Educational Policy and Intergenerational Mobility

Tomoaki Kotera and Ananth Seshadri

Department of Economics, University of Wisconsin-Madison

July, 2014

1 Introduction

In the U.S., there is considerable variation in intergenerational mobility at the state level. According to our calculation based on data from Chetty et al. (2014), the most and least mobile states are California and Mississippi, respectively. In California, the rank-rank slope which is the standard measure of relative mobility is 0.237 whereas the corresponding value in Mississippi is 0.414. It means that if the difference between two parents' income ranking is 100, the difference in their children's income ranking decreases to 24 (in California) and 41 (in Mississippi). Therefore, where a family resides changes children's future outcome significantly.

Then, a natural question arises: what factors generate this variation across states? Chetty et al. (2014) argue that segregation, income inequality, school quality, social capital and family structure are highly correlated with the variation of intergenerational mobility. However, since these variables are endogenous, their argument is inconclusive.

The goal of this paper is to examine how much of the variation in intergenerational mobility can be accounted for by the variation in state policies that lead to differences in expenditure on elementary and secondary education across school districts in a state[1]. Recent evidence suggests that early child investments are critical in improving a child's status and consequently, intergenerational mobility. Therefore, spending on public schools potentially plays an important role.

Our data show that there is also a variation regarding the level of per-pupils spending at the state level. Particularly, Connecticut spends approximately 3.5 times more than Mississippi. However, more important is the distribution of per-pupil expenditure on primary and secondary education. For example, California and Ohio spend the same amount per student. In spite of this, the gap in spending between wealthier and poorer districts is large in Ohio whereas it is small in California. Depending on whether expenditure

[1]Note that this element is not highly correlated with the interegenerational mobility in Chetty et al. (2014). When they use test scores on the National Assessment of Educational Progress (NAEP) tests and dropout rates, they are highly correlated.

are equally distributed, the impact of expenditure on pre-college education on intergenerational mobility is different.

To the best of our knowledge, our paper is the first paper to consider the impact of policy on intergenerational mobility within a country taking a structural approach. There is now a significant literature on intergenerational mobility (e.g., Becker and Tomes (1979), Becker and Tomes (1986), Solon (1992), Restuccia and Urrutia (2004), Mazumder (2005), and Lee and Seshadri (2014)), but these literature consider the income mobility of U.S. at the aggregate level[2]. Another literature compare the mobility, but they explore cross-country difference (Corak (2013), Holter (2011), and Abott and Gallipoli (2014)). Only Chetty et al. (2014) consider intergenerational mobility in a finer division, county level, from the rich data, but they only show the variation and propose its possible reasons.

There is also a large literature on public spending for primary and secondary education. Some papers discuss the influence of school finance reform on the equality of spending (Murray et al. (1998),, Hoxby (2001), Card and Payne (2002) and Jackson et al. (2014),). In addition, Hoxby (2001) and Card and Payne (2002) refer to the effect on school achievement such as drop-out rate (Hoxby (2001)), SAT scores (Card and Payne (2002)), or adults earnings and family income (Jackson et al. (2014),). However, they take a reduced-form approach. Moreover, no literature takes into account the relationship between disparity in public schools spending and intergenerational mobility. Therefore, we plan to construct a dynamic model in order to pursue the relationship.

2 Evidence

2.1 The Variation of the Intergenerational Mobility.

For the variation of the intergenerational mobility at the state level, we use rank-rank slope[3]. This term is the correlation between parent's income ranking and child's income ranking. Chetty et al. (2014) compute rank-rank slope at the county level which are available from their website[4]. Using their data, we compute the population weighted rank-rank slope at the state level. We use the population of each county in 2000 from County Intercensal Estimates of the U.S. Census Bureau.

