EFFECT OF DEMOGRAPHIC CHANGES ON STATE FISCAL BALANCES IN THE U.S.

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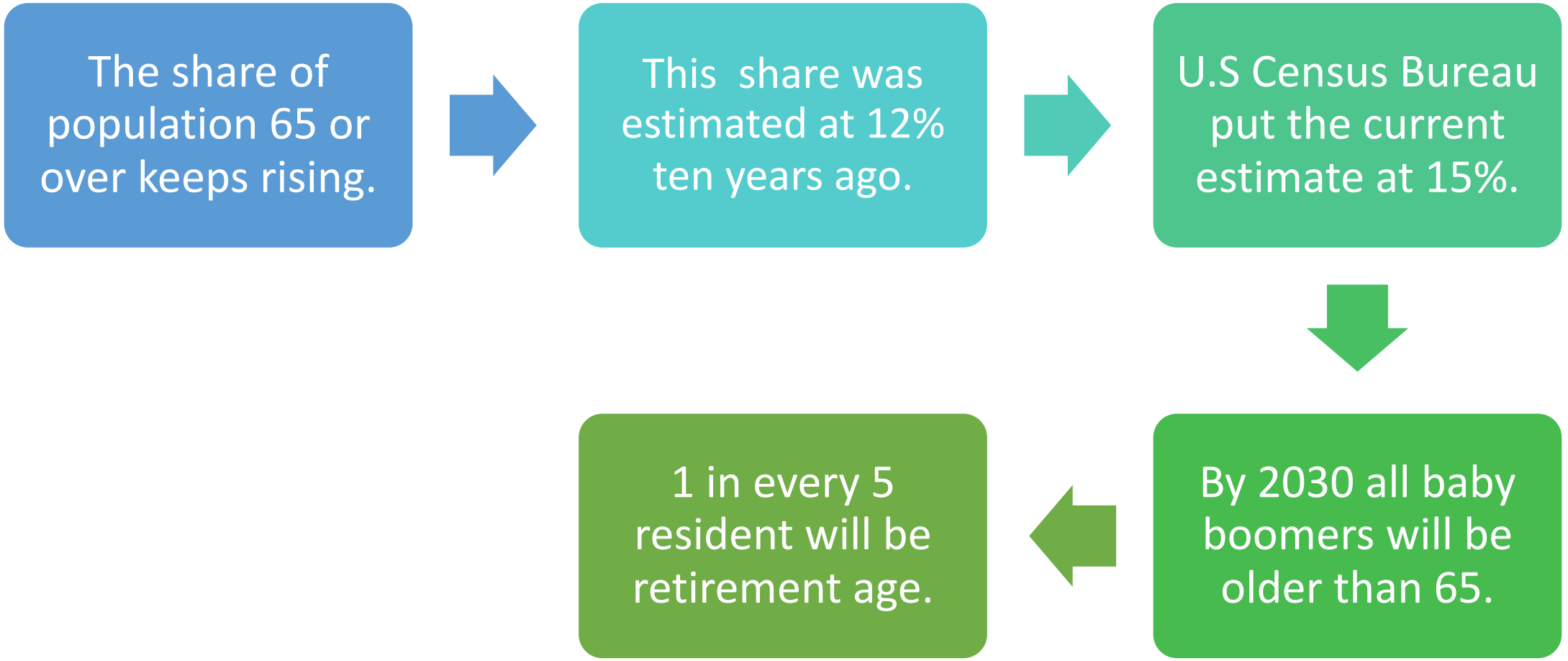
INTRODUCTION



U.S POPULATION PROJECTIONS :According to Vespa, Armstrong & Medina(2018)

U.S POPULATION WILL REACH 405 MILLION IN 2060.

THE GROWTH RATE WILL BE 1.8 MILLION PEOPLE PER YEAR BETWEEN 2017-2060.

THE GROWTH RATE WILL FALL TO 1.5 MILLION PEOPLE PER YEAR BETWEEN 2040 -2060.

NET MIGRATION WILL OVERTAKE NATURAL INCREASE BY 2030.

