Appendix B – Data Regarding Small and Large States
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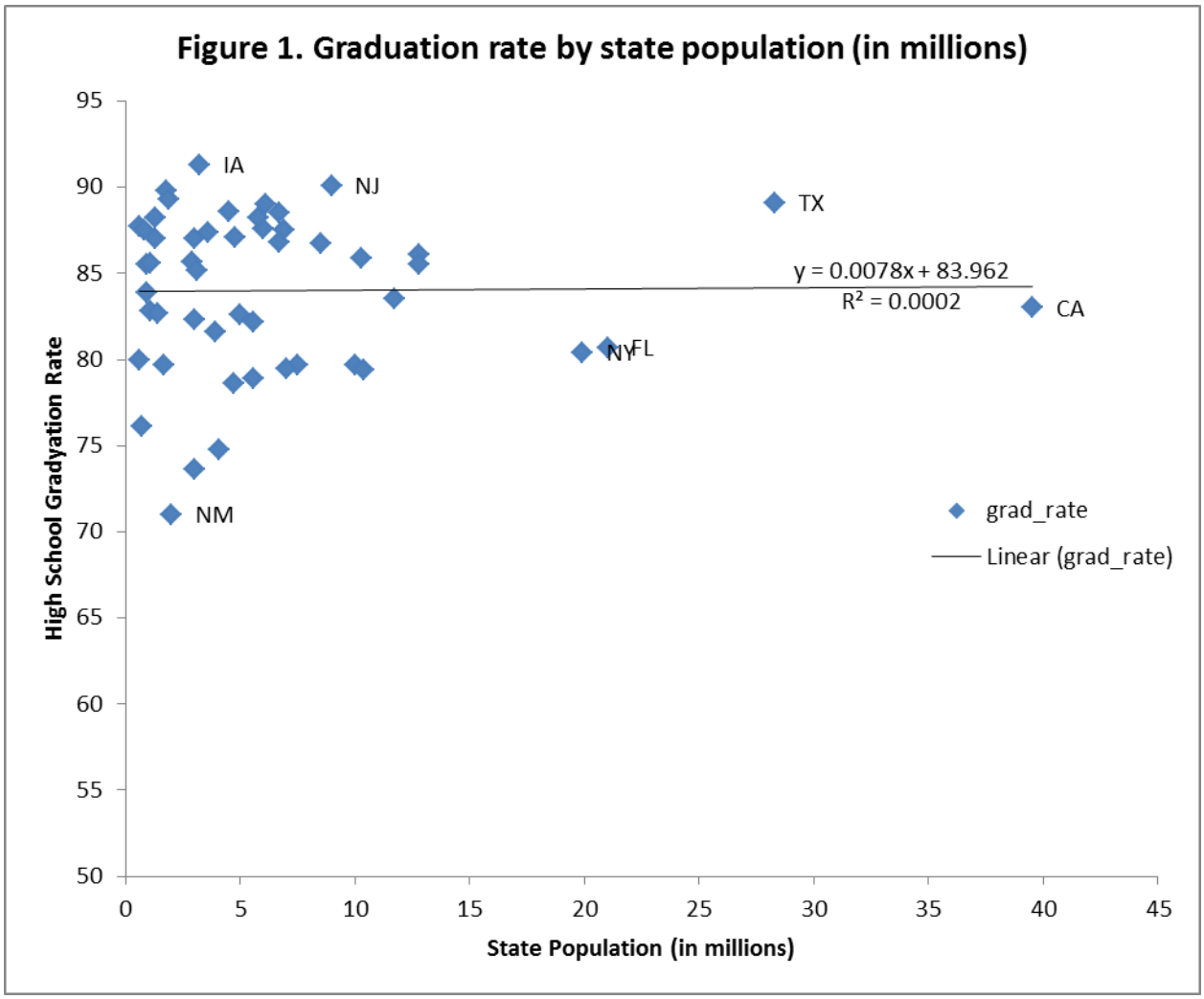
The initiative finds that, "The citizens of the whole state would be better served by three smaller state governments while preserving the historical boundaries of the various counties, cities, and towns." Proponents of the initiative argue that smaller states fare better than larger states on important issues that affect the daily life of residents, such as the quality of public schools, roads, and infrastructure such as bridges.

