Technical appendix: How Does New Hampshire Do It? An Analysis of Spending and Revenues in the Absence of a Broad-based Income or Sales Tax

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Workload measures

My methodology for constructing workload measures largely follows the approach of Yilmaz et al., which itself is an updated version of the methodology developed by Rafuse.[1] Except where noted, I have used the same data elements and weightings as Yilmaz et al. One minor difference from the previous authors is that I adjust my workload factors to correspond to fiscal years, to be consistent with data on government finances.

K-12 education

The workload measure for K-12 education is equal to each state's share of the regional sum of education cost index values. The education cost index for a given state is calculated as:

$$(0.85e + s) \text{ x } (1 + 0.5p)$$

where e is the number of potential public elementary school students, s is the number of potential public secondary school students, and p is the poverty rate among the population aged 5 to 17 (a slight departure from previous studies, which used the under-18 poverty rate).

Per Yilmaz et al., the workload measure assumes that the cost of educating one elementary student is 85 percent of the cost of educating one secondary student, and that educating a student living in poverty is 50 percent more costly than educating a student not living in poverty.

The number of potential public elementary students is calculated by subtracting the estimated number of students enrolled in private elementary schools from the number of children in the population aged 5 to 13. The estimated number of students enrolled in private elementary schools is equal to the total number of students enrolled in private school (all grades, elementary and secondary), multiplied by the share of the 5 to 17 population aged 5 to 13.

The number of potential public secondary students is calculated by subtracting the estimated number of students enrolled in private secondary schools from the number of children in the population aged 14 to 17. The estimated number of students enrolled in private secondary schools is equal to the total number of students enrolled in private school (all grades, elementary and secondary) multiplied by the share of the 5 to 17 population aged 14 to 17.

The rationale for looking at *potential* elementary and secondary school students rather than the number actually enrolled is that enrollment figures may be shaped to some extent by policy decisions (they may have an effect on dropout rates, for example). Per Rafuse, estimated private

school enrollments are netted out based on the assumption that the decision to attend public or private school is often made independently of the quality of the public school (such as for religious reasons). Including private enrollments in the potential public school population does not substantively change the results of the expenditure need calculation.

The population aged 5 to 17 and poverty rate among those aged 5 to 17 are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates. Private school enrollment data were available for the 2005–2006 and 2007–2008 school years. I averaged the two for an estimate of the 2006–2007 school year.

Sources:

Population aged 5 to 17: U.S. Census Bureau, http://www.census.gov/popest/states/asrh/files/SC-EST2009-AGESEX-RES.csv

Percent of population aged 5 to 17 living in poverty: U.S. Census Bureau Small Area Income and Poverty Estimates, http://www.census.gov/did/www/saipe/data/statecounty/data/index.html, est06US.xls and est07US.xls

Private school enrollment: U.S. Department of Education, National Center for Education Statistics, Private School Universe Survey, http://nces.ed.gov/surveys/pss/tableswhi.asp, 2005–2006 and 2007–2008, Table 15

Higher education

The workload measure for higher education is equal to each state's share of the estimated regional college population. To estimate the college population for each state, I first computed national college enrollments in each of four age groups: 14–17, 18–24, 25–34, and 35 and over, assuming that three part-time students equal one full-time-equivalent (FTE) student. I then divided national FTE enrollment in each age group by national population in that age group to obtain the national enrollment ratio for that age group. I then applied the national enrollment ratio for each age group to each state's population in that age group to obtain estimated state enrollment by age group. I then summed across all age groups to get each state's total estimated college population.

Population data are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates. National college enrollment data are for the 2007-2008 school year.

Sources:

Population by age group: U.S. Census Bureau, http://www.census.gov/popest/states/asrh/files/SC-EST2009-AGESEX-RES.csv

National college enrollment by age group: U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics*, http://nces.ed.gov/programs/digest, 2009, Table 191

Public welfare

The workload measure for public welfare is a weighted average of each state's share of total regional population living in poverty, and its share of total regional population aged 75 and over living in poverty, where the weights are 75 percent and 25 percent, respectively.

The weighting was taken from Yilmaz et al., and is based on a 2002 estimate that roughly 25 percent of all public welfare expenditures were Medicaid payments for elderly enrollees.

Population data are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates.

