

On the Intergenerational Persistence of Work Hours*

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Abstract

This paper studies the intergenerational persistence of work hours. In particular, I look at the correlation of hours between fathers and sons in the U.S. Using data from the Panel Study of Income Dynamics, I find a strong persistence in the permanent component of hours worked. I investigate the extent this correlation is explained by (i) persistence in wages, (ii) correlation in leisure preferences, and (iii) intergenerational wealth transfers. I also examine the role of work effort in the transmission of earnings across generations. To this end, I provide a quantitative model of intergenerational transmission of human capital and wealth. I find that the observed persistence in hours is mostly explained by the intergenerational correlation of leisure preferences. Moreover, the latter also plays an important role in accounting for the similarities in earnings between parents and children. However, the transmission of wages across generations explains a larger fraction of the earnings dynamics.

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1 Introduction

There is a large literature on intergenerational socioeconomic mobility and persistence in economic status.¹ This literature mainly focuses on the intergenerational transmission of family income, earnings and wages. In contrast, few studies have looked at the correlation of work hours across generations.² To fully understand social mobility, we must also understand how work effort is transmitted from parents to children. After all, work hours is a fundamental determinant of earnings.

I examine the intergenerational persistence of work hours and find evidence that there exists a strong positive father-son correlation. That is, fathers that work more hours than their cohort's average tend to have children that also work more hours than their cohort's average. Using the Panel Study of Income Dynamics (PSID), I estimate a statistically significant intergenerational correlation in the *permanent* component of the logarithm of annual hours of about 0.20 in the U.S. Other estimates found in the literature, although not directly comparable with mine, also indicate a significant positive correlation. Altonji and Dunn (1991) find an estimate of 0.19 using time averages of log annual hours reported on the National Longitudinal Surveys of Labor Market Experience (NLS). Using the PSID, Mulligan (1997b) reports an estimate of 0.25 using average weekly work hours, and Couch and Dunn (1997) find a regression coefficient of 0.14 when regressing single-year annual hours of work on six-year averages of fathers' annual hours. The main purpose of this paper is to explain this pattern.

Notice that a significant positive intergenerational correlation in hours is not necessarily a clear-cut prediction that emerges from the theory. Consider a model of intergenerational transmission of human capital and wealth. It is plausible that children of relatively hard working parents will work much less due to the negative wealth effect on hours caused by parental wealth transfers in the form of both bequest and inter vivos transfers. However, these children will also tend to receive more education, have better wages and, therefore, work more than average. In addition, if we assume that preferences for leisure are sufficiently positively correlated across generations, it is possible to observe a significant positive correlation of work hours between fathers and sons. Indeed, I find empirical evidence that suggests a significant positive father-son correlation of leisure preferences. The question is what drives the observed correlation in hours across generations: preferences, wages or wealth transfers.

Another important related question posed by Altonji and Dunn (1991) is: "Is the link between the economic success of fathers and sons primarily due to work effort or to wage levels?" In other words, what role does this intergenerational linkage in work hours play in the observed transmission of earnings across generations? I address these questions by providing a quantitative model of intergenerational transmission of human capital and wealth to explain the persistence of hours, wages and earnings. Identifying the importance of each source of intergenerational persistence is important for designing and implementing effective public policies to increase socioeconomic

¹See Solon (1999) for an extensive survey on this topic.

²See, for example, Altonji and Dunn (1991, 2000), Couch and Dunn (1997), and Mulligan (1997b).

mobility in a society.

The first main finding of this paper is that the transmission of leisure preferences from parents to children is fundamental to account for the intergenerational persistence of work hours. In fact, a reasonably calibrated model of wealth and wage transmission across generations with no correlation in leisure tastes, or alternatively no preference heterogeneity, counterfactually predicts a negative father-son correlation in hours. Furthermore, similarities in work preferences along family lines seem to be more important than the transmission of human capital or wages in order to explain the intergenerational hours dynamics.

A related interesting result is that the persistence of earnings across generations also depends importantly on the transmission of work preferences from parents to children. However, the father-son wage correlation seems to explain a larger fraction of the observed similarities in earnings.

These findings are consistent with the results of Altonji and Dunn (2000) who specify a statistical factor model to measure the effects of parental and sibling wage and work preferences on the wages, hours, and earnings of young individuals. Using data from the NLS, they find that family linkages in preferences account for nearly all of the similarities in work hours among family members. They also find that the covariance in the earnings of fathers and sons is mostly explained by parental wage factors.