BABY BOOMERS WILL AGE INTO RETIREMENT BY 2030.

65 and older population will double by 2060.

85 year and older will double by 2035.

85 year and older will triple by 2060.

Table 1.

Table 1. Projected Age Groups and Composition of the Population 2020 to 2060

	Population (million)						Change from 2016 to 2060	
	2016	2020	2030	2040	2050	2060	Number	percent
Total population	323.1	332.6	355.1	373.5	388.9	404.5	81.4	25.2
Under 18 years	73.6	74.0	75.7	77.1	78.2	80.1	6.2	8.4
18 to 64 years	200.2	202.6	206.3	215.6	225.0	227.8	29.4	14.7
65 years and over	49.2	56.1	73.1	80.8	85.7	94.7	45.5	92.3

Source: U.S Census Bureau, 2017 National Population Projections.

Population Aging and Fiscal Balance

Modify Expenditure Such as:

- Pension
- Medical care
- Social Security
- Long term Care

Modify Revenue Such as:

- Sales Tax
- Personal Tax
- Income Tax
- Corporate income tax

Research Objective

- To Investigate Impact of Population Aging in the U.S on public expenditure and revenue in U.S States.

- Whether Population Aging Affect the Budget Balance…….

Literature Review

Demographics changes affect:

taxes

Lee and Edwards (2001) - U.S.

Fiscal balance of different layers of Govt.

Hofmann et. al., (2008) – Germany.

causes vertical imbalance across levels of Govt

Seitz and Kempes (2007) – Germany.

Savings rate and account balance

Soyoung kim and Jong-Wha Lee (2007) –Japan.

Demographic Change Affect:

Savings and Investment

Matthew Higgins (1998) –U.S.

Per capita Growth

Prettner (1995)

Retirement savings.

Robin Brooks et al.,(2003)

Literature Review Continues:

Empirical Evidence on Fiscal Impact

Demographic changes Affect :

- Transfer of income between generations
  - Yashiro et al., (1997) – Japan
- Aggregate expenditure
  - Grubber and Wise (2001)
- Payroll tax
  - Auerbach and Kotlikoff (1985) –U.S
- Tax base from labor income to capital asset
  - Kurdal et al.,(2015) - Australia

Empirical Evidence (cont.)

Demographic changes Affect:

- Health Expenditure
  - Keehan S.P et al., (2004)
- Per capita Govt Health Expenditure
  - Di Matteo & Di Matteo (1998) –Canada

DATA

Dependent variables

- Revenue
- Expenditure
- Fiscal balance

Explanatory variable

- dependency ratios:
  - Old age dependency ratio
  - Young age dep. Ratio
  - Control variables:
  - Population density
  - Unemployment
  - Financial crises dummy
  - Trend

Table 2.Public Expenditure, Revenue and fiscal balances in U.S states.

Variable	Mean	St. Dev.	Min	Max
Revenue (billion dollars)	49.58	60.08	4.35	419.03
Expenditure (billion dollars)	49.17	49.17	4.16	412.79
Revenue per capita (dollars)	7,890	1,701	5,294	15,370
Expenditure per capita (dollars)	7,733	1,464	5,120	14,322
Fiscal balance (billion dollars)	0.418	3.292	-24.605	28.950
Fiscal balance per capita (dollars)	157	491	-793	3,725

Source: Revenue and expenditure data are compiled from Tax Policy Center; fiscal balance are authors' calculation

Figure 1: fiscal balance and Dependency Ratios

Heterogeneity in data Due to:

- State size, **population**, Tax system.
- California deficit of 20 billion in (2008-2009)
- New York has surplus (30b)
- NY per cap Rev (2015) $14499
- NY PER cap Exp (2015) $13033
- Fiscal balance $14466/person

