



# Inter-generational effect of parental time and its policy implications



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## ABSTRACT

Motivated by the empirical fact that parents with more human capital spend more time teaching and taking care of their children, we develop and estimate a theoretical model in which altruistic parents pass their human capital on in two ways: goods investment and time investment. Based on the estimated model, we quantitatively assess how the two types of investment affect wage inequality and inter-generational mobility. Using the model to study the impacts of a public policy that taxes income to finance public schooling, we find significantly different policy effects in our model than in a model where time investment does not respond endogenously to the policy.

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## 1. Introduction

Empirical studies reveal that parental time with children is strongly positively correlated with parents' human capital, proxied by either wage rate or educational attainment. Using the 2003–2006 waves of the American Time Use Survey, Guryan et al. (2008) document a positive wage/education gradient in child care time which holds true for various categories of child care. Similar patterns have been documented in many earlier studies, although in a less comprehensive way. Positive wage gradient of parental time is found in Hill and Stafford (1974), Kimmel and Connelly (2007) and others; while positive education gradient is seen in Leibowitz (1974a, 1974b), DeSimone and Dills (2006), Ramey and Ramey (2010), etc. The positive correlation is also found in countries other than the U.S. (Gauthier et al., 2004; Guryan et al., 2008).

Why would higher wage/education parents spend more time with their children despite the higher opportunity cost? We answer this question based on a simple idea—altruistic parents make both time investment and goods investment to produce their next generation's human capital. If the two types of investment have low substitutability, then higher wage/education parents make more time investment in optimality to complement goods investment.<sup>1</sup>

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<sup>1</sup> Two stylized data facts are consistent with the view that parental time with children is a type of investment. First, in cross-sectional data, parental time with children follows a different pattern than either leisure or home production time—the amount of time allocated to home production and to leisure

We formalize this idea in a model featuring inter-generational transmission of human capital. We show analytically that the wage gradients of parental investment are positive if time-goods substitutability is low. Further, the gradients are reduced by the public policy that levies a proportional tax on income and provides public schooling.

Ramey and Ramey (2010) provide another channel that leads to the positive wage/education gradient of time investment. Using a model in which parental time is the only input in human capital production, Ramey and Ramey (2010) show that the gradient is positive if the time investment of more educated parents is more efficient. This channel is admitted in an extended version of our model. When human capital production needs both goods and time inputs, we show that whether the gradient is positive also depends on the substitutability between time and goods. When the substitutability is high, parents with more human capital (hence higher efficiency in time investment) should make less time investment and work more to provide more goods investment, unless their advantage in parenting outweighs the advantage on the labor market.<sup>2</sup>

Through time and goods investment, parents partially transmit their human capital to the next generation, thus earnings must exhibit inter-generational persistence. In addition, because richer parents make more investment, parental investment is also a source of long-run wage inequality. In order to assess these inter-generational effects, we estimate the model parameters through the simulated method of moments, then use these parameters to decompose wage inequality and earnings persistence quantitatively.

We also quantitatively analyze the policy effects of public schooling. Since the public policy triggers a reinforcing mechanism among time investment, goods investment and human capital accumulation, it effectively reduces wage inequality and earnings persistence, and increases wage level. In an otherwise similar model that assumes exogenous time investment, the policy effects are much weaker. Given the strong empirical evidence of positive wage gradient, the endogenization of time investment is critical in policy analysis. We further show that if parents with more human capital are more efficient in time investment, the public policy is less effective in reducing inequality and earnings persistence, but more effective in promoting human capital accumulation.

The rest of the paper is organized as follows. Section 2 discusses the related literature. Section 3 introduces the model and presents the analytical results regarding positive wage gradients of goods and time investment. Some analytical results related to policy effects are also obtained. In Section 4, we estimate the parameter values of the model and use them to show how public policy affects resource allocation and wage structure. Quantitative decomposition of wage inequality and earnings persistence are also carried out in this section. Section 5 emphasizes the role played by time investment by comparing results between our model and a model in which time investment is exogenous. Section 6 includes further discussions regarding model setup and model implications. Section 7 concludes.

## 2. Literature review

Our paper is closely related to Restuccia and Urrutia (2004) which considers a model of inter-generational human capital transmission featuring two types of goods investment: early education, and college education. Many important traits exist both in that paper and ours. Both assume that altruistic parents make all the decisions for children. Individuals are heterogeneous in their own human capital and their children's innate ability which is persistent across generations. In addition, both papers find that innate ability accounts for the majority of inter-generational persistence. The distinctive feature of our model is the role of parental time investment. We compare our model and a variant of their model to show that policy effects are significantly different when parents can respond to the policy with changing time investment.

The paper is also closely related to Glomm and Ravikumar (1992) and Glomm and Ravikumar (2003). Both use dynamic models to explore the interactions among parental investment, inter-generational earnings persistence and long-run wage inequality.

Another strand of related literature empirically studies the inter-generational correlation of earnings and educational attainment. Solon (1992) regresses children's log earnings when adults against parents' log earnings, and obtains the slope coefficient that is around 0.45. Aaronson and Mazumder (2008) also report high inter-generational correlation. Parental income (or parents' educational performance) is also correlated with children's educational outcomes. See Acemoglu and Pischke (2001), Dahl and Lochner (2008) and Tominey (2009), Oreopoulos et al. (2003), Chevalier (2004), Black et al. (2005) and others. The causality between parental income (education) and children's educational attainment has been studied in Blau (1999), Black et al. (2005), and Loken (2010).

Roughly speaking the inter-generational correlation can be caused by “nature effect” and “nurture effect”. A large number of studies find that “nature effect” is the key determinant, including Behrman and Taubman (1989), Shea (2000), Sacerdote (2002), Maurin (2002), Plug and Vijverberg (2003), and Huggett et al. (2011). Our structural estimation also finds that “nature effect” accounts for a large fraction of inter-generational earnings persistence.

A key parameter in this paper is the substitutability between time and goods investment for which little direct evidence exists. We use the structure of the model to infer a low substitutability from the data. A few existing empirical studies imply

(footnote continued)

falls sharply as income and educational attainment rise (Aguiar and Hurst, 2007; Kimmel and Connelly, 2007; Guryan et al., 2008). Second, parental time exhibits positive effects on children's outcome (Leibowitz, 1974b; Cooksey and Fondell, 1996; Li et al., 2005).

<sup>2</sup> We are grateful to a referee for pointing out the importance of this additional mechanism.

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