Sources:

Population living in poverty: U.S. Census Bureau, American Community Survey, http://factfinder.census/gov, one-year estimates for 2006 and 2007, Table B17001

Population aged 75 and over living in poverty: U.S. Census Bureau, American Community Survey, http://factfinder.census.gov, one-year estimates for 2006 and 2007, Table B17001

Health and hospitals

The workload measure for the health and hospital categories is equal to the equally weighted average of each state's share of total regional population, total families in the region living under 150 percent of poverty, and work-disabled population.

Population and number of families living below 150 percent of poverty are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates. The number of disabled workers is estimated as of December 2006. The use of families living below 150 percent of poverty is based on Rafuse's original work.

Sources:

Population: U.S. Census Bureau, http://www.census.gov/popest/states/asrh/files/SC-EST2009-AGESEX-RES.csv

Disabled workers: *Social Security Annual Statistical Supplement*, http://www.ssa.gov/policy/docs/statcomps/supplement/2007/index.html, Table 5.J8

Families below 150 percent of poverty: U.S. Census Bureau, American Community Survey, http://factfinder.census.gov, one-year estimates for 2006 and 2007, Table C17022

Highways

The workload measure for highways is equal to a weighted average of each state's share of vehicle-miles and each state's share of lane-mileage, where the weights are 0.825 and 0.175, respectively. These weightings are based on engineers' estimates in the report from the General Accounting Office cited in Rafuse's study.

Data are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates.

Source:

U.S. Department of Transportation, Highway Statistics, http://www.fhwa.dot.gov/policy/ohpi/hss/hsspubs.cfm, 2006 and 2007, Table PS-1

Police and corrections

The workload measure for the police and corrections categories is equal to an equally weighted average of each state's share of total regional population, total regional population aged 18–24, and total number of murders and non-negligent manslaughters in the region.

Data are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates.

Sources:

Population: U.S. Census Bureau, http://www.census.gov/popest/states/asrh/files/SC-EST2009-AGESEX-RES.csv

Population aged 18-24: U.S. Census Bureau, http://www.census.gov/popest/states/asrh/files/SC-EST2009-AGESEX-RES.csv

Number of murders and non-negligent manslaughters: FBI Uniform Crime Reports, http://www.ucrdatatool.gov/

All other categories

The workload measure for all other categories of direct general government expenditures, including environment and housing, government administration, and interest on general debt, is equal to each state's share of total regional population.

Data are based on calendar years. I averaged values from 2006 and 2007 to obtain FY 2007 estimates.

Source:

Population: U.S. Census Bureau, http://www.census.gov/popest/states/asrh/files/SC-EST2009-AGESEX-RES.csv

Input cost index

My approach to constructing the category-specific input cost indices is patterned after the methodology of Herman Leonard in his study of public expenditures in Massachusetts—which is itself a variation on the input cost index developed by Rafuse in the original RES analysis.[2] The index attempts to capture differences across New England states in prevailing wage rates and cost of living.

For each individual category of spending except public welfare and interest on general debt, the input cost index for a given state is equal to:

$$(w_l \text{ x (labor cost index))} + ((1 - w_l) \text{ x (cost of living index))}$$

where w_l is the regional labor weight for that category.

I computed the regional labor weights for each category using government payroll and expenditure data from the Census Bureau. For any given category I first annualized total regional state and local government payroll in March 2007 and then divided this by 0.8 to obtain an estimate for total compensation costs.[3] I then divided estimated total compensation costs by the total regional expenditures in the category, to obtain the category's final labor weight.

The labor cost index is state-specific. It is based on median earnings for full-time, year-round civilian employed population aged 16 and over, as captured in the American Community Survey.

I first computed the weighted average of median earnings for the for-profit and not-for-profit segments of the private sector in 2006 and 2007, with the weights being the number of workers in the for-profit and not-for-profit segments. I then indexed the values relative to New Hampshire (that is, the index for New Hampshire equals 100) in each year, and took an average of the two years to obtain index values for FY 2007.

The cost-of-living index is also state-specific, and is based on an index developed by Berry, Fording, and Hanson.[4] The Berry-Fording-Hanson index was originally created for each continental U.S. state for each year from 1960 to 1995, and is suitable for both time-series and cross-sectional research.