The model presented in this paper also has implications on individuals' consumption, arguably a more accurate measure of economic well-being. Even though consumption is not the central focus of this study, I look at its correlation across generations and compare it to what is observed in the data. The benchmark model predicts a much stronger intergenerational persistence of consumption than of earnings, wages, and hours. This result is consistent with the empirical evidence shown here and in previous studies.³ I find that the correlation in consumption is mainly driven by the transmission of wealth from parents to children. Indeed, I show that in a model with no wealth transfers, the intergenerational persistence of consumption mimics that of earnings.

The paper is organized as follows. I first outline the model economy in Section 2, which is then employed for the empirical investigation in Section 3. There I show evidence on the correlation of hours worked and preferences for leisure between fathers and sons in the U.S. I also revisit the empirical evidence on the intergenerational persistence of wages, earnings and consumption, and explore the role of education on the transmission of human capital across generations. In Section 4 I will proceed to calibrate the model. Next, I report the results of simulations of the model economy in Section 5, and perform sensitivity analysis in Section 6. Finally, Section 7 presents the concluding remarks.

³See Mulligan (1997a) and Aughinbaugh (2000) for comparative estimates of the intergenerational correlation of consumption and earnings.

2 The economy

There are a number of potential channels for explaining the intergenerational correlation of socioeconomic status and labor market outcomes. One obvious channel, on which much of the literature has focused, is human capital investment and persistence in skills. I therefore incorporate those elements in the model economy considered here. Another relevant and intuitive source of correlation across generations, that I also include in the model, is wealth transfers from parents to children (bequest, inter-vivos transfers, etc.). In addition, it is common to hear someone say that a person comes from a family of *hard workers*. That motivates my additional channel: the intergenerational transmission of work preference, for which I present empirical evidence below.

Environment. I consider a discrete-time overlapping generation (OLG) economy where individuals live for two periods. In their first period of life they are children, while in the second they are adults. When agents become adults, they have one child with whom they form a household that lasts one period. Since each adult has only one offspring, population does not grow. Thus, at each period $t \in \{0, 1, 2, \dots\}$, the economy is populated by a continuum of households with constant measure normalized to one.

Children do not make any decisions. However, they receive education level e chosen by their parent. The education level can be either low (e_l) or high (e_h). Let $E = \{e_l, e_h\}$ denote the set of possible education levels.

Each adult is endowed with one unit of time available for work and h efficiency units of human capital.⁴ Productivity can either be low (\underline{h}) or high (\bar{h}). Define $H = \{\underline{h}, \bar{h}\}$. Each individual's productivity depends on his education level and his parent's human capital. In particular, it follows a conditional Markov process with transition probabilities $\pi(h'|h, e) = Pr(h_{t+1} = h' | h_t = h, e_t = e)$ for $h, h' \in H$ and $e \in E$. Let $\pi(\bar{h}|h, e_h) > \pi(\bar{h}|h, e_l)$ and $\pi(\underline{h}|h, e_l) > \pi(\underline{h}|h, e_h)$ for all $h \in H$. Let Π_e , $e \in E$, denote the transition matrix associated with the above conditional transition probabilities.

Every adult also draws a leisure preference parameter $\theta \in \Theta$, where $\Theta = \{\theta_l, \theta_h\}$ with $\theta_h > \theta_l \geq 0$. Each individual's θ is a function only of his father's leisure preference parameter according to a stationary Markov process with transition probabilities $p(\theta'|\theta) = Pr(\theta_{t+1} = \theta' | \theta_t = \theta)$ for $\theta, \theta' \in \Theta$. Define Γ as the transition matrix given by $p(\theta'|\theta)$.

Agents know their productivity h and preference parameter θ when they become adults. Therefore, parents face idiosyncratic uncertainty about their child's human capital and leisure preference.

Technology. For simplicity, I abstract from physical capital accumulation. Parents however may save and leave bequest b through a linear storage technology which yields exogenous gross return $\rho > 0$. Thus, a parent who wants his child to have $\rho b'$ goods next period must leave bequest b' . Intergenerational wealth transfers must always be nonnegative, $b \geq 0$.

⁴I will refer to h as human capital, ability or productivity interchangeably.

There is one consumption good in this economy produced with a linear technology that only requires labor services. Output is produced according to production function,

$$F(N) = \xi N, \quad \xi > 0,$$

where N are efficiency units of labor services.