There are several ways to evaluate these claims, using existing data to look at whether state size (either geographic or population) is related to better performance on specified outcomes. In particular, one can look across all states to see whether the population of a state and/or area within a state predicts better educational outcomes and infrastructure ratings. Additionally, one can look at the states that are most similar to the three proposed states in terms of population and land mass to see whether such states are able to better deliver the specified services to their residents than a large state, such as the State of California.

Trends Across all States. To assess the claims that smaller states have better outcomes related to education, infrastructure, and taxation, one can examine results of statistical analyses that compare data across all 50 states.

a) Education. By looking at how reading scores, math scores, and graduation rates are related to the population of states, one can see if population is a significant predictor of performance on these outcomes. Figure 1 (below) shows one example of how state population in millions (the x axis) is related to one particular educational outcome: graduation rates (the y axis). The regression line (or line of best fit) in figure 1 has a slope near 0, suggesting no relationship between state population and graduation rates. At .0078 on the slope of the "x" term (also known as the regression coefficient) is not statistically significant at conventionally accepted levels of $p < .05$. Instead, the *p*-value for the regression coefficient is .932, suggesting that there is not sufficient evidence to reject the null hypothesis – namely, that there is no association between state population and graduation rates. A series of bivariate ordinary least squares linear regression models are used to assess the extent to which variation in population across all 50 states can predict the following measures of educational performance: 4^{th} grade reading score, 8^{th} grade reading score, 4^{th} grade math score, 8^{th} grade math score, and graduation rate. None of these reveal a statistically significant relationship between state population and any of the educational outcomes of interest.



Analyses looking at the relationship between geographic size of a state (i.e., land area) and educational outcomes reveals a significant and negative relationship between state size in square miles and 4th grade reading scores (regression coefficient = -.0000269, *p*=.003). This suggests that states with more land area tend to have worse performance on 4th grade reading achievement. A similar result is found for graduation data (regression coefficient = -.0000191, *p*=.01).

However, when California is removed from the analyses, there is no statistically significant relationship between state geographic land mass and any of the given educational outcomes examined. *In other words, based on the data from all other states in the country, there appears to be no relationship between either state population or state land mass and any of the educational outcomes that proponents of the initiative are interested in improving through dividing California into three smaller states.* Test score data from National Assessment of Educational Progress (NAEP) 2015: https://www.nationsreportcard.gov/reading_math_2015/#?grade=8 Graduation rate data: https://nces.ed.gov/ccd/tables/ACGR_RE_and_characteristics_2015-16.asp).

b) Infrastructure. Using data from U.S. News and World Reports which ranks all 50 states on their road quality and bridge quality, statistical analyses are again conducted to see how these outcomes relate to state size and population. Using ordinal logistic regression models to account for the rank nature of the data, one sees that population has a significant and negative relationship with bridge quality ranking (ordinal logistic regress coefficient = -.08, *p = .032).* This relationship holds when California is removed from the analyses, suggesting that greater population in a state is related to a lower rank on bridge quality relative to other states. However, the pseudo R-squared, a measure of variance explained, is .015 for models with or without California included. *This measure indicates 1.5% of the variability in bridge quality rank is explained by the population size of states – or, in other words, 98.5% of the variability in bridge quality is explained by factors other than state population. Road quality rank for states has no statistically significant relationship with population or land area of states, regardless of whether or not California is included in the analyses.* (U.S. News and World Reports Bridge and Road quality data: https://www.usnews.com/news/best-states/rankings/infrastructure/transportation)