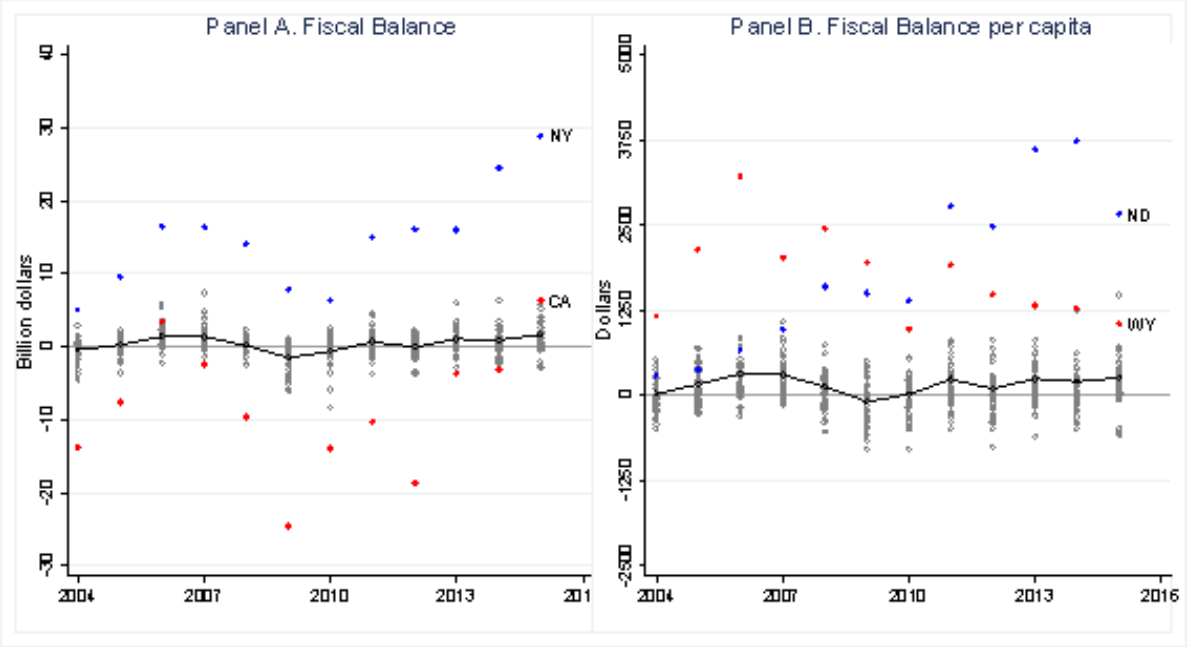


Figure 1. Fiscal Balance and Dependency Ratios
Source: Authors' calculation using public revenue and expenditure data from Tax Policy Center

Variable	Mean	St. Dev.	Min	Max
Old-age dependency ratio (%)	21.59	2.99	13.60	32.30
Youth dependency ratio (%)	37.99	3.58	26.20	52.90

Source: authors' calculation

Table 3: Old Age and Young Age Dependent Ratio.

Figure 2.Dependency Ratio (%).

