**Appendix 2.**

**Alternative Model Specifications and Estimation Strategies**

## Table A2-1.  Old Age program average benefits by state, three specifications

| | Original Specification | **Final Version** | Including Manufacturing variable |
|---|---|---|---|
| Real income per capita In thousands, first difference (15 year lag) | 25.5** (9.2) | 25.5** (9.2) | 24.0** (9.22) |
| Unemployment rate Percentage, first difference | 102.5** (6.5) | 103.0** (6.6) | 102.8** (6.6) |
| Minority population Percentage, first difference | 33.0** (9.2) | 32.7** (9.3) | 33.7** (9.3) |
| Poverty rate Percentage, first difference | -35.6** (13.3) | -35.6** (13.3) | -35.8** (13.3) |
| College completion Percentage, first difference | -103.8** (12.0) | -104.6** (12.1) | -106.8** (12.1) |
| Senior population Percent change, first difference | n/a | 4.5 (10.8) | 2.4 (10.8) |
| Proportion of state and local workers covered Social Security | n/a | 29.9* (16.3) | 30.8* (16.3) |
| Proportion of workers employed in manufacturing, first difference (10 year lag – series begins in 1990) | n/a | n/a | -17.5* (10.0) |
| Constant | 190.7** (10.3) | 165.4** (17.0) | 160.5 (17.2) |
| Common ar(1) coefficient | -0.30 | -0.30 | -0.30 |
| Wald chi-squared | 489.5** | 495.7** | 500.94** |

Notes: Standard errors in parentheses.  Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term. Estimates from STATA 13.0.  **designates p<.05.

## Table A2-2.  Old Age program average benefits by state, four estimation strategies

| | Generalized Least Squares | OLS | Panel estimator fixed effects | OLS PCSE with ar(1) |
|---|---|---|---|---|
| Real income per capita In thousands, first difference (15 year lag) | 25.5** (9.2) | 26.4** (10.6) | 27.5** (11.3) | 21.0 (39.6) |
| Unemployment rate Percentage, first difference | 103.0** (6.6) | 121.3** (7.8) | 121.0** (8.15) | 101.0** (11.0) |
| Minority population Percentage, first difference | 32.7** (9.3) | 39.7** (9.0) | 43.4** (9.6) | 26.4 (32.6) |
| Poverty rate Percentage, first difference | -35.6** (13.3) | -27.0** (14.7) | -22.4 (15.6) | -37.5 (41.5) |
| College completion Percentage, first difference | -104.6** (12.1) | -90.0** (12.8) | -92.4** (13.4) | -97.7** (49.9) |
| Senior population Percent change, first difference | 4.5 (10.8) | -0.91 (10.4) | -0.77 (10.7) | -0.84 (44.4) |
| Proportion of state and local workers covered by Social Security | 29.9* (16.3) | 32.2 (22.1) | -39.5 (451.0) | 31.6** (6.6) |
| Constant | 165.4** (17.0) | 151.4** (21.7) | 208.4 (364.9) | 164.7** (52.4) |
| Common ar(1) coefficient | -0.30 | n/a | n/a | -0.30 |
| Goodness of fit | 495.7** | 60.1** | 56.7** | 29.8** |

Notes: Standard errors in parentheses.  Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term.

Estimates from STATA 13.0.  **designates $p<.05$.  Goodness-of-fit test statistics are the Wald chi-squared for GLS and OLS with Panel Corrected Standard Errors (PSCE) and F-tests for OLS.

Column 2: F-test for state-varying intercepts is not significant, so GLS is not compromised by unobserved heterogeneity.

**Table A2-3. Old Age program average benefits by state, different sample periods**

| | **1999-2014** | 1999-2007 | 2006-2014 |
|---|---|---|---|
| Real income per capita In thousands, first difference | 25.5** (9.2) | -69.3** (10.0) | 24.8** (9.1) |
| Unemployment rate Percentage, first difference | 103.0** (6.6) | 115.3** (6.7) | 103.1** (6.8) |
| Minority population Percentage, first difference | 32.7** (9.3) | 28.2** (9.4) | 29.4** (9.3) |
| Poverty rate Percentage, first difference | -35.6** (13.3) | -38.2** (13.0) | -36.9** (13.3) |
| College completion Percentage, first difference | -104.6** (12.1) | -105.8** (11.9) | -91.7** (12.4) |
| Senior population Percent change, first difference | 4.5 (10.8) | 3.2 (10.2) | -2.4 (10.7) |
| Proportion of state and local workers covered by Social Security | 29.9* (16.3) | 28.4* (16.6) | 29.2 (16.7) |
| Constant | 165.4** (17.0) | 216.7** (17.6) | 163.6 (17.1) |
| Common ar(1) coefficient | -0.30 | -0.25 | -0.275 |
| Goodness of fit | 495.7** | 566.0** | 483.26** |

Notes: Standard errors in parentheses. Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term. Estimates from STATA 13.0. **designates $p<.05$. Goodness-of-fit test statistics are the Wald chi-squared.

