

## APPENDIX A

### *Policy Note #17: Three Future Scenarios Show Potential Economic Benefits of Rising Rates of Postsecondary Educational Attainment*

This technical appendix describes the data and methodology used to explain variations in past and future estimates of state-level per capita income relative to education. Table A.1 shows information regarding the variables used in the analysis.

#### THE DATA

<b>TABLE A.1</b>						
<b>Names, Description, and Source of State-Level Variables, 1984-2003</b>						
Name	Description	Source	1984		2003	
			Mean	Kentucky	Mean	Kentucky
PCI	Real per capita personal income in constant 2003 dollars	Bureau of Economic Analysis	\$23,532	\$19,714	\$30,512	\$26,252
EDU	Percent of persons 25 to 64 years old with at least a bachelor's degree	March Current Population Survey	19%	15%	29%	24%
PCEMP	Per capita private employment	Bureau of Economic Analysis	41%	34%	50%	45%
URBAN	Percent of the population living in urban areas	Decennial Census, 1980, 1990, and 2000	67%	51%	72%	56%

#### THE MODEL

An exponential model explained the relationship between PCI and each of the independent variables:

$$PCI_{it} = e^{(a_{it} + B_{1t}EDU_{it} + B_{2t}PCEMP_{it} + B_{3t}URBAN_{it} + u_{it})}$$

for all  $i = 1$  to 50 for each of the 50 states,  $t = 1$  to 20 for each of the 20 years from 1984 to 2003, and error term  $u \sim N(0,1)$ .

Each variable is hypothesized to have a positive relationship with PCI:

$$H_0: \quad \begin{aligned} B_1 &> 0 \\ B_2 &> 0 \\ B_3 &> 0 \end{aligned}$$

$$H_A: \quad B_1 = B_2 = B_3 = 0$$

#### THE RESULTS

All estimated coefficients for all 20 models were positive and statistically significant at approximately the 1 percent level.<sup>1</sup> The adjusted  $R^2$  values for each of the models ranged from a low of 0.59 in 1994 to a high of 0.77 in 1988. Table A.2 shows the pseudo-elasticities of each variable given by each model year.<sup>2</sup>

<sup>1</sup> In 1984, 1989, and 1992 the levels of statistical significance for the estimated coefficients on EDU were slightly greater than 1 percent, but still well below the 5 percent statistical significance level.

<sup>2</sup> The relationships estimated using an exponential model show the percent change in the dependent variable given a one *unit* change in the independent variable and are therefore not true elasticities. They are referred to here as "pseudo-elasticities."

<b>TABLE A.2</b>			
<b>Pseudo-Elasticities: the percentage change in PCI given a one unit change in the independent variable</b>			
<b>Model Year</b>	<b>EDU</b>	<b>PCEMP</b>	<b>URBAN</b>
1984	0.92%	1.31%	0.32%
1985	1.29	1.24	0.26
1986	1.08	1.32	0.32
1987	1.00	1.61	0.29
1988	0.79	1.83	0.33
1989	0.89	1.75	0.32
1990	1.21	1.49	0.31
1991	0.94	1.41	0.34
1992	0.89	1.59	0.31
1993	1.15	1.25	0.30
1994	1.04	1.05	0.37
1995	1.14	0.90	0.39
1996	1.61	0.75	0.29
1997	1.27	1.02	0.32
1998	1.24	1.04	0.32
1999	1.22	1.20	0.34
2000	1.40	0.96	0.41
2001	1.17	1.04	0.35
2002	1.38	0.86	0.29
2003	1.14	0.93	0.29

### **THE POLICY SCENARIOS**

The three policy scenarios were established using various methods. The change in the national percentage of persons 25 to 64 years old with at least a bachelor’s degree from 1990 to 2000 was used to generate the 36 percent projection for 2020. A study released by the Census Bureau takes into account demographic shifts in the population and slowing educational attainment replacement patterns by younger cohorts as older cohorts leave the workforce.<sup>3</sup> That study resulted in a 2028 projection which was the basis for the 2020 moderate scenario. The “current” or “no policy change” scenario assumes that Kentucky engages in no policy changes to boost educational attainment in the Commonwealth and projects that approximately 28 percent of Kentucky’s working-age population will have a four-year postsecondary degree or higher by 2020 based on recent degree production, migration patterns, and state’s population projection.

### **THE PROJECTIONS**

The compound annual growth rate (CAGR) of the pseudo-elasticities listed in Table A.2 was used to project out to 2020 the estimated relationship between educational attainment and PCI. The CAGR’s for both per capita private employment and the urban population for Kentucky were used to project the growth in each of these variables to 2020. Using these changes and the ones provided in each of the policy scenarios, per capita income was predicted annually for the years 2004 to 2020. The predicted populations were used to obtain aggregate personal income for the state. Finally, a revenue elasticity of one was assumed in predicting the subsequent changes in revenue growth.

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<sup>3</sup> Jennifer Cheeseman Day and Kurt J. Bauman, *Have We Reached the Top? Educational Attainment Projections of the U.S. Population* (Washington, DC: US Census Bureau, Population Division, May 2000) Working Paper Series No. 43.