- OLD AGE DEPENDECY RATIO KEEPS ON INCREASEING.
- HIGHEST: FL
- LOWEST: UT

- YOUNG AGE DEPENDENT RATIO SHOWS NEGATIVE TREND.
- LOWER FERTILITY
- HIGHEST RATE: UT
- LOWEST RATE : VT

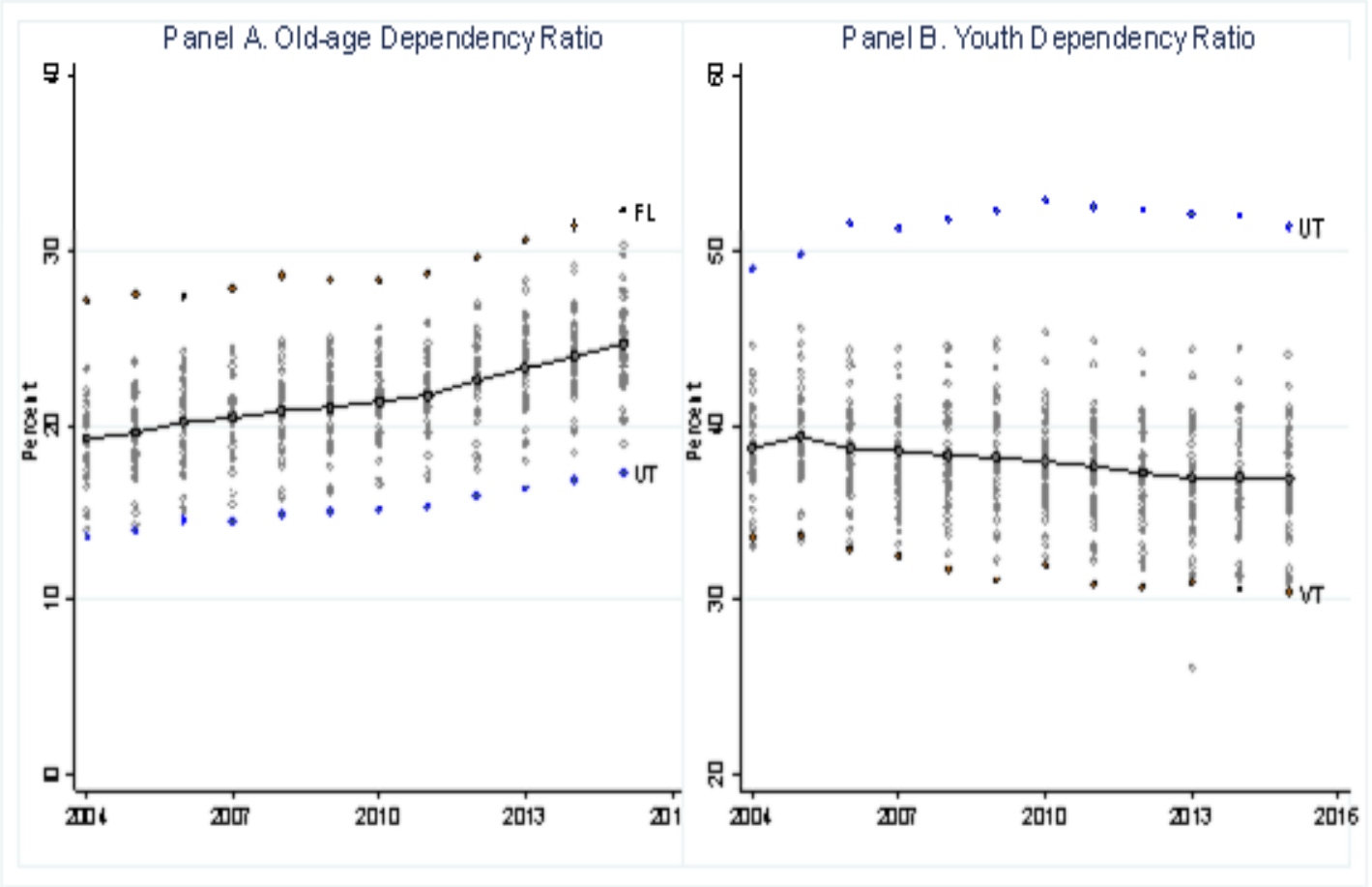


Figure 2. Dependency Ratios in Percent

Source: US Census Bureau

Table 4: Other Explanatory Variables.

During 2008-2009 Great recession,

- Unemployment rate hit 10%
- GDP decreased by 5% (U.S treasury Dept. 2012)

Variable	Mean	St. Dev.	Min	Max
Unemployment rate (%)	6.21	2.13	2.59	13.61
Population density (persons/square mile)	214	559	5	12,121
Financial crisis	0.17	0.37	0	1
Trend	6.50	3.46	1	12

Source :Unemployment rate https://www.bls.gov/, Population density is author's Calculations

Figure 3: scatter Diagram.