## Table A2-4.  Old Age program average benefits by state, four lags of real income

|  | **15 year lag** | 10 year lag | 20 year lag | 25 year lag |
|---|---|---|---|---|
| Real income per capita<br>In thousands, first difference | 25.5**<br>(9.2) | -69.3**<br>(10.0) | 24.8**<br>(9.1) | 27.0**<br>(8.2) |
| Unemployment rate<br>Percentage, first difference | 103.0**<br>(6.6) | 115.3**<br>(6.7) | 103.1**<br>(6.8) | 93.1**<br>(7.0) |
| Minority population<br>Percentage, first difference | 32.7**<br>(9.3) | 28.2**<br>(9.4) | 29.4**<br>(9.3) | 35.3**<br>(9.3) |
| Poverty rate<br>Percentage, first difference | -35.6**<br>(13.3) | -38.2**<br>(13.0) | -36.9**<br>(13.3) | -36.8**<br>(13.3) |
| College completion<br>Percentage, first difference | -104.6**<br>(12.1) | -105.8**<br>(11.9) | -91.7**<br>(12.4) | -112.7**<br>(12.4) |
| Senior population<br>Percent change, first difference | 4.5<br>(10.8) | 3.2<br>(10.2) | -2.4<br>(10.7) | 0.47<br>(10.7) |
| Proportion of state and local<br>workers covered by Social Security | 29.9*<br>(16.3) | 28.4*<br>(16.6) | 29.2<br>(16.7) | 30.4*<br>(16.0) |
| Constant | 165.4**<br>(17.0) | 216.7**<br>(17.6) | 163.6<br>(17.1) | 174.0**<br>(16.2) |
| Common ar(1) coefficient | -0.30 | -0.25 | -0.275 | -0.32 |
| Goodness of fit | 495.7** | 566.0** | 483.26** | 502.61** |

Notes: Standard errors in parentheses.  Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term.
Estimates from STATA 13.0.  **designates $p<.05$.  Goodness-of-fit test statistics are the Wald chi-squared.

## Table A2-5.  Old Age program coverage by state, three specifications

| | Original Specification | **Final Version** | Including Manufacturing variable |
|---|---|---|---|
| **Real income per capita** In thousands, first difference (15 year lag) | -0.091** (0.03) | -0.132** (0.02) | -0.133** (0.02) |
| **Unemployment rate** Percentage, first difference | 0.217** (0.02) | 0.175** (0.02) | 0.173** (0.02) |
| **Minority population** Percentage, first difference | -0.153** (0.03) | -0.102** (0.02) | -0.106** (0.02) |
| **Poverty rate** Percentage, first difference | 0.352** (0.04) | 0.274** (0.03) | 0.274** (0.03) |
| **College completion** Percentage, first difference | 0.151** (0.03) | 0.127** (0.03) | 0.127** (0.02) |
| **Senior population** Percent change, first difference | n/a | -0.436** (0.02) | -0.437** (0.02) |
| **Proportion of state and local** workers covered Social Security | n/a | 0.229** (0.05) | 0.230** (0.05) |
| **Proportion of workers employed** in manufacturing, first difference (10 year lag – series begins in 1990) | n/a | n/a | 0.005** (0.002) |
| **Constant** | -0.146** (0.03) | -0.174** (0.05) | -0.243** (.052) |
| **Common ar(1) coefficient** | 0.013 | 0.19 | 0.19 |
| **Wald chi-squared** | 472.4** | 1099.8** | 1100** |

Notes: Standard errors in parentheses.  Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term. Estimates from STATA 13.0.  **designates $p < .05$.

