



Intergenerational long-term effects of preschool-structural estimates from a discrete dynamic programming model[☆]



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ARTICLE INFO

Article history:

Received 12 February 2010

Received in revised form

10 September 2015

Accepted 5 October 2015

Available online 17 October 2015

JEL classification:

J24

J62

O15

I21

Keywords:

Preschool investment

Early childhood development

Intergenerational social mobility

Structural dynamic programming

ABSTRACT

This paper formulates a structural dynamic programming model of preschool investment choices of altruistic parents and then empirically estimates the structural parameters of the model using the NLSY79 data. The paper finds that preschool investment significantly boosts cognitive and non-cognitive skills, which enhance earnings and school outcomes. It also finds that a standard Mincer earnings function, by omitting measures of non-cognitive skills on the right-hand side, overestimates the rate of return to schooling. From the estimated equilibrium Markov process, the paper studies the nature of within generation earnings distribution, intergenerational earnings mobility, and schooling mobility. The paper finds that a tax-financed free preschool program for the children of poor socioeconomic status generates positive net gains to the society in terms of average earnings, higher intergenerational earnings mobility, and schooling mobility.

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[☆] We would like to thank the anonymous Associate Editor and two referees of the *Journal of Econometrics* for many valuable comments. An earlier draft was presented at the Centre for Development Studies, Institute of Economic Growth, Indian Statistical Institute, Indira Gandhi Institute of Development Research, Center for Development Studies, Nanyang Technological University, Periyar University, Singapore National University, University of Nevada at Las Vegas, Tokyo University, University of Southern California, the Western Economic Association Meeting 2003, and the Public Economic Theory (PET) 2006, Hanoi, Vietnam. Comments of the participants of these workshops, especially of Juan Pantano as a discussant of the Western Economic Association conference, Lien H. Tran for presenting and commenting on the paper at the PET 2006 conference, and comments from Han A.T. Raut and T.N. Srinivasan are gratefully acknowledged. This research was supported in part by the American Bar Foundation (3203), the Pritzker Children's Initiative, the Buffett Early Childhood Fund, NICHD R37 HD065072, R01 HD054702, the Human Capital and Economic Opportunity Global Working Group – an initiative of the Becker Friedman Institute for Research in Economics – funded by the Institute for New Economic Thinking (INET) (INO14-00035), and an anonymous funder. The views expressed in this paper are those of the authors and not necessarily those of the funders or commentators mentioned here.

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1. Introduction

This paper formulates and estimates an altruistic model of parental preschool investment decisions. In our model, preschool investments affect the cognitive and non-cognitive skills of the children, and hence their lifetime permanent earnings and school outcomes. Optimal choices by parents determine the equilibrium controlled Markov process, characterizing the equilibrium dynamics of earnings distributions within each generation, and the schooling and earnings mobility across generations. We also examine the effect of a social policy that provides free preschool to children of low socioeconomic status (SES) financed by taxing all parents in the population, on the distribution of earnings within generation and on intergenerational earnings and schooling mobility. We use the NLSY79 (National Longitudinal Survey of Youth, 1979) and the NLSY79 Children and Young Adults data containing information on a nationally representative sample of parent–child pairs of the US population. This paper extends Raut (2003) by incorporating unobserved heterogeneity and estimating the structural parameters. The paper utilizes the Rust (1987, 1994) nested fixed point maximum likelihood estimation procedure.

Two important building blocks of our model are: (1) The stochastic production processes of the cognitive and non-cognitive

skills with early childhood investment as one of the inputs; (2) An augmented Mincer earnings function that adds non-cognitive skills to the standard Mincer earnings function. We estimate these relationships. We provide an estimate of the extent to which the rate of return to schooling in the standard Mincer earnings function is inflated because the schooling level in the standard Mincer earnings function embodies the effect of the omitted non-cognitive skills variables.

In the past three decades, the income gap between the rich and the poor and the wage gap between the college educated and the non-college educated workers in the US have been widening. Equalizing education is advocated as the main policy in the US to reduce poverty and income disparities. Many are, however, highly skeptical about a positive answer to the basic question: “*Can we conquer poverty through school?*”.

There are many reasons for this skepticism. In the US, education through high school level is virtually free. Yet many children of poor SES (Socio Economic Status) do not complete high school and many of them perform poorly in schools. Gaps in test scores between rich and poor children are substantial, and unequal schooling quality does little to widen this gap (Carneiro and Heckman, 2003; Heckman, 2008). In spite of its positive effects on test scores and earnings, the effects of improved school quality on school dropout rates is marginal.

