Linking Demographic Change to State Fiscal Outcomes

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Thanks to Gretchen Donehower for the state-level age profiles, and Ryan Edwards and Tim Miller for collaboration on California fiscal projections.
Outline of my talk

I. US demographic change – full of surprises!
II. Linking demographic change to public budgets using age profiles.
IV. Conclusions
I. US demographic change – full of surprises!

- Fertility
- Mortality
- Immigration
- Population Aging
Fertility: Massive Baby Boom dominates subsequent US demography. No surprise there.
Fertility dropped in the Great Recession – no surprise there either.
Surprise is it kept heading down after recession ended.
We have lost .4 births per woman!
US has joined the low fertility club of other rich nations

• Will fertility continue to be low? Who knows.
• Social Security Administration assumes fertility will return to pre-Recession levels at 2.0 births per woman. Maybe. But now 1.728.
• If stays at 1.7, pop and labor force growth will drop by .8% per year (long term) relative to typical projections and pop aging will be much greater.

FIGURE 1-3 Life expectancy at birth between 1980 and 2015, by country; the United States ranked 20\textsuperscript{th} in 1980 and 40\textsuperscript{th} in 2015.

Since 2015 a stunning reversal of trend in US life expectancy

Ronald Lee, UC Berkeley, Oct. 10 2019
After decades of upward trend, now three years of decline

[Graph showing a trend line with labeled points for years 1920 to 2030, indicating a decline and slowdown in the trend.]
By 2017 we lost one year of life relative to trend.

Life expectancy dropped .3 or .4 years from 2014 to 2017. Should have risen by .5 years. We have lost about one year of life in last three years.
Elsewhere life expectancy has continued to rise. Why has it declined in US?

- “Deaths of Despair” – rising suicide, drug overdoses, alcohol deaths, particularly for low education whites of working ages.
- Obesity and diabetes
- Smoking
- Widening social class differences in mortality in US.
Immigration: Foreign born share of pop has been rising since 1970.


Pew Research Center  June 17, 2019
77% of immigrant pop (foreign born) is legal, 23% unauthorized.
Unauthorized immigrant population increased by 500,000 per year 1990 to 2007, then started to decline in recession. In 2018 3.2% of total US pop.
Undoc Mexican population in US declined by 1.5 million since 2007; from other places rose slightly.
Population Aging is happening fast bringing:
* more dependent elderly
* slower labor force growth
Population age distribution 1950-2015 and projected to 2100 (United Nations), children, working age, elderly
Population Aging, 1950-2015 and projected to 2100 (United Nations)

Population Age Distribution (%)

- Working ages: 20-64
- Children: 0-19
- Elderly: 65+

Old Age Dependency Ratio (65+/20-64)

We are in middle of exceptionally rapid increase as OADR doubles.
**Slowing labor force growth** is part of pop aging

1%/yr drop in labor force gr rate will cause 1%/yr drop in growth rate of GDP.

With 1.6%/yr productivity growth rate, we get GDP growth rate of only 2%/yr in future.

(CBO projects 1.9% GDP growth)
II. Linking demographic change to public budgets

• First step – examine budget shares of revenue sources and expenditures.

• Expenditures
  ➢ Which are targeted to individuals by age?
  ➢ Which are not targeted by age, but do increase as the population grows? “congestibles” (e.g. roads, public utilities, police, fire)
  ➢ Are some pure public goods that do not need to grow as population grows? E.g. legislative expenses. At federal level, defense.

• Revenues
  ➢ Which sources are expected to vary by age? Which not?
Examine state sources of revenue to determine which are age-specific and which are not.

Example of California in 2000-2001

- **Sales taxes** depend on consumption which is varies by age
- **Personal income tax** depends on income which varies strongly with age
- **Together these account for 93% of General Fund revenue in 2000-01**

- Corporations are owned by individuals through stock market equities. Elderly hold most equities and indirectly pay most corporate taxes. Could be included, but not in what follows.
- If Local taxes were included, then property tax would highly age related.

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Table 2-1

<table>
<thead>
<tr>
<th>Revenue Categories, in Thousands of Current Dollars</th>
<th>2000-01</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales taxes(^1)</td>
<td>21,691,958</td>
<td>30.4</td>
</tr>
<tr>
<td>Corporation tax</td>
<td>6,899,302</td>
<td>9.7</td>
</tr>
<tr>
<td>Horse racing (parimutuel) license fees</td>
<td>4,382</td>
<td>0</td>
</tr>
<tr>
<td>Estate, inheritance, and gift tax</td>
<td>934,708</td>
<td>1.3</td>
</tr>
<tr>
<td>Insurance gross premiums tax</td>
<td>1,406,556</td>
<td>2.1</td>
</tr>
<tr>
<td>Trailer coach license (in-lieu) fees</td>
<td>26,337</td>
<td>0</td>
</tr>
<tr>
<td><strong>Personal income tax</strong></td>
<td>44,614,297</td>
<td>62.5</td>
</tr>
<tr>
<td>Regulatory taxes and licenses</td>
<td>64,745</td>
<td>0.1</td>
</tr>
<tr>
<td>Revenue from local agencies</td>
<td>309,448</td>
<td>0.4</td>
</tr>
<tr>
<td>Services to the public</td>
<td>36,625</td>
<td>0.1</td>
</tr>
<tr>
<td>Use of property and money</td>
<td>890,483</td>
<td>1.2</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>638,737</td>
<td>0.9</td>
</tr>
<tr>
<td>Transfers and loans</td>
<td>-6,180,234</td>
<td>-8.7</td>
</tr>
<tr>
<td>Totals, revenues, and transfers</td>
<td>71,428,156</td>
<td>100</td>
</tr>
</tbody>
</table>