[2]Solon (1992), and Mazumder (2005) finds out the income generational mobility of the U.S. from a reduced-form approach. On the contrary, Becker and Tomes (1979),Becker and Tomes (1986), Restuccia and Urrutia (2004), and Lee and Seshadri (2014) explore the mechanism behind the income mobility

[3]The alternative measure is the intergenerational elasticity (IGE). This is the elasticity of a child's income with regards to parent's income. This methodology is more standard. In fact, Solon (1992), and Mazumder (2005) take this approach. However, as Chetty et al. (2014) point out, the drawback of IGE is robustness. Depending on the specification, the value of the elasticity changes significantly.

[4]We can download from http://www.equality-of-opportunity.org/index.php/data.

Table 1: Top 5 and Worst 5 States on Rank-Rank Slope.

Top			Bottom		
Ranking	State	Rank-Rank Slope	Ranking	State	Rank-Rank Slope
1st	**California**	**0.237**	48th	**Mississippi**	**0.414**
2nd	**Utah**	**0.243**	47th	**Louisiana**	**0.394**
3rd	**Idaho**	**0.248**	46th	**Delaware**	**0.393**
4th	**Wyoming**	**0.255**	45th	**Ohio**	**0.391**
5th	**Montana**	**0.257**	44th	**Alabama**	**0.389**

Table 1 presents Top 5 and Worst 5 states regarding rank-rank slope. In this ranking, we exclude Hawaii and Alaska. According to Table 1, the lowest rank-rank slope is 0.23-0.25 whereas the highest one is 0.39-0.41. It means that if there are two parents and the difference of their income rankings is 100, then the same difference for their children decreases to 23-25 and 39-41, respectively.

2.2 Expenditure on Elementary and Secondary Education.

As an explanation for the variation in intergenerational mobility, we first provide evidence on spending on public schools. We use per-pupil spending at the school district level from Public Elementary-Secondary Education Finance Data of the U.S. Census Bureau. We choose the data from 1990 to 1998 because children's year of birth is between 1980 and 1982 in the data of Chetty et al. (2014). Based on these data, we compute the averaged spending at the state level. Following Murray et al. (1998), we exclude Montana and Vermont as well as Hawaii and Alaska. This is because these two states have no unified school districts. Regarding our computation, we adjust the value by CPI from IPUMS.

2.2.1 The Level of Per-Pupil Public Spending.

Table 2: Top 5 and Worst 5 States on Per-Pupil Spending.

Top			Bottom		
Ranking	State	Spending	Ranking	State	Spending
1st	**Connecticut**	$ **9,296**	46th	**Mississippi**	$ **2,735**
2nd	**Maryland**	$ **7,246**	45th	**North Dakota**	$ **3,195**
3rd	**Massachusetts**	$ **7,531**	44th	**Oklahoma**	$ **3,813**
4th	**New Jersey**	$ **7,489**	43rd	**Arkansas**	$ **3,854**
5th	**Rhode Island**	$ **6,908**	42nd	**Idaho**	$ **3,865**

Table 2 shows Top 5 and Worst 5 states with regards to the averaged spending on elementary and secondary education. Highest spending is more than $ 7,000 on average and lowest spending is less than $ 4,000. Particularly, Mississippi spends only $ 2,700, which is less than one third of Connecticut's expenditure.

2.2.2 The Distribution of Per-Pupil Public Spending.

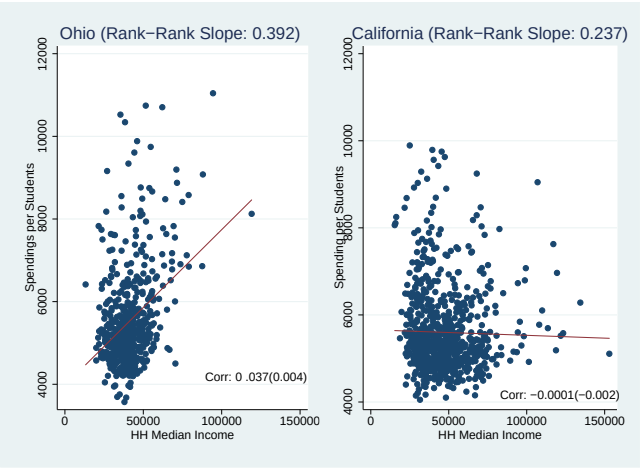

Figure 1: Comparison of the Two States on the Distribution of spending.

