



Human capital accumulation in a federation

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ABSTRACT

More than half of the variation across U.S. school districts in real K-12 education expenditures per student is due to differences between, rather than within, states. I study the welfare implications of redistribution of education expenditures by the Federal government, using an analytically tractable model of human capital accumulation with heterogeneous agents and endogenous state policies. The net welfare effect of Federal redistribution depends on a trade-off between the positive effect of redistributing resources toward poorer states and the negative effect resulting from misallocation of population across states. Federal redistribution increases welfare in a calibrated version of the model.

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1. Introduction

Between one half and three quarters of the variation in primary and secondary education spending per student across school districts in the U.S. is due to differences in average expenditures across U.S. states, as opposed to school districts within a state (Murray et al., 1998; Corcoran et al., 2003, and Section 2 below). A key determinant of the average level of schooling expenditures across states is average state income, with richer states spending more on schooling than poorer ones. While disparities in schooling expenditures that occur within states tend to be offset by state-level redistribution, the Federal government has historically played a much smaller role in education finance. Even relatively poor states such as Mississippi receive only about a fifth of their K-12 education revenue from the Federal government (Hanushek and Lindseth, 2009). While the existence of differences in education expenditures across states is not a new phenomenon, it has received relatively little attention in the literature on school finance.¹ The latter has mostly focused on the implications of state-level school finance litigation starting with the 1970's *Serrano* lawsuits in California.²

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¹ The issue of the optimal involvement of the Federal government in K-12 education and its financing is, however, a hotly debated topic in many public policy circles. See, for example, the *Koret Task Force on K-12 Education's 2012* report *Choice and Federalism*.

² See Silva and Sonstelie (1995), Evans et al. (1997), Murray et al. (1998), Fernandez and Rogerson (1998), Fernandez and Rogerson (1999), and Hoxby (2001) for analysis of the effects of court-ordered education finance reform. Interestingly, Coons et al. (1970, Appendix A, p. 465) in the seminal book that provided the theoretical foundation for state-level school finance litigation, draw the reader's attention to the "state-nation analogy to the district-state picture." While they focus on education financing at the state level, they observe that "the variation among states themselves mirrors the pattern of district variation within the states. One of the implications of this is that large-scale federal aid to education is needed if we are to achieve full national equalization."

This paper makes two contributions relative to the existing literature (e.g. Fernandez and Rogerson, 1998). First, it proposes a model that simultaneously generates both *within*-state and *between*-states differences in the distribution of education resources.³ Second, it studies the welfare implications of Federal redistribution of education expenditures taking into account states' policy reactions, movements of population across states, and the dynamic accumulation of human capital across generations. I seek to answer a number of questions related to these two contributions: What economic forces sustain heterogeneity in education expenditures across states despite free geographic mobility of labor? What are the key determinants of between-state differences in expenditures? What are the benefits and costs associated with Federal – as opposed to state – redistribution of education expenditures? How large are the welfare gains from Federal redistribution?

In order to answer these questions, I develop a general equilibrium overlapping generations model of investment in education with heterogeneous agents, heterogeneous states, and state-level voting over redistribution of education expenditures. States are assumed to be characterized by exogenous differences in productivity. Productivity differences are the key determinant of the endogenous dispersion in education expenditures per student across states that emerges in the model's equilibrium. This positive association between income and education expenditures, while intuitive and consistent with the empirical evidence, is not obvious in an economy characterized by free geographic mobility of labor.⁴ Labor mobility tends to equalize wages, incomes, and ultimately education expenditures across states. To prevent wage equalization I focus on a different form of congestion, associated with population density, that makes agents indifferent among various states. Thus, although in equilibrium each state has to offer the same utility level to a given agent, it does not have to offer her the same level of income (Roback, 1982).

A key difference between this model and others in this literature (e.g. Fernandez and Rogerson, 1997, 1998, 1999, 2003; Bénabou, 1996a, 1996b, 2002) is the fact that I allow for multiple states in addition to multiple school districts within each state. A state in the model is both a *politico-administrative unit* with its own policy toward redistribution of education expenditures as well as an *economic unit* with a distinct labor market. In the literature cited above an individual's wage is independent of her school district of residence as individuals are choosing a school district within a given metropolitan area (or state). The model presented here allows an individual's wage to vary across school districts if they are located in different states. This feature of the model shapes the relevant policy trade-off associated with Federal redistribution. On one hand, redistributing education resources towards households located in poorer states has the potential of increasing aggregate human capital and welfare due to diminishing returns to inputs in the production of new human capital. On the other hand, redistribution toward poorer states increases the incentives of households to locate there, leading to a lower average productivity of the economy's workforce. This potential for misallocation of population across states induced by Federal policy is a new unique distortion identified in this paper. A sufficient condition under which Federal policy has a positive impact on welfare is that the elasticity of population to wages across states is not too large. A calibrated version of the model yields an increase in welfare stemming from Federal redistribution of education expenditures corresponding to 1.3 percent of consumption.

This paper is related to the literature on investment in human capital and redistributive policies in economies with heterogeneous agents (Glomm and Ravikumar, 1992; Boldrin, 1992; Fernandez and Rogerson, 1997, 1998, 1999, 2003; Bénabou, 1996a, 1996b, 2002; Herrington, 2013; Heathcote et al., 2013). Relative to this literature I emphasize the geographic – particularly inter-state – dimension of the debate on education financing. The paper is also related to contributions in other neighboring literatures. A number of authors have studied empirically the effects of court-ordered education finance reform in various U.S. states (Evans et al., 1997; Murray et al., 1998; Hoxby, 2001). There is a small empirical literature on the effects of Federal Title 1 transfers to school districts with a high concentration of students under the poverty line (Gordon, 2004; Cascio et al., 2011). Within the local public finance literature, reviewed by Epple and Nechyba (2004), Calabrese et al. (2012) find that a centralized provision of public goods is often more efficient than a decentralized one. In the urban literature, Albouy (2009), Albouy (2012) uses versions of Roback (1982)'s model to measure the distortions associated with Federal tax and transfer policies.

The rest of the paper is organized as follows. Section 2 presents the two stylized facts that motivate the analysis. Section 3 introduces the benchmark model. Section 4 defines the stationary equilibrium of the model and characterizes its qualitative properties. Section 5 shows that the model can account for the two stylized facts that motivate the analysis. Section 6 considers the welfare effects of Federal redistribution. Section 7 considers the quantitative version of the model. Section 8 concludes. The paper has two sets of appendices. Appendices A, C, and D provide additional details on the model and on the data. The online technical appendix contains the proofs of all proposition and additional details on the calibration of the model.⁵

³ While I have in mind the financing of primary and secondary education, the ideas developed here are in principle applicable to tertiary education as well.

⁴ The mobility of labor across states is an important point of departure of my analysis relative to the cross-country literature on schooling and cross-country income differences (see e.g. Erosa et al., 2010).

⁵ I relegated the proofs to the online technical appendix because they are quite lengthy. The technical appendix can be found at: http://www.pitt.edu/~coen/research/technical_appendix.pdf.

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