



# Early childhood education expenditures and the intergenerational persistence of income <sup>☆</sup>



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## ABSTRACT

We consider the extent to which cross-country differences in the intergenerational persistence of income can be explained by differences in government spending on early childhood education. We build a life-cycle model where human capital is accumulated in early, middle and late childhood. Both families and the government can increase the human capital of young agents by investing in education at each stage of childhood. Ability in each dynasty and wages per unit of human capital are stochastic. Different realizations of these values and the resultant education spending histories generate a stochastic steady-state distribution of income. Government spending can reduce persistence by weakening the link between parental income and education spending for a child. Our results show that doubling early childhood spending in the U.S. to match levels in Norway and Denmark eliminates less than 8.5 percent of the gap in intergenerational income persistence. Increased government education spending in later childhood has almost no effect on persistence. Early childhood expenditures can have a larger effect when allocated to low income families.

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## 1. Introduction

Children from lower income families tend to earn less in adulthood than children from wealthier families. This reflects more than inherited traits. Children from wealthier families are provided with more and better education, a socioeconomic environment more suitable for human capital accumulation, and greater workplace opportunities through networking. As children transition to the labor market, these accumulated differences result in an intergenerational persistence of income.

Compelling evidence demonstrates that skills attained early in life form the foundation of later achievement. Cunha et al. (2005) show that disparities in ability across young children account for much of the variation in socioeconomic outcomes as adults. Knudsen et al. (2006) cite evidence from economics, neurobiology and sociology to show that different abilities and skills are formed in different stages of the life cycle and that some essential skills are developed in early childhood.<sup>1</sup> Since

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<sup>1</sup> Related work includes Carneiro and Heckman (2003) and Currie (2001).

early childhood education plays a foundational role in human capital development, families can transfer earning potential to their children through this channel.

Public funding of early childhood education can lead to more uniformity in early learning opportunities. Countries differ widely in the extent of such funding. Government spending on early childhood education is equal to 0.4 percent of GDP in the United States. Norway and Denmark spend twice this amount. Lower government spending in the U.S. means that resources available in the critical years of early childhood are more closely related to parental income.

Income persistence is much higher in the U.S. than in Denmark and Norway. While persistence measures are only 0.17 in Norway and 0.15 in Denmark, it is equal to 0.47 in the U.S. The differences in funding and persistence across these countries suggest an opportunity for the U.S. to lower the persistence gap through lowering the funding gap. This paper considers the extent to which the persistence gap could be narrowed if the U.S. were to adopt the funding level for early childhood education seen in Norway and Denmark. Despite the central role of early childhood education, we find little scope for reducing persistence through government education spending. Doubling government funding of early childhood education in the U.S. to match spending in these Nordic countries would eliminate less than 8.5 percent of the observed gap in persistence. Moreover, we find that increased funding for children in later childhood has almost no effect on persistence. The explanation for large differences in persistence apparently lies beyond differences in government funding of education in childhood.

We investigate the relationship between government early education spending and the intergenerational persistence of income using a stochastic, heterogeneous agent life-cycle model. We follow [Cunha et al. \(2010\)](#) and model human capital accumulation as a multi-stage process where the timing of education investment is critical to its effectiveness. The education outcome at each stage depends on the education outcome at the previous stage, parental human capital, and current investment. We model early childhood education as being both relatively productive and a complement to later childhood education.

In our model, government education spending serves to weaken the link between total education spending and family income. Families respond to government spending in part by reducing private spending. For poor families, private spending is low and there is scarce room for such crowding out. An increment to government spending then lowers private spending more for the wealthy than for the poor. Equivalently, increments to government expenditures increase total spending more for low income families than for high income families. As a result, income and education spending are less closely linked and the persistence of income diminishes. Our results show that the opportunity to reduce persistence through spending on early childhood education is largely exploited at current funding levels. The current level of spending has a relatively large effect on persistence. Eliminating government spending on early education would increase persistence by nearly 18 percent. In contrast, an equivalent increase in spending would decrease persistence by just over 5 percent.

In part, this relatively small impact reflects a weakening of the crowding out effect. At higher levels of government spending, families provide a smaller share of total spending. This leaves less room for additional crowding out and additional equalization of spending. At higher levels of spending, then, another effect on persistence has a relatively larger impact. Since the crowding out is incomplete, increased government spending results in increased total spending for all agents. The same amount of increase in spending has a larger effect on the offspring of the wealthy since on average these are the more able students. This second effect serves to strengthen the relationship between parent and progeny income.

The decreasing marginal impact of government education spending on persistence is even more clear at the primary and secondary levels. Current spending levels on primary and secondary education in the U.S. are much larger than on early childhood education. We show that further spending at these levels has almost no effect on persistence.

An increase in early childhood education spending can be more effective when targeted at the lower end of the income distribution. We show that an equivalent increase in government spending would decrease persistence by 17 percent, rather than 5 percent, if it were allocated only to the lowest income quintile. This is because total spending for affected families increases nearly in proportion to government spending while total spending for wealthier families is unaffected. As a result the gap in spending falls. This is helpful in understanding the impact of such programs as the Perry Preschool Project, the Abecedarian Project (see [Cunha and Heckman, 2007](#)), and Head Start (see [Currie, 2001](#)). These are programs targeted directly at the early development of children from low income families and each has arguably been highly effective.

[Restuccia and Urrutia \(2004\)](#) also consider the role of education at different stages on the intergenerational persistence of earnings. However, they focus on a two-stage education process where early education encompasses all of education prior to college. Features that distinguish these two levels of education are quite different than those that distinguish early and later childhood education in our paper. Thus they consider related but distinct questions. They find that increasing funding of pre-college education is more effective than funding for college. In this sense our work can be seen as a refinement of this prescription. We argue that when increasing pre-college funding, it is best to focus these additional resources on the pre-primary period.

[Holter \(forthcoming\)](#) builds a model in a similar vein in order to understand better the sources of differing levels of intergenerational income persistence in Western economies. He also considers how persistence in the U.S. would change upon implementing Danish taxation and government education spending policies. He finds that the required increased progressivity of taxes would have a larger effect on persistence than the required spending changes. Holter models education as a multi-stage process. While there are several periods prior to college, education is assumed to begin at age 5 and the pre-college periods contribute to human capital in a symmetric fashion. Also, there are not sharp funding differences across the pre-college periods. Thus the paper addresses a distinct but complementary set of questions.

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