\(^1\) Includes the following subcategories: alcoholic-beverage taxes and fees; cigarette tax; and retail sales and use taxes. Italics are used to identify fiscal programs that are intrinsically tied to the population's age characteristics.

Sources: Data are from California Governor's Budget Summary 2002–03, Schedule 8. They represent General Fund transactions only. Data for 2001–02 are preliminary, and data for 2002–03 are proposed.
Two thirds of General Expenditures are age related.

- For age related, estimate average age profiles.
- For non-age related (e.g. transportation, resources, legislative, judicial), assign equal proportion to all ages.
State/Local taxes and benefits per capita by age (national averages)

• Benefits
  ➢ most costly per child age 5-18 (K-12, at about $14K per yr)
  ➢ Not high for elderly because Soc Sec and Medicare are federal. A part of Medicaid for nursing home care.

• Taxes
  ➢ Payments start in late teens, flat from 35-65, then decline slightly. Elderly still pay property and sales tax.

• Net fiscal impact (taxes – benefits)
  ➢ Negative up to age 25
  ➢ Positive 25-65
  ➢ Zero 65+
State/Local taxes and benefits by age, national average per person

- Conclusions
  - Children are very costly, $14K per year.
  - Elderly are a wash on average.
  - Prime age adults are big fiscal help.
Breaking down the state/local programs

[Graph showing the distribution of education, Medicaid (state-funded portion only), and congestibles (not age-targeted) across different age groups.]
What is the fiscal impact of the immigrant (foreign born) population?

• Calculate separate average age profiles for native born and foreign born.

• Could also do this for 1\textsuperscript{st} generation (foreign born) and 2\textsuperscript{nd} generation (children of foreign born) immigrants, but not done here.
Fiscal impact of native born vs immigrants (foreign born) at State/Local level

- Immigrants
  - Pay substantially less taxes at all adult ages.
  - Receive very similar benefits.
  - Kids are slightly more expensive to educate.

- Net impact of immigrant adults (25+) is very beneficial at 3 or $4,000 per year, although slightly less so than natives.
Immigrant vs native benefits by program

- **Education**: Immigrants cost 1 to 2 thousand more per year.
- **Medicaid**: is slightly lower for immigrants until age 30, but after age 50 is slightly higher; differences are about $500 per year.
- **Could do this in great detail.**
Caution

• These age profiles can give a correct account of the fiscal impact in the state of the immigrant population by age.

• They do not give a correct account of the long term fiscal impact of one additional immigrant.
  - This approach is static.
  - The fiscal impact of an immigrant unfolds over time, requires a longitudinal calculation.
• Typical immigrant arrives as young adult, contributes net positive 3 or $4,000 each year to state, even when old.

  **BUT**

• Immigrants also bear and raise (native born) bchildren in US who each cost 15,000/yr at ages 5-18, almost all for education, plus more for higher education.
  - Say more than $200,000 per birth.
  - Virtually all paid by state/local governments.

  **BUT**

• Children of immigrants (US citizens) become native adults who pay net positive 4 or $5,000 each year to state, even when old.

• And they pay much more in federal taxes and help fund costly federal programs for elderly like Social Security, Medicare and Medicaid.
To assess the net fiscal impact of immigrants requires a careful longitudinal projection

• For examples, see two reports of the National Academy of Sciences, first in 1997 and second in 2017 (or so).
• State of the art analysis.
• A lot on fiscal impact on state/local governments.
Data

• Data
  - Microdata source is March CPS samples, pooled for 2016-2018. At state level, may be necessary to pool more years and do more smoothing.
  - Supplemental information from ACS and IPUMS samples as necessary.
  - Administrative data such as the National Health Accounts and Census of Governments, as needed.
  - Aggregate data, “control totals” on total flows for each year are from 2017 National Income and Product Accounts (NIPA).

• Unfortunately data are grouped above age 80 to protect confidentiality of respondents in smaller geographic areas.
  - Long term care costs, partly paid by Medicaid, rise very rapidly after age 85.

• We estimate 45 different age profiles for benefits or taxes at federal, state or local level.
• Methods
  ➢ Age profiles for each item are estimated by single years of age from surveys, then smoothed (using LOESS in Stata).
  ➢ Age profiles are then multiplied by population age distribution and summed. This should give the total for this item, such as K-12 education expenditure.
  ➢ This amount is compared to the NIPA (or State) total for the item, and the age profile is then multiplicatively adjusted so that the totals match.
More details on calculations, for reference only.

