

January 8, 2015

## Technical Appendix to “Geographic Pattern of Disability Receipt Largely Reflects Economic and Demographic Factors”

States with high rates of disability receipt tend to have populations that are less educated, older, and more blue-collar than other states and to have fewer immigrants.<sup>1</sup> In fact, those four factors alone are associated with about 85 percent of the variation in disability receipt rates across states.

That conclusion is based on a common statistical tool used by economists known as ordinary least-squares regression. This technique attempts to isolate the individual effects of explanatory (or “independent”) variables on the statistic of interest (the “dependent variable”). In doing so, it “fits” the data to a line and attempts to minimize the gap between the line and the actual data.

The table below shows the results of our regressions. Briefly, the *coefficient* shows the separate effect of each independent variable — education, age, and so forth — on a state’s rate of disability receipt, while holding everything else constant. The *t-statistic* is a gauge of statistical significance; as a rule of thumb, an independent variable whose t-statistic has an absolute value of 2 or more (that is, greater than 2 or less than -2) has very strong explanatory power. The *R-squared* tells how much of the total variation in the dependent variable (here, states’ rate of disability receipt) can be explained by the combined effect of all of the independent variables. An R-squared can range between 0 (no explanatory power whatsoever) and 1.000 (an implausibly perfect fit).

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<sup>1</sup> Kathy A. Ruffing, “Geographic Pattern of Disability Receipt Largely Reflects Economic and Demographic Factors,” Center on Budget and Policy Priorities, January 8, 2015, <http://www.cbpp.org/cms/index.cfm?fa=view&id=5254>.

TABLE 1

## Regression Results for Analysis of Geographic Variation in Disability Receipt, by State

	Constant	High-School Completion Rate, Native-Born	Median Age	Foreign-born Share of Population	State Industry Mix (Percent "Blue-Collar")			
					All <sup>a</sup>	Excluding Mining	Poverty Rate	Unemploy- ment Rate
Dependent variable: Percent of state population age 18-64 receiving Title II (Social Security <sup>b</sup> ) disability benefits								
<b>Equation 1</b>								
Coefficient	13.62	-0.23	0.28	-0.07	0.05	n.a.	0.08	0.04
t-statistic	2.418	-4.607	7.271	-2.991	1.332	n.a.	1.829	0.511
R-squared	0.859							
<b>Equation 1a (excluding mining from "blue-collar")</b>								
Coefficient	14.49	-0.24	0.27	-0.07	n.a.	0.07	0.08	0.02
t-statistic	2.694	-4.834	7.105	-3.024	n.a.	1.822	1.844	0.264
R-squared	0.864							
Dependent variable: Percent of state population age 18-64 receiving Title II or Title XVI (SSI) disability benefits								
<b>Equation 2</b>								
Coefficient	23.89	-0.34	0.32	-0.09	0.00	n.a.	0.13	0.09
t-statistic	2.959	-4.779	5.742	-2.689	-0.037	n.a.	1.999	0.763
R-squared	0.835							
<b>Equation 2a (excluding mining from "blue-collar")</b>								
Coefficient	23.70	-0.34	0.32	-0.09	n.a.	0.01	0.13	0.09
t-statistic	3.025	-4.809	5.737	-2.715	n.a.	0.130	2.021	0.743
R-squared	0.836							

<sup>a</sup> "Blue-collar" denotes the share of state employment in forestry, fishing, and related activities, mining, utilities, construction, and manufacturing.

<sup>b</sup> Includes disabled-worker (Disability Insurance, or DI) beneficiaries, disabled widow(er)s, and disabled adult children; the last two categories are relatively small.

Here's how to interpret the individual effects:

- **Education.** A one-percentage-point increase in a state's high-school graduation rate tends to lower the percent of its population that receives disability benefits by about 0.24 percentage points for Title II (Social Security disability benefits) and by 0.34 percentage points for Title II and Title XVI (Supplemental Security Income disability benefits) combined.<sup>2</sup> This effect is statistically very strong.
- **Age.** A one-year increase in a state's median age tends to boost its rate of disability receipt by about 0.27 percentage points for Title II and by 0.32 percentage points for Titles II and XVI. This effect is also extremely strong.

<sup>2</sup> Because a large immigrant population may distort a state's overall high-school graduation rate, we focus on the rate for U.S.-born residents.

- **Foreign-born population.** A one-percentage-point rise in a state’s foreign-born population tends to lower its rate of disability receipt by a little less than 0.1 percentage point. The effect is statistically strong.
- **Industry mix.** A one-percentage-point-increase in the share of the state’s employment that we call “blue-collar” tends to raise the rate of Title II receipt by about 0.07 percentage points, with borderline statistical significance, and combined (Titles II and XVI) receipt not at all. This is the weakest of our four main explanatory variables.

Many studies have documented the greater propensity of workers in certain sectors — such as manufacturing, forestry, or coal mining — to end up on the disability rolls; most of those studies, though, have focused on males, whereas the DI program is now nearly one-half female. Surprisingly, we obtain a better fit by dropping mining from the definition of “blue-collar” (equations 1a and 2a) because recent growth in mining has been concentrated in western states with low rates of disability receipt. This relationship between disability receipt and states’ industrial and occupational mix bears future study. Note that our regressions already control for education and age, so to the extent that workers in blue-collar industries are also older and less educated, those effects are accounted for elsewhere.