Note: "Corr" stands for the correlation coefficient between per-pupils expenditure on public schools and median household income. The standard error is in parenthesis.

Clearly, the level of expenditure on pre-college education is important for a child's human capital, which is relevant to the intergenerational mobility. However, we point out that a more important element is the distribution of the spending. This is because if spending is substantially lower in poor districts, but spending is overwhelmingly higher in a wealthier district, there would be low income mobility regardless of the level. In this section, we present the distribution of per-pupil spending in each state.

We use Census 1990 school district tabulation data of National Center for Education Statistics. This data has household median income in 1989[5]. Since the data are also in U.S. current dollar, we adjust it by using CPI.

Figure 1 reveals the (un) equal distribution of expenditure on elementary and secondary education. We choose Ohio and California as a specific example. The averaged spending in the two states are almost the same ($ 4,626 for Ohio and $ 4,313 for California), but the difference of rank-rank slope is huge (0.392 for Ohio and 0.237 for California). As the fitted line depicts in each figure, the correlation coefficient in Ohio is positive (0.037) and significant at 1% level, but the value in California is negative (-0.0001), but insignificant. It implies that there is a positive relationship between rank-rank slope and median household income in Ohio, but no correlation in California. Therefore, overall, public spending on early education is equally (unequally) distributed in California (Ohio). The same tendency as Ohio can be found in the

[5]This data is taken every ten years. Thus, we cannot obtain the same variable from 1991 to 1998.

following states: Connecticut, Illinois, Maryland, Massachusetts, Louisiana, New Jersey, Michigan, Missouri, New Hampshire, New York, Ohio, Pennsylvania, Virginia, and Wisconsin. On the contrary, the correlation coefficient is negative, *and* significant. in some states. It implies that a poor school district tend to spend more for public schools than a wealthier district.

2.2.3 The Importance of Both Level and (Un) Equal Distribution of spending.

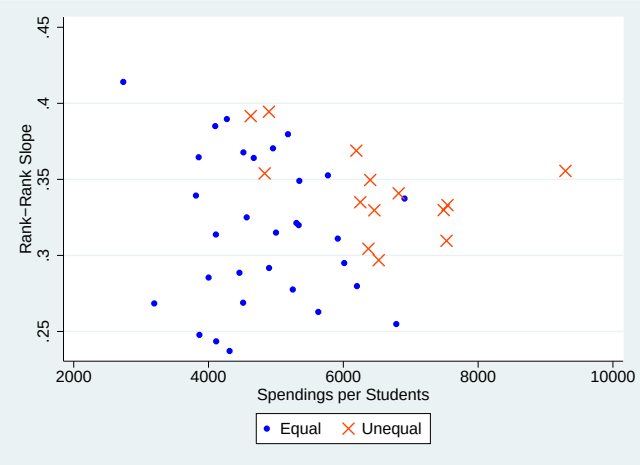

Figure 2: The Correlation of Rank-Rank Slope and Per-Pupil Spending.

Figure 2 illustrates the relationship between rank-rank slope and public spending per student. Overall, there is no correlation between two variables. The correlation coefficient is only -0.01. This finding is consistent with Chetty et al. (2014). They point out that the correlation is not strong as the correlation between the income mobility and test scores or drop-out rate. This suggests that variation in state financing does not have a first order impact on intergenerational mobility. However, when we create two subgroups based on the distribution of expenditure, the correlation is much higher for the both groups (-0.17 and -0.46 for the states in which per-pupils spending are equally, and unequally distributed)[6]. In addition, it is worth noting that if the spending were unequally distributed, their impact is relatively weak. This is why (un) equal distribution of spending cannot be neglected.