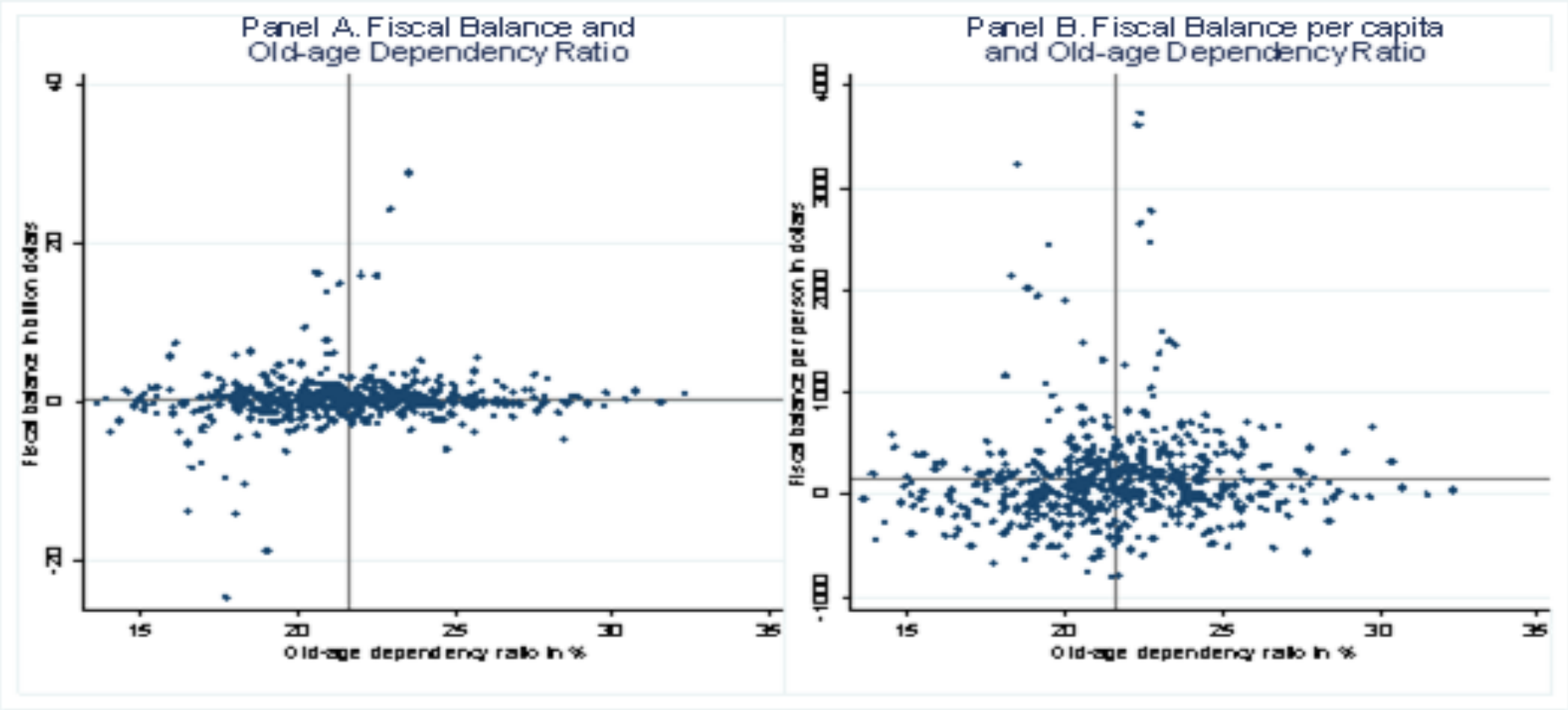


Figure 3. Scatter Diagrams between Fiscal Balance and Dependency Ratios
Source: Tax Policy Center and US Census

No clear relationship between fiscal balance and dependency ratios

DYNAMIC PANEL MODEL.

- Fiscal balance is persistent.
- No changes in public Revenue and Expenditure in short term.

- Lagged dependent variable provides dynamic adjustment.
- Bond (2002) argue for consistent estimates with lagged dependent variable.

The general linear dynamic model takes this form:

$$y_{i,t} = \mu + \gamma y_{i,t-1} + \beta \mathbf{x}_{i,t} + \varepsilon_{i,t}, \quad (1)$$

Where ***i*** denotes state (*i*=1,…, 48) and ***t*** *denotes time periods (t*=2004 2015

$\boldsymbol{y}_{i,t}$ represents dependent variable e.g. fiscal balance

β is a vector of parameter of interest.