A growing consensus reached among educators, media writers (see for instance Traub, 2000), researchers in economics (see, for instance, Cameron and Heckman, 1998; Carneiro and Heckman, 2003; Cunha et al., 2006; Heckman, 2000, 2008; Keane and Wolpin, 1997, 2001) finds that children of poor SES are not prepared for college because they were not prepared for school to begin with. The most effective intervention for the children of poor SES should be introduced at the preschool stage so that these children are prepared for school and college. The question is, then: does preschool experience have long-term positive effects on school performance and labor market success? This is the main issue that we address in this paper, and our finding corroborates the evidence in Cameron and Heckman (1998), Cunha and Heckman (2007, 2009), Heckman et al. (2010a,b) and Keane and Wolpin (1997, 2001) that early intervention is effective.

There are quite a few quantitative studies on this issue. One set of studies uses data on high cost high quality pilot preschool programs such as the High Scope/Perry Preschool Program (see Heckman et al., 2010a,b) and the North Carolina Abecedarian Study (Conti et al., 2016). These studies find a substantial lasting effect of these programs on school performance, labor market outcomes, and health. The participants in these programs are not representative of the US population.

Another set of studies estimates the production function for children's cognitive achievements, which is usually measured by scores in math and reading tests in early childhood.³ Most of these studies do not explicitly examine the effect of the mother's employment or types of childcare on cognitive and non-cognitive skill formation of children. Blau (1999), however, uses the childcare data on the nationally representative full NLSY79 sample of parents, matched with the NLSY79 Children data. He finds that the childcare investments during the first three years have no significant effect, but an experience with better quality childcare during the next two years has a significant positive effect on the cognitive developments of children in early school years. Other studies (see Blau and Currie, 2006) find negligible or negative effects of maternal employment on child outcomes. When a mother works,

maternal time input for child development is reduced, which may yield a negative effect. This negative effect might be offset by the positive effects of higher income and better quality childcare on child outcomes, yielding a net small or negative effect of maternal employment. Similarly, the negligible effect of childcare may be because the mothers may use childcare to be able to work, which reduces mother's time input on child development, offsetting the positive effect of childcare on child outcomes. The problem is that childcare and maternal employment are endogenous variables. The regression models that treat these variables as exogenous regressors will produce biased estimates of their effects on child outcomes. Bernal (2008) and Bernal and Keane (2011) formulate and estimate structural models in which these two are choice variables. Using the same dataset as in Blau (1999), they find significant negative effects of maternal employment and informal childcare (i.e., care by relatives) on test scores of children. These studies do not distinguish between preschool and daycare centers of various qualities that the respondent uses. The results are for the restricted groups in the sample of single mothers (or mothers that do not cohabit with a male) during the first five years of the child's life or for mothers who live with the husband/male-partner during the first five years of the child's life. In both cases, the mothers do not have another child for at least five years. See Blau and Currie (2006) for a summary of similar findings on various other subgroups.⁴

The other set of studies uses data on the Head Start preschool program which is funded by the Federal Government. It is available to children whose parents earn incomes below the poverty line. Not all eligible children are, however, covered by the program. The quality of the program is very poor compared to the enriched pilot programs or most private preschool programs. Some studies find that the Head Start Preschool Program has no long-term effect on children's cognitive achievements and school performance, especially for black children. Currie and Thomas (1995) carry out a careful econometric investigation and conclude that the benefits disappear for black children because most of the Head Start black children attend low-quality public schools. But after controlling for school quality, they find significant positive effects of the Head Start Preschool Program. Studying two types of preschool is beyond the scope of this study; see the recent study by Deming (2009).

The above studies are not based on nationally representative samples of children. Most studies examine only the effect on school performance, such as test performance in early school years, grade retention, and high school and college graduation rates, and do not model parental choice of investing in their children's preschool. In this paper, we formulate a model of parental investment in preschool that is guided by economic incentives. We show that the preschool experience benefits children in acquiring many useful cognitive and non-cognitive skills, especially for the children of poor SES who live in poor home environments—a measure of family investment. We also show the importance of non-cognitive

³ See Todd and Wolpin (2003) and Blau and Currie (2006) for earlier surveys and summaries of these studies, and Cunha and Heckman (2008), Todd and Wolpin (2007) for more recent studies and recent references.

⁴ “The most consistent evidence of negative effects of maternal employment comes from families in which some or all of the following are true: the mother returns to work when the child is less than one year old; young children spend very long hours in care; the mother's employment does not raise family income (as in some households where families have been forced off welfare); there is a single parent with few family members to draw on so that time spent in employment cannot be compensated by drawing on the time of other family members either for child care or for housework; and/or the work itself is very stressful and reduces the resources the mother brings to parenting. Some studies of shift-work, for example, suggest that it may have this effect. Adolescents may also suffer more negative effects of maternal employment than younger children, particularly if they are left unsupervised” Blau and Currie (2006, pp. 1170–1171).

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