Preferences. Each period- t adult has preferences defined over household consumption c_t and leisure l_t given by instantaneous utility function,

$$u_\theta(c, l) = \frac{c^{1-\sigma}}{1-\sigma} - \theta \frac{(1-l)^{1-\gamma}}{1-\gamma}, \quad \sigma > 1, \gamma < \sigma.$$

Moreover, each parent is altruistic towards his child and so his utility depends on the stochastic processes for future generations' consumption \tilde{c}_{t+1} and leisure \tilde{l}_{t+1} . Let $U(\tilde{c}_t, \tilde{l}_t)$ denote the period- t parent's utility function, where $\tilde{c}_t = (c_t, \tilde{c}_{t+1})$ and $\tilde{l}_t = (l_t, \tilde{l}_{t+1})$. I assume that U can be represented recursively as

$$U(\tilde{c}_t, \tilde{l}_t) = u_\theta(c_t, l_t) + \beta EU(\tilde{c}_{t+1}, \tilde{l}_{t+1}), \quad \beta \in (0, 1). \quad (1)$$

Individual's problem. All household decisions are made by adult individuals. Adults may differ in their labor productivity, leisure preferences, and initial wealth. Thus, an adult's state is given by vector $x \in X$, $x = (h, \theta, b)$. Let $X = H \times \Theta \times [0, \infty)$ be the adult individual state space. Parents choose household consumption, their labor supply, intergenerational wealth transfers, and their child's education. That is, each parent chooses vector (c, l, e, b') , with $c \geq 0$ and $l \in [0, 1]$.

An adult with human capital h that spends a fraction $(1-l)$ of his time working on the market, supplies $h(1-l)$ efficiency units of labor to the labor market and earns $\omega h(1-l)$ units of the consumption good, where $\omega > 0$ is the market efficiency-unit wage rate.

Providing higher education to one's children is costly. Parents must pay τ units of the consumption good to provide a high level of education e_h . Education level e_l is costless. Without loss of generality, let $e_l = 0$ and $e_h = 1$.

Each adult with state $x \in X$ seeks to maximize (1) and faces budget constraint

$$c + b' + \tau e \leq \omega h(1-l) + \rho b.$$

Thus, the choice set for an agent with state x is given by

$$\Lambda(x) = \{(c, l, e, b') : c + b' + \tau e \leq \omega h(1-l) + \rho b, l \in [0, 1], e \in E, b' \geq 0\}.$$

An adult's decision problem may be described by the following functional equation:

$$V(x) = \max_{(c, l, e, b') \in \Lambda(x)} \{u_\theta(c, l) + \beta E[V(x')|x, e]\}. \quad (2)$$

Let $(g^c(x), g^l(x), g^e(x), g^b(x)) = \arg \max_{(c, l, e, b') \in \Lambda(x)} \{u_\theta(c, l) + \beta E[V(x')|x, e]\}$ be the policy functions associated with (2).

This dynamic programming problem can also be written as follows,

$$V(x) = \max\{V^0(x); V^1(x)\},$$

where

$$V^0(x) = \max_{(c,l,b') \in \Lambda^0(x)} \{u_\theta(c, l) + \beta E_{e_l} V(x')\}$$

represents the father's expected discounted value of providing his son with low education level, and similarly

$$V^1(x) = \max_{(c,l,b') \in \Lambda^1(x)} \{u_\theta(c, l) + \beta E_{e_h} V(x')\}$$

denotes the associated value when high education is chosen. Expectation operator E_e is understood to be taken conditional not only on e but also on x . Let $\Lambda^j(x) = \{(c, l, b') : c + b' + \tau j \leq \omega h(1 - l) + \rho b, l \in [0, 1], b' \geq 0\}$, $j = \{0, 1\}$.

I now turn to the existence of a unique solution to (2). Before doing so, it is necessary to settle some notation. Define $z = (h, \theta) \in Z$, $Z = H \times \Theta$. Let $B^0(z) = \{b : V^0(z, b) \geq V^1(z, b)\}$ and $B^1(z) = \{b : V^0(z, b) < V^1(z, b)\}$. Let $I^j(z, b)$, $j = \{0, 1\}$, be indicator functions taking value 1 if $b \in B^j(z)$ and 0 otherwise.