$\boldsymbol{X}_{i,t}$ represents vector of explanatory variables e.g old age and Young age dependent ratio.

$\boldsymbol{\varepsilon}_{i,t}$ is the error term assumed to be i.i. D with mean zero and Constant variance.

$\boldsymbol{\alpha}_{i,t}$ represents unobserved individual specific time-invariant Effect which allows for heterogeneity across states.

Dynamic model (cont.)

- Equation 1 faces endogenous issue.
- $y_{i,t-1}$ is correlated with $\varepsilon_{i,t}$
- Panel data estimate is not consistent
- Issue is resolved by taking first difference.
- Individual specific effect parameter is eliminated.

The first differenced dynamic model looks like this :

$$y_{i,t} - y_{i,t-1} = \gamma\left(y_{i,t-1} - y_{i,t-2}\right) + \beta(\mathbf{x}_{i,t} - \mathbf{x}_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (2)$$

$$\rightarrow \quad \Delta y_{i,t} = \gamma \Delta y_{i,t-1} + \beta \Delta \mathbf{x}_{i,t} + \Delta \varepsilon_{i,t}$$

$\Delta y_{i,y-2}$ is used as instrument for $\Delta y_{i,y-1}$.

Instruments will not correlate with $\Delta \varepsilon_{i,t}$ (A. and Hsiao,1981)

Arellano and Bond(1991) proposed GMM procedure.

Blundell and Bond(1998) suggested a system GMM estimator.

Table 5. Fiscal Balance Estimation Results using System GMM

Variables	Model 1 Fiscal Balance in Billion Dollars	Model 2 Fiscal Balance Per Capital in Dollars	Model 3 Fiscal Balance in Percent of State Income
Lagged dependent variable	0.5269***	0.5157***	0.5428***
	(0.003)***	(0.022)***	(0.003)***
Old-age dependency ratio	−0.4260***	−82.580***	−0.1099***
	(0.020)***	(10.76)***	(0.014)***
Youth dependency ratio	−0.3808***	−59.458***	−0.1275***
	(0.015)***	(6.11)***	(0.011)***
Unemployment rate	−0.4564***	−44.799***	−0.0776***
	(0.008)***	(3.79)***	(0.005)***
Population density	0.0003***	0.038***	0.0001***
	(0.0001)***	(0.001)***	(0.0001)***
Financial crisis dummy	−2.2458***	−238.340***	−0.6325***
	(0.034)***	(11.08)***	(0.015)***
Trend	0.1831***	26.083***	0.0030***
	(0.008)***	(5.09)***	(0.007)***
Constant	26.0010***	4289.348***	7.9687***
	(0.879)***	(418.57)***	(0.647)***
N used	528	528	528
Number of groups	48	48	48
Arellano-Bond test[note]			
Order 1	−1.823 [0.068]	−3.001 [0.003]	−3.479 [0.001]

Interpretation of Results

Old age dependency Ratio

The estimates are:

- -0.426 in model 1
- -82.580 in model 2
- -0.1099 in model 3

Youth dependency Ratio

- The estimates are:
- -0.3808 in model 1
- -59.458 in model 2
- -0.1275 in model 3

Figure 4: Old Age Impact on Government Revenue

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In panel A in figure 4:

- It is positive and statistically significant on property tax and corporate income tax.
- A % increase in OADR will increase the above taxes by $35/person.
- Negative effect on individual income tax, other tax, and all other revenue.
- A 1% increase in OADR will decrease the above taxes by $139/person.
- In all a 1% increase in OADR will decrease state revenue by $104/person.