2.3 Model.

In this section, we briefly lay out the central elements of the model. The objective is to simulate a simple model along the lines of Caucutt and Lochner (2012),. We will assume that individuals live for three periods – the first as a child and the second and third as adults. We will assume for simplicity that parents care about the income of their children. Our goal is to simulate the model for each of the states in the United States.

[6]With regards to the division, we do not differentiate between states which have no correlation and states which have a negative correlation.

The variation across states comes from two sources: some states have a higher productivity and hence are richer and have higher wages and states have different educational policies. A representative household in our model will be the average person in a school district. Parents take as given the educational spending and then decide how much to bequeath to their children – poor parents will set bequests to zero. Children's abilities will be drawn from a distribution that depends on their parent's circumstances. This along with capital market imperfections (the inability to pass on negative bequests) will generate persistence in status across generations.

Our overriding objective in calibrating the model is to choose model parameters so as to replicate various moments including Figure 2. Then we plan to conduct a counterfactual experiment in which all states have the same school finance system. We thus hope to uncover the causal impact of school finance systems on intergenerational mobility. We believe that our analysis will complement existing instrumental variable type studies that look at the effects of educational policies on mobility.

References

Abott, Brant and Giovanni Gallipoli, "Skill Complementarity and the Geography of Intergenerational Mobility," 2014. mimeo. 2

Becker, Gary S and Nigel Tomes, "An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility," *Journal of Political Economy*, December 1979, *87* (6), 1153–89. 2

_ **and** _ , "Human Capital and the Rise and Fall of Families," *Journal of Labor Economics*, July 1986, *4* (3), S1–39. 2

Card, David and A. Abigail Payne, "School finance reform, the distribution of school spending, and the distribution of student test scores," *Journal of Public Economics*, 2002, *83* (1), 49–82. 2

Caucutt, Elizabeth M. and Lance Lochner, "Early and Late Human Capital Investments, Borrowing Constraints, and the Family," NBER Working Papers 18493, National Bureau of Economic Research, Inc October 2012. 5

Chetty, Raj, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez, "Where is the land of Opportunity? The Geography of Intergenerational Mobility in the United States," *The Quarterly Journal of Economics*, 2014, *129* (4), 1553–1623. 1, 2, 3, 5

Corak, Miles, "Income Inequality, Equality of Opportunity, and Intergenerational Mobility," *Journal of Economic Perspectives*, Summer 2013, *27* (3), 79–102. 2

Holter, Hans A, "Accounting for Cross-Country Differences in Intergenerational Earnings Persistence: The Impact of Taxation and Public Education Expenditure," Working Paper Series 2011:21, Uppsala University, Department of Economics December 2011. 2

Hoxby, Caroline M., "All School Finance Equalizations Are Not Created Equal," *The Quarterly Journal of Economics*, November 2001, *116* (4), 1189–1231. 2

Jackson, C. Kirabo, Rucker Johnson, and Claudia Persico, "The Effect of School Finance Reforms on the Distribution of Spending, Academic Achievement, and Adult Outcomes," NBER Working Papers 20118, National Bureau of Economic Research, Inc May 2014. 2

Lee, Sang Yoon and Ananth Seshadri, "On the Intergenerational Transmission of Economic Status," 2014. mimeo. 2

Mazumder, Bhashkar, "Fortunate Sons: New Estimates of Intergenerational Mobility in the United States Using Social Security Earnings Data," *The Review of Economics and Statistics*, May 2005, *87* (2), 235–255. 2

Murray, Sheila E, William N Evans, and Robert M Schwab, "Education-Finance Reform and the Distribution of Education Resources," *American Economic Review*, September 1998, *88* (4), 789–812. 2, 3

Restuccia, Diego and Carlos Urrutia, "Intergenerational Persistence of Earnings: The Role of Early and College Education," *American Economic Review*, December 2004, *94* (5), 1354–1378. 2

Solon, Gary, "Intergenerational Income Mobility in the United States," *American Economic Review*, June 1992, *82* (3), 393–408. 2