Consider the bivariate functional equations,

$$V^0(z, b) = \max_{(c,l,b') \in \Lambda^0(x)} \{u_\theta(c, l) + \beta E_{e_l} [V^0(z', b') I^0(z', b') + V^1(z', b') I^1(z', b')]\}, \quad (3)$$

$$V^1(z, b) = \max_{(c,l,b') \in \Lambda^1(x)} \{u_\theta(c, l) + \beta E_{e_h} [V^0(z', b') I^0(z', b') + V^1(z', b') I^1(z', b')]\}. \quad (4)$$

Now, let $C(X)$ be the space of bounded continuous functions $V : X \rightarrow R$, and let $T : C(X)^2 \rightarrow C(X)^2$ be an operator defined by

$$(T\{V^0, V^1\})(x) = \left\{ \begin{aligned} &\max_{(c,l,b') \in \Lambda^0(x)} u_\theta(c, l) + \beta E_{e_l} [V^0(x') I^0(x') + V^1(x') I^1(x')], \\ &\max_{(c,l,b') \in \Lambda^1(x)} u_\theta(c, l) + \beta E_{e_h} [V^0(x') I^0(x') + V^1(x') I^1(x')]. \end{aligned} \right.$$

Moreover, define $T^n\{V^0, V^1\} = T(T^{n-1}\{V^0, V^1\})$ for all $n = \{1, 2, 3, \dots\}$.

Proposition 1 *There exists unique solution $\{V^0(X), V^1(X)\} \in C(X)^2$ to (3)-(4) and $T^n\{V_0^0, V_0^1\}$ converges uniformly to $\{V^0, V^1\}$ as $n \rightarrow \infty$ from any $\{V_0^0, V_0^1\} \in C(X)^2$. Both $V^0(x)$ and $V^1(x)$ are strictly increasing, strictly concave, and continuously differentiable in b .*

Proof. See Appendix. ■

Corollary 2 *There exists a unique $V(x)$ that solves (2).*

Firm's problem. I consider a representative firm that seeks to maximize profits. This representative firm solves the following optimization problem every period taking the wage rate w as given,

$$\max_{N \geq 0} \{Y - \omega N\} \quad \text{s.t.} \quad Y = F(N). \quad (5)$$

Equilibrium. I focus on stationary equilibrium. This notion of equilibrium requires that parents never transfer wealth beyond some endogenously determined level \bar{b} . Thus, the relevant state space is subset $S \subset X$, where $S = H \times \Theta \times [0, \bar{b}]$. Furthermore, this equilibrium concept is associated with a distribution of individuals across states that remains unchanged over time. This distribution is given by a stationary probability measure λ on (S, \mathfrak{B}) , where \mathfrak{B} denotes the Borel sets of S . Stationarity of probability measure λ means that for a *well-defined* transition function P , $P : S \times \mathfrak{B} \rightarrow [0, 1]$,

$$\lambda(B) = \int_S P(s, B) d\lambda(s), \quad \forall B \in \mathfrak{B}.$$

The transition function $P(s, B)$ can be thought as the probability that an individual with state $s \in S$ will have a child whose state when adult lies in B . $P(s, B)$ can be found from transition matrices Π_e and Γ , and policy rules $g^e(s)$ and $g^b(s)$.

Definition 3 *A stationary recursive competitive equilibrium is a value function $V(s)$, a set of individuals' policy functions $g^c(s)$, $g^l(s)$, $g^e(s)$, and $g^b(s)$, firm's labor demand N , a wage rate ω , and probability measure λ such that:*

1. V solves (2) given ω with associated policy rules g^c , g^l , g^s , and g^b ,
2. N solves the representative firm's problem (5) given ω , i.e., $F'(N) = \omega$,
3. markets clears, i.e., $N = \int_S (1 - g^l(s)) d\lambda(s)$, and $F(N) + \rho \int_S b(s) d\lambda(s) = \int_S (g^c(s) + \tau g^e(s) + g^b(s)) d\lambda(s)$, where $b(s) = \{\tilde{b} : s \equiv (z, \tilde{b}) \in S\}$,
4. λ is a stationary probability measure.

Before stating the next proposition that gives conditions under which there exist a stationary probability measure λ , I need to establish some notation. Let $M(S)$ be the space of probability measures on (S, \mathfrak{B}) . Let $W : M(S) \rightarrow M(S)$ be a mapping defined by

$$(W\lambda)(B) = \int_S P(s, B) d\lambda(s), \quad \forall B \in \mathfrak{B}.$$

Define $W^{n+1}\lambda = W(W^n\lambda)$ for all $n = \{1, 2, 3, \dots\}$.