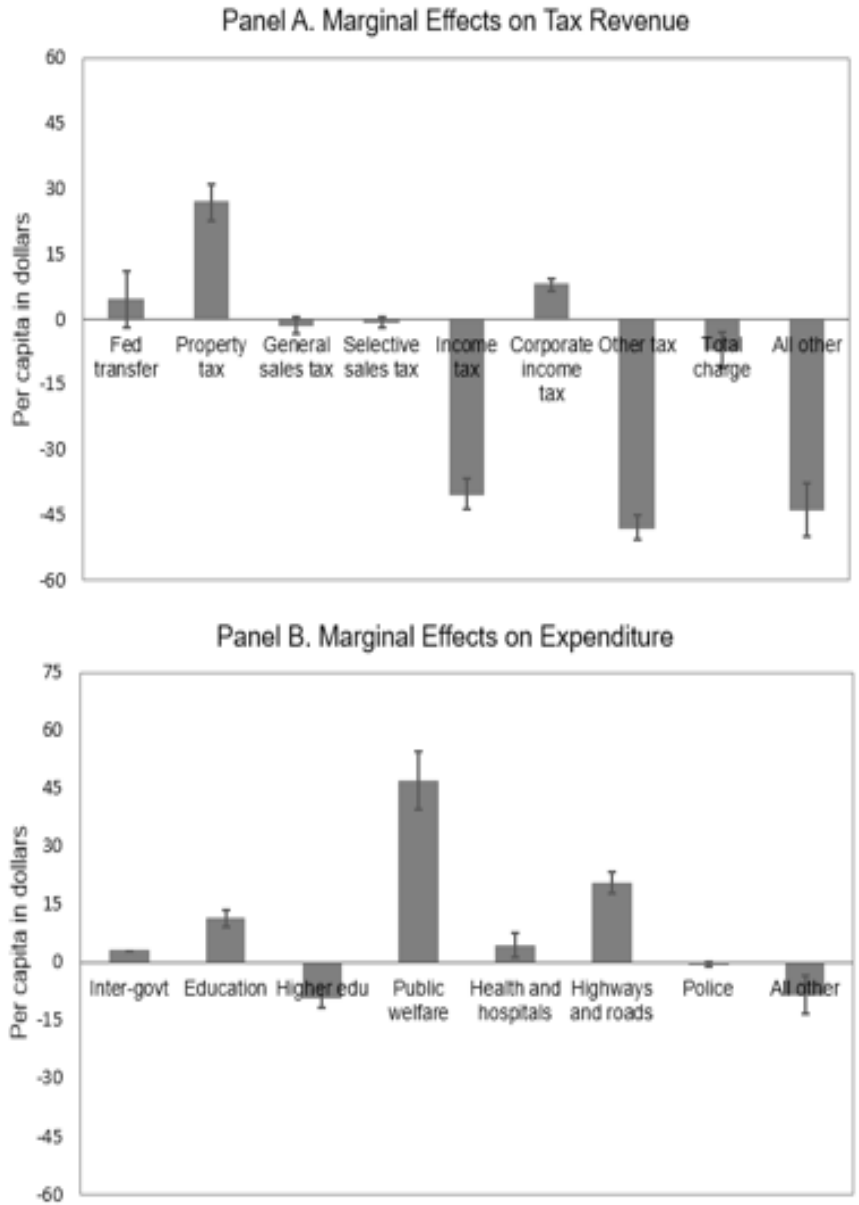

Figure 4. Impact of Old-age Dependency on Government Revenue and Public Expenditure

Figure 4: Old Age Impact on Government Expenditure .

In panel B in figure 4:

- It is positive and statistically significant on public welfare, hospital expenditure and education & highway.
- A % increase in OADR will increase state expenditure by $64/person.
- Combining changes in Government revenue a 1% increase in OADR will lead to $172/person in state fiscal balance which is a bit larger than $83/person in model 2 table 4