1. Rolling 3-year samples of CPS microdata are combined.

2. For each flow, an individual-level indicator is found in the CPS 3-year sample. Where only household-level data are available, an assumption is made for allocating the amount to individuals within the household. Where there is no CPS flow indicator, either an assumption is made (e.g. congestible goods are consumed equally by all individuals) or another sample is used (e.g. CPS has no institutionalized persons, so those are estimated from ACS for 1st generation vs. 2nd+ generation).

3. The age-means of the microdata are calculated for each flow to get an age profile representing the flow for the civilian non-institutionalized population (CNIP, the base for CPS samples). Assumptions are made on the relative flows for armed forces and institutionalized persons and each profile is adjusted so that it represents the flow for the resident population.

4. Each age mean is smoothed (using LOESS in Stata) and adjusted so that the aggregate flow matches the aggregate flow measured in the NIPA for the central year of the 3-year pooled sample.

5. Summary flows and population sub-groups are calculated from the lowest-level age profiles.
For more detail on this approach and the methods, see:


- Project website: ntaccounts.org


• Download this report at: https://escholarship.org/uc/item/9x32c1kq
Approach for projecting demographic impacts forward

• Age profiles of average per capita benefit costs and tax payments link demography to state budgets.

• Inflate these age profiles at the rate of expected productivity growth, e.g. 1.5% per year, keeping shapes constant.
  - Take projected productivity growth rate from annual Social Security Trustees report.
  - Use it to raise age profiles of both taxes and benefits (some public programs may need other assumptions).
  - Rate of increase for health care age profile (Medicaid) probably probably greater (3.5 or 4.0%) (refer to annual report of Medicare Trustees).

• Get population projections by age and perhaps immigrant status from US Census or state agency.

• Multiply projected population age distributions times projected age profiles and sum to project fiscal impacts.
CA Report started by formulating probabilistic population projections

• Model fertility and mortality as probabilistic time series processes
• Model the share of immigrants to US that come to CA; use that with Social Security assumptions about immigration.
• Model net domestic migration to or from CA.
• Use stochastic simulation to get a thousand diff sample paths.

• On all this see the CA report, and also:
Probabilistic projections are not necessary, but I will show them.

Everything I will present can just as well be done for a single best guess population projection which is what is typically available.
Domestic net migration
Top panel: historical data.
Fit model to project net domestic immigrants probabilistically.
Results: lower panel, with probability distribution.
Model percent of international immigs moving to CA (1950-2000) as stochastic.

Apply projected share to US Census Bureau projections of number of immigrants.

Not ideal.
10% prob in dark shaded
90% prob in any shaded part
Blue dots are actual in 2010 (37.3) and 2018, (39.6 million)
CB is census bureau
DOF is CA Dept of Finance
CCSCE is Cntr for Cont. Study of Ca Econ
BEA is Bureau of Econ Analysis
UCLA

Probabilistic projections of population increase per decade in CA

Figure 6: Probability Deciles for Young-age dependency ratio

Great uncertainty!
(0-19/20-64)

“Growth and Aging of CA Pop”
Figure 5: Probability Deciles for Old-age dependency ratio

Less uncertainty about pop aging (65+/20-64)

“Growth and Aging of CA Pop”
General picture of taxes and benefits for all states and local areas in 2017 is very similar to California in 2000.

Benefits and taxes on average for all US states and local areas, 2017.

Benefits and taxes on average for state of California and its local areas in 2000.

General Fund Expenditures and Receipts by Age in California, 2000

After age 80, long term care costs rise sharply.

Sources: Gretchen Donehower (left) and Lee, Miller and Edwards (2003) “Growth and Aging of CA Pop”
As share of GSP, tax revenues are quite certain, expends uncertain

Expenditures depend strongly on educational enrolments, and these depend on fertility and immigration, both very uncertain.

Medicaid (Medical) costs relative to SGP are uncertain mainly due to uncertainty about rate of growth of per capita costs.

The forecasts are more certain if they exclude uncertainty due to rate of health care cost inflation

95% prob interval for 2050 is 4% to 10.5% (left) vs 3% to 8% (right).

Figure 2-7: Projections of California’s General Fund Revenues and Expenditures as Shares of GSP
Includes health care cost gr per capita uncertainty

Figure 2-8: Projected Revenues and Expenditures as Shares of GSP Without Excess Medical-Care Cost Growth
Excludes health care cost gr per capita uncertainty

Projected K-12 spending is very uncertain (.75% to 2.8%) because future fertility is very uncertain.

IV. Conclusions

• US demography is full of surprises, but population aging is happening for sure.

• Age profiles of state/local taxes and benefits link demographic change to fiscal outcomes including for individual public programs.

• Population aging is a big fiscal problem at federal level but will have little fiscal effect overall on states. Long term care will become more costly, though, as pop over 85 increases.

• Uncertainty is mostly due to fertility (which drives education costs) and to health care cost growth relative to productivity growth (drives state Medicaid costs).