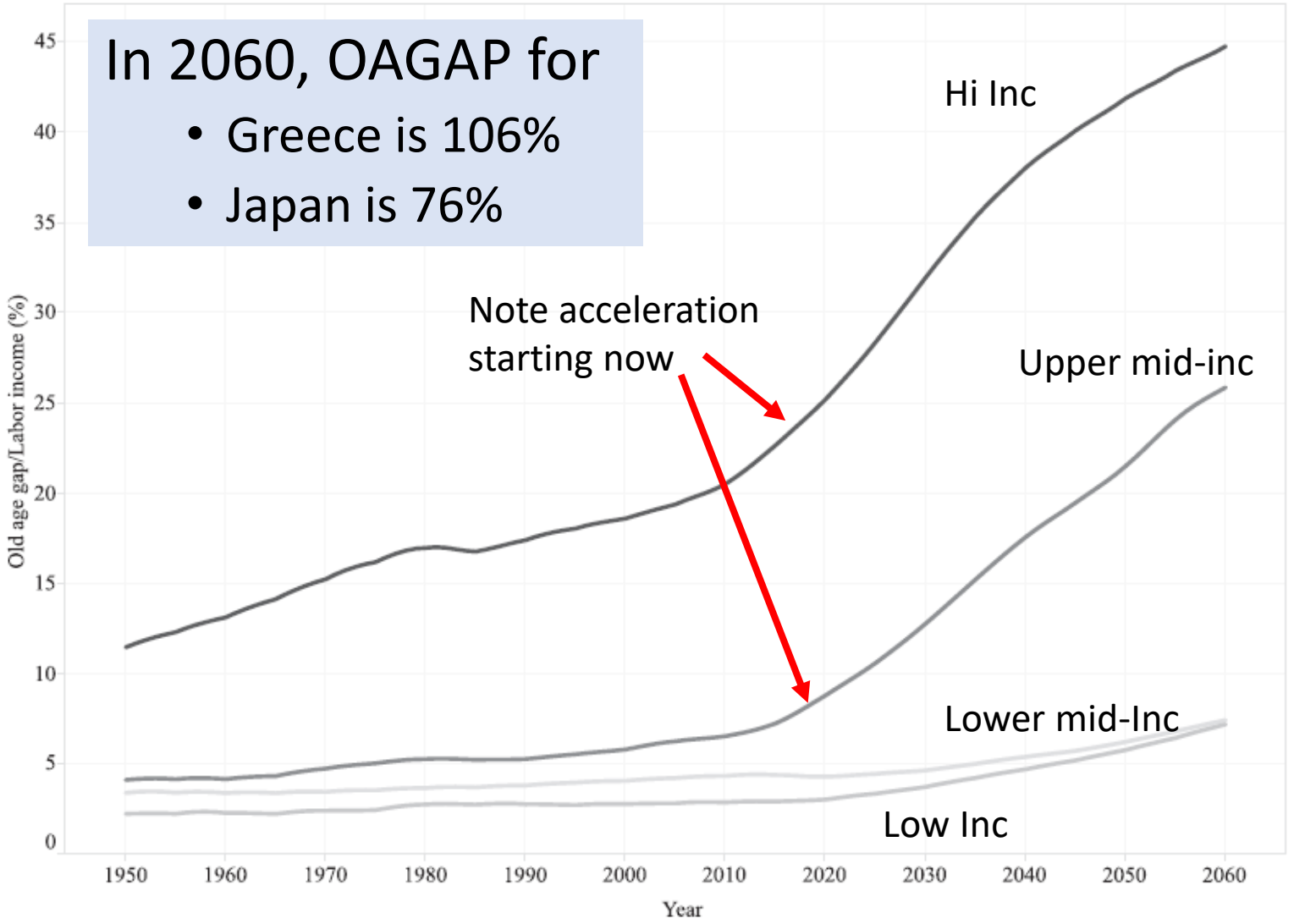
- Note the OADR assumes there is zero labor inc 65+ and av cons.
- Actually, all countries have labor inc 65+ and elder cons can be more or less than average.
- OAGAP reflects these points.

- A simple interpretation: A tax on labor income equal to the OAGAP would raise exactly enough revenues to pay for elder consumption in excess of their labor inc.

The OAGAP 1950–2060, for four inc groups

Currently the OAGAP is about half the OADR in middle and low inc countries but ¾ the OADR in hi inc countries.

Reason is in hi inc, elderly work less and consume more.



NOTES: The old-age gap (OAGAP) is the ratio of the difference between consumption and labor income for all persons 65 and older expressed as a percentage of total labor income for all persons.

6) Wealth, wealth gap, capital, and transfer wealth

- Many economists expect population aging will raise capital/labor ratio ("capital deepening").
- This would make labor more productive, reduce profit rates on capital and reduce interest rates, and increase output.
- Will this happen?
- So far all our measures have been cross-sectional, even when projected over time.
- Now we look at generations longitudinally to calculate the "wealth gap".

The wealth gap is wealth that would be required to fund old-age needs conditional on a country's existing consumption and labor income profiles.
*It projects each gen's hypothetical need for wealth to fund future net cons.
*Then sums these needs across all generations.
*Wealth Gap is expressed as percent of total labor income.

TABLE 3 Wealth gap as a percentage of total labor income

	Low-income	Lower-middle-income	Upper-middle-income	High-income
1980	142	88	192	510
2020	190	118	387	884
2060	264	227	736	1299

How will this increasing need for wealth be met?

- Perhaps by rescaling the economic life cycle to match longer life and lower fertility so that the increased need is smaller.
- Perhaps in form of greater public transfer wealth.
  - This would not raise productivity.
  - Would burden future generations.
  - Would likely reduce inequality for elderly (depends on pension structure)
- Perhaps in form of increased saving and asset accumulation.
  - A shift of emphasis to individual savings would raise inequality.
  - Could be beneficial macro effects or could bring secular stagnation.
- So far different countries and regions of the world have taken different routes with different mixes of these.