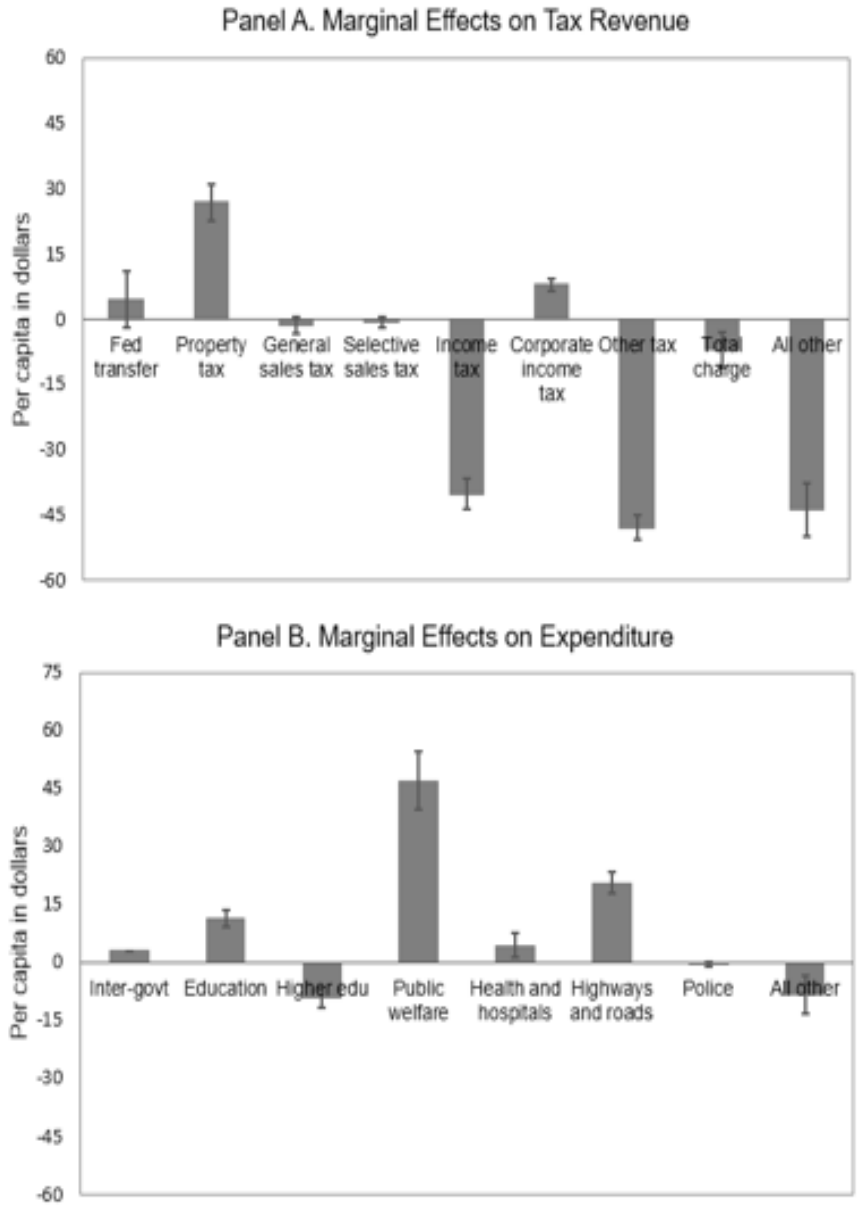

Figure 4. Impact of Old-age Dependency on Government Revenue and Public Expenditure

Summary and Concluding Remarks

Demographic change causes aging population.

U.S population will rise to 404 million in 2060.

23% of U.S population will be 65 years and over in 2060.

OADR has a negative impact on fiscal balances.

A 1% point increase in OADR will result in $0.426 billion worse in fiscal balance

About $83/person in model 2

0.11% point more in model 3.

All other explanatory variables are significant with expected signs.

Summary and conclusion Remarks (cont.)

OADR increases spending on primary education, public welfare, health and highways & roads expenditure.

OADR increases property and corporate tax.

OADR decreases individual tax, other tax on motor vehicles etc.

All told 1% increase in OADR will decrease state revenue by $104/ person.

Recommendations

Policy makers should put up measures to increase Government revenue by:

- Increase labor force participation and employment.
- Expand tax base.
- Increase the eligible retirement age.
- Social intervention programs to encourage large family.
- Immigration policies for skilled migrant workers.

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QUESTIONS AND COMMENTS.