Since its original publication, the index has been revised and updated through 2007. Because I am interested in showing costs in other New England states relative to New Hampshire in FY 2007, I re-indexed the Berry-Fording-Hanson values for 2006 and 2007, setting New Hampshire's value equal to 100, and averaging across the two years to obtain index values for FY 2007.

Because Medicaid payments to healthcare providers represent such a large portion of public welfare expenditures, and because underlying medical costs may differ somewhat from differences in the overall cost of living, I followed Leonard in using a slightly different approach for the public welfare cost index. The public welfare input cost index in a given state is equal to:

$$(w_l \text{ x labor cost index}_i) + (w_m \text{ x medical cost index}) + ((1 - w_l - w_m) \text{ x cost of living index}_i)$$

where w_m is the share of public welfare expenditures comprised of payments to medical vendors for the region as a whole. It was equal to about 75 percent in FY 2007. The labor cost and cost-of-living indices used to calculate the input cost index for the public welfare category are the same as described above.

The medical cost index is based on state-level data on adjusted hospital expenses per inpatient day. The data come from an annual survey by the American Hospital Association, and are available on the Kaiser Family Foundation's State Health Facts website.[5] I indexed the data relative to New Hampshire for 2006 and 2007 (New Hampshire's values equal 100), and averaged across the two years to obtain index values for FY 2007.

For interest on the general debt, I used an input cost index equal to 100 for all states.

Expenditure need calculation

The steps for calculating expenditure need for each state and spending category are as follows:

(1) For each spending category, I summed total expenditures and total workload units across all New England states.
(2) I then divided total regional expenditures by total regional workload units, to obtain regional average spending per workload unit.
(3) For each state, I then multiplied the state's workload units by the regional average spending per workload unit to obtain unadjusted expenditure need.
(4) I next multiplied unadjusted expenditure need by the state- and category-specific input cost index to obtain adjusted expenditure need.
(5) I then normalize adjusted expenditure need by multiplying each state's share of the regional total adjusted expenditure need by actual total regional expenditures, thus ensuring that the sum of normalized adjusted expenditure need equals the sum of actual expenditures.
(6) Finally, to facilitate comparisons, I divided normalized adjusted expenditure need by population to obtain per capita estimates. By design, the regional average per capita normalized adjusted expenditure need equals the regional average per capita actual expenditure.

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[1] Yesim Yilmaz, Sonya Hoo, Matthew Nagowski, Kim Rueben, and Robert Tannenwald, "Measuring Fiscal Disparities across the U.S. States: A Representative Revenue System/Representative Expenditure System Approach, Fiscal Year 2002," Occasional Paper No. 74, Washington, DC: Urban Institute, 2006; and Robert W. Rafuse, Jr.,

"Representative Expenditures: Addressing the Neglected Dimension of Fiscal Capacity," Washington, DC: Advisory Commission on Intergovernmental Relations, December 1990.

[2] Herman B. Leonard, *By Choice or By Chance? Tracking the Values in Massachusetts Public Spending*, Boston: Pioneer Institute for Public Policy Research, 1992.

[3] This is based on the fact that wages and salaries paid to state and local employees in New England in 2007 represented roughly percent of total compensation costs per data from the Bureau of Economic Analysis. U.S. Bureau of Economic Analysis, Regional Economic Information System, Washington, DC: U.S. Department of Commerce.

[4] William D. Berry, Richard C. Fording, and Russell L. Hanson, "An Annual Cost of Living Index for the American States, 1960–95," *Journal of Politics* 60 (2) (May 2000):550–567. I used the authors' 2009 revised version of the index, available at: http://mailer.fsu.edu/~wberry/garnet-wberry/statecpi2007.zip.

[5] According to the State Health Facts website, the adjusted expenses include "all operating and non-operating expenses for registered U.S. community hospitals, defined as nonfederal short-term general and other special hospitals whose facilities and services are available to the public. Adjusted expenses per inpatient day include expenses incurred for both inpatient and outpatient care; inpatient days are adjusted higher to reflect an estimate of the volume of outpatient services. It is important to note that these figures are only an estimate of expenses incurred (by the hospital to provide a day of) inpatient care and are not a substitute for either actual charges or reimbursement for care provided." See http://www.statehealthfacts.org.