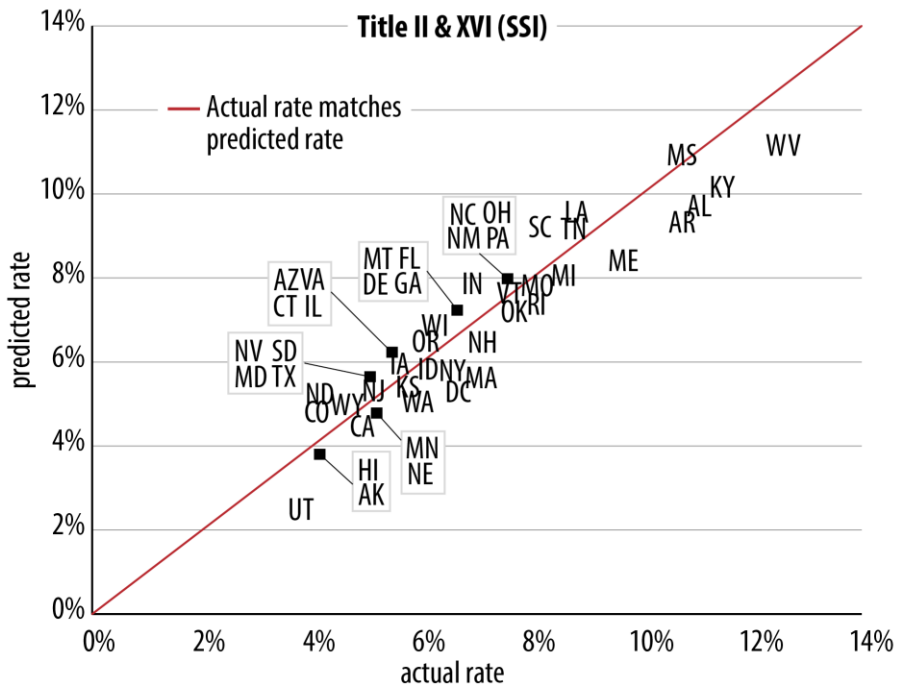
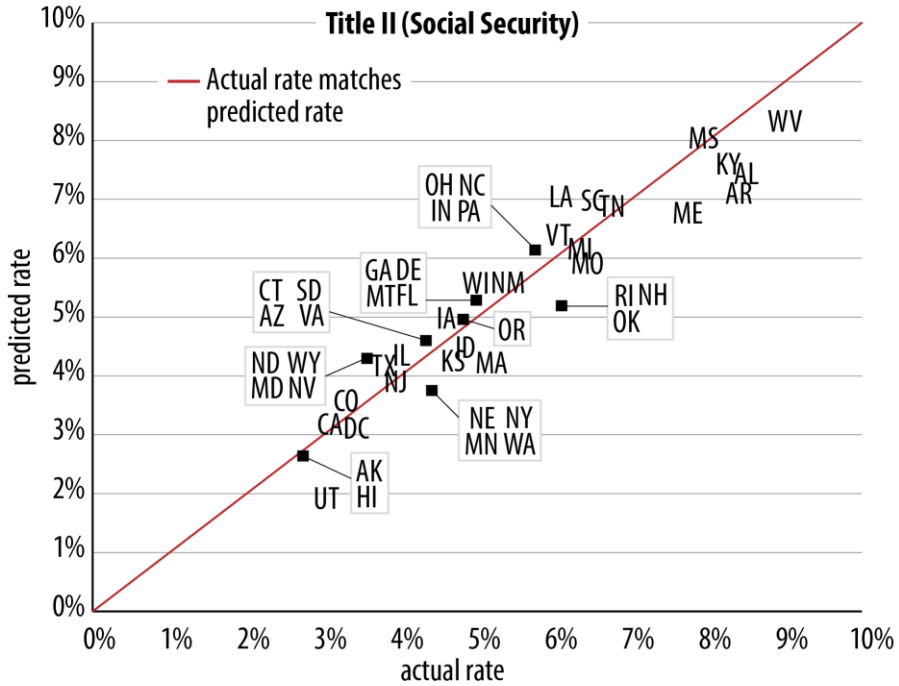
- **Poverty.** A one-percentage-point increase in a state’s poverty rate is associated with a 0.08 percentage-point increase in the rate of Title II receipt and a 0.13 percentage-point increase in combined (Titles II and XVI) receipt. The effect is only borderline significant and should be interpreted cautiously in any case because it’s not clear whether poverty is driving disability receipt or vice versa. DI and (especially) SSI benefits are very modest, so the presence of large numbers of disability recipients itself tends to boost a state’s poverty rate.
- **Unemployment.** Higher unemployment is associated with greater disability receipt, but the effect is small and statistically insignificant.

Although the table of regression results also shows a constant term, that has no useful meaning here. The constant is the rate of disability receipt that’d exist, according to the equation, if all of the dependent variables (such as high-school graduation rates and age) equaled zero, which is clearly not meaningful. Statistically, the constant simply serves to “anchor” the overall equation.

Overall, as can be discerned from the R-squared statistics, the factors we analyzed are associated with 86 percent of the variation in states’ rate of Title II (principally DI) receipt and 84 percent of the variation in combined Title II and XVI receipt.

The graphs below show each state’s actual disability benefit receipt rate — that is, the share of its population aged 18-64 receiving disability benefits — in December 2013 compared with the state’s *estimated* (or “fitted”) disability receipt rate based on the six variables outlined above. The diagonal line represents a 100-percent correlation between a state’s estimated and actual rates. Most states cluster near the diagonal line, indicating that the variables account for most (but not all) of the variation in disability benefit receipt rates among states.

### Comparison of Predicted and Actual Rates of Disability Benefit Receipt, by State



Source: CBPP regressions, based on data for 2013