c) Taxation rates. Supporters of the initiative claim that creating three smaller states from California would also lead to lower taxation rates. To evaluate this claim, one can compare the effective tax rates for each state with the population and the geographic size of states. Using the population of states to predict the effective state and local tax rate for the median U.S. individual, one sees that population is not a significant predictor of tax rates whether or not California is included in the model. Analyses looking at the geographic size of states reveal that larger states are related to lower effective state-level tax rates (regression coefficient = -.0000107, *p* = .001). Results remain similar when conducting the analysis without California's data included. *In other words, states that have greater geographic size tend to have lower effective state and local tax rates for a household making the median U.S. income.* (Source for Effective State and local tax rates by state: https://wallethub.com/edu/best-worst-states-to-be-a-taxpayer/2416/)

Evidence of Mixed Outcomes for States Based on Population Size. While analyses across all states provide useful insights, such models can also miss trends that may be relevant at the extremes (e.g., even if state population is not generally related to education outcomes, perhaps the very smallest states have excellent educational outcomes while mid-sized and large states have "noisier" data that hides this pattern). In table 1, three types of states are compared on a number of relevant outcomes. The first group, labeled "Smallest States" represents Vermont, Wyoming, and Alaska. The second grouping includes Ohio, Illinois, and Pennsylvania – states which have populations that are most similar to the population of the three newly proposed states that would be created from the division of California. Finally, the "Largest States" category represents states with the greatest population (excluding California).

By comparing across the groups, one sees that each grouping of states has mixed outcomes for education, taxation, and infrastructure quality. Within small states, Vermont has amongst the best education in the country with a rank of 4 out of 50, while Alaska is near the bottom at 46th out of the 50 states. Likewise, tax rates and infrastructure quality vary greatly within the smallest population states, suggesting that having a relatively small population does not necessarily translate into better education, lower tax rates, or higher quality infrastructure. Likewise, there is considerable heterogeneity amongst the second category of states with

populations similar to the newly proposed states in this initiative. While education rank and graduation data for these jurisdictions are all generally strong, taxation rates are high and infrastructure quality is generally below average for the country. Finally, if larger states tend to perform worse at providing for their citizens, then we should expect the states with the biggest populations to be uniformly lackluster. However, as with the prior two categories of states, there is considerable variability in how these states stack up to the rest of the country. For example, while Texas has the 2nd best bridge quality in the country, its roads are well below average at 38th. Effective state and local taxes are also quite variable, with rates generally higher than that of the smallest states, but lower than those in the states with populations that are similar to the newly proposed jurisdictions of California, Northern California, and Southern California. (All data from sources references above except Pre-K – 12 Education Rank data from US News and World Reports: https://www.usnews.com/news/best-states/rankings/education)

Note: All statistical models reported above are simple bivariate models and do not include controls for potentially confounding factors which could affect relevant outcomes (e.g., the average income or percent of residents below the poverty line in a state). While including control variables can help account for differences amongst the states, if a relationship between two variables is robust, one would expect to find a significant relationship when not considering controls too.

TABLE 1. Comparison of Education, Tax, and Infrastructure by State Size

	State	Population (in millions)	PreK-12 Education Rank	Graduation Rate	Effective State and Local Tax Rate	Bridge Quality Rank	Road Quality Rank
Smallest States	VERMONT	0.6	4	87.7	11.04	12	33
	WYOMING	0.6	34	80	7.45	35	3
	ALASKA	0.7	46	76.1	5.67	32	28
States similar to proposed new states	OHIO	11.7	36	83.5	13.09	20	25
	ILLINOIS	12.8	14	85.5	14.89	25	23
	PENNSYLVANIA	12.8	11	86.1	12.45	48	43
Largest States	NEW YORK	19.9	31	80.4	13.72	36	39
	FLORIDA	21	40	80.7	8.83	3	6
	TEXAS	28.3	33	89.1	11.04	2	38