**Table A2-6. Old Age program average coverages by state, four estimation strategies**

| | Generalized Least Squares | OLS | Panel estimator fixed effects | OLS PCSE with ar(1) |
|---|---|---|---|---|
| Real income per capita In thousands, first difference (15 year lag) | -0.132** (0.02) | -0.132** (0.03) | -0.136** (0.03) | -0.122** (0.06) |
| Unemployment rate Percentage, first difference | 0.175** (0.02) | 0.160** (0.02) | 0.162** (0.02) | 0.166** (0.05) |
| Minority population Percentage, first difference | -0.102** (0.02) | -0.071** (0.02) | -0.068** (0.03) | -0.067 (0.05) |
| Poverty rate Percentage, first difference | 0.274** (0.03) | 0.305** (0.04) | 0.303** (0.04) | 0.259** (0.06) |
| College completion Percentage, first difference | 0.127** (0.02) | 0.125** (0.03) | 0.127** (0.03) | 0.107 (0.07) |
| Senior population Percent change, first difference | -0.436** (0.02) | -0.451** (0.03) | -0.453** (0.03) | -0.460** (0.06) |
| Proportion of state and local workers covered by Social Security | 0.229** (0.05) | 0.245** (0.05) | 1.42 (1.06) | 0.247* (0.09) |
| Constant | -0.174** (0.05) | -0.176** (0.05) | -1.13 (0.86) | -0.167** (0.10) |
| Common ar(1) coefficient | 0.19 | n/a | n/a | 0.19 |
| Goodness of fit | 1099.8** | 107.8** | 108.4** | 109.8** |

Notes: Standard errors in parentheses. Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term.

Estimates from STATA 13.0. **designates $p<.05$. Goodness-of-fit test statistics are the Wald chi-squared for GLS and OLS with Panel Corrected Standard Errors (PSCE) and F-tests for OLS.

Column 2 F-test for state-varying intercepts is significant at $p<0.05$, so fixed effects approach may be more appropriate in this case.

**Table A2-7. Old Age program coverage by state, four lags of real per capita income**

| | 15 year lag | 10 year lag | 20 year lag | 25 year lag |
|---|---|---|---|---|
| Real income per capita In thousands, first difference | -0.132** (0.02) | -0.040* (0.03) | -0.006 (0.02) | -0.076** (0.02) |
| Unemployment rate Percentage, first difference | 0.175** (0.02) | 0.183** (0.02) | 0.179** (0.02) | 0.199** (0.02) |
| Minority population Percentage, first difference | -0.102** (0.02) | -0.102** (0.02) | -0.090** (0.02) | -0.098** (0.02) |
| Poverty rate Percentage, first difference | 0.274** (0.03) | 0.269** (0.03) | 0.268** (0.03) | 0.270** (0.02) |
| College completion Percentage, first difference | 0.127** (0.02) | 0.109** (0.03) | 0.112** (0.03) | 0.134** (0.03) |
| Senior population Percent change, first difference | -0.436** (0.02) | -0.420** (0.02) | -0.418** (0.02) | -0.418** (0.02) |
| Proportion of state and local workers covered by Social Security | 0.229** (0.05) | 0.236** (0.06) | 0.236** (0.06) | 0.224** (0.06) |
| Constant | -0.174** (0.05) | -0.234** (0.06) | --0.254** (0.06) | -0.226** (0.05) |
| Common ar(1) coefficient | 0.19 | 0.26 | 0.26 | 0.24 |
| Goodness of fit | 1099.8** | 1029.8** | 1016.5** | 1047.1** |

Notes: Standard errors in parentheses. Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term. Estimates from STATA 13.0. **designates $p<.05$. Goodness-of-fit test statistics are the Wald chi-squared for GLS.

**Table A2-8. Old Age program coverage by state, different sample periods**

| | 1999-2014 | 1999-2007 | 2006-2014 |
|---|---|---|---|
| Real income per capita In thousands, first difference | -0.132** (0.02) | -0.094** (0.02) | -0.136** (0.03) |
| Unemployment rate Percentage, first difference | 0.175** (0.02) | 0.116** (0.03) | 0.180** (0.02) |
| Minority population Percentage, first difference | -0.102** (0.02) | -0.791** (0.15) | -0.106** (0.02) |
| Poverty rate Percentage, first difference | 0.274** (0.03) | 0.176** (0.03) | 0.372** (0.04) |
| College completion Percentage, first difference | 0.127** (0.02) | -0.04 (0.09) | 0.153** (0.03) |
| Senior population Percent change, first difference | -0.436** (0.02) | -0.281** (0.04) | -0.423** (0.02) |
| Proportion of state and local workers covered by Social Security | 0.229** (0.05) | 0.290** (0.05) | 0.105 (0.07) |
| Constant | -0.174** (0.05) | 0.100 (0.07) | --0.211** (0.06) |
| Common ar(1) coefficient | 0.19 | 0.12 | 0.16 |
| Goodness of fit | 1099.8** | 191.08** | 1185.2** |

Notes: Standard errors in parentheses. Feasible Generalized Least Squares panel estimator with heteroskedastic panels and a common ar(1) error term. Estimates from STATA 13.0. **designates p<.05. Goodness-of-fit test statistics are the Wald chi-squared.