Proposition 4 *If $\rho < 1/\beta$, and $\pi(\bar{h}|\bar{h}, e) \geq \pi(\bar{h}|\underline{h}, e)$ for all $e \in E$ and $p(\theta_h|\theta_h) \geq p(\theta_h|\theta_l)$, then there exists a unique stationary probability measure λ on (S, \mathfrak{B}) , and for any $\lambda_0 \in M(S)$, $W^n\lambda_0$ converges weakly to λ as $n \rightarrow \infty$.*

Proof. It closely follows proof of Huggett's (1993) Theorem 2. ■

3 Empirical evidence

In this section I present and estimate a statistical model of intergenerational transmission of the permanent component of work hours and leisure preferences. I show evidence that reveals a strong positive correlation of hours and preferences across generations. In addition, I report estimates on the intergenerational persistence of wages, earnings and consumption.

3.1 Statistical model and estimation method

A number of popular statistical models to explore the transmission of economic status across generations can be found in the literature. In this paper I adopt Zimmerman’s (1992) econometric specification. However, I pursue a different estimation strategy than he does.

In general, for any measure of the permanent component of economic status, the basic problem is to uncover the parameter values of the following statistical model relating father’s and son’s outcomes:

$$Y_{is} = \alpha + \psi Y_{if} + \epsilon_{is}, \quad (6)$$

where Y_{is} (Y_{if}) denotes a measure of family i son’s (father’s) permanent status and ϵ_{is} is a white-noise error term. I am interested in the coefficient ψ . The closer ψ is to zero, the less the intergenerational persistence we observe.

Unfortunately, the permanent component of any measure of economic status or any other variable of interest is not observable. What we do observe are their transitory realizations. I assume that a person’s current realization, Y_{ikt} , is related to his permanent component as follows,

$$Y_{ikt} = Y_{ik} + \delta X_{ikt} + \nu_{ikt}, \quad (7)$$

where X_{ikt} are individual time-varying characteristics pertaining to person $k = \{s, f\}$ in family i in period t , and ν_{ikt} is a transitory error term.

The estimation strategy I pursue consists of two stages. First, I estimate equation (7) separately for fathers and sons and obtain the fixed effect estimator as measure of each individual’s permanent component. In particular, the first-stage regression fits the log of the variable of interest using fixed effects and life-cycle variables such as age, up to the fourth power, family size, and year dummies. The generated permanent measures for all father-son pairs are then used to directly estimate equation (6). This estimation, however, suffers from an error-in-variables problem. Therefore, the ordinary-least-square (OLS) estimator of ψ is downward biased.

I estimate this error-in-variables regression model by instrumenting the fathers’ permanent component. I proceed as follows. I first split each father’s set of yearly observations in half and form two subsamples.⁵ I then follow the estimation strategy described above using fathers’ *first-half* subsample and instrumenting fathers’ permanent component with the fixed-effect estimate of equation (7) using their second-half subsample.⁶

3.2 Data description

I use data from the PSID, a yearly household survey begun in 1968, conducted by the Survey Research Center at the University of Michigan. The PSID started with a

⁵That is assuming that all fathers have an even number of observations M . For M odd I assign $(M + 1)/2$ to the “first-half” subsample.

⁶I choose the fathers’ first-half subsample as the baseline for my estimation because that makes ages closer for father and son.

core sample of approximately 4,800 households. Individuals from this original sample have been traced whether or not they are living in the same household or with the same people. The core sample of the PSID has two components. One is the Survey Research Center (SRC) subsample which is representative of the U.S. households in 1968 and consists of nearly 3,000 families. The other component consists of about 1,900 low-income households sampled by the Census Bureau for the 1966-1967 Survey of Economic Opportunity (SEO).⁷ I restrict my sample to the SRC component of the PSID to avoid overrepresenting low-income families.

Since I focus on father-son correlations, I consider only male individuals who belong to a sampled household at the time of the 1968 interview who were either household heads or head's sons. The data are from all waves of the PSID until 2001 and only heads who were between the ages of 25 and 65 in any given year at the moment of the interview are included. Thus, sons still living with their parents are omitted regardless of their age. I also drop single-year observations with missing hours worked, or with positive labor income and zero hours at the same time.⁸

For the analysis below, I consider the following key variables. I use the natural logarithm of annual hours worked to investigate the intergenerational persistence of work effort. To avoid excluding zero hours (approximately 6 percent of the sample) from the analysis when taking logarithm, I essentially set them to 1 hour.⁹

The wage rate is hourly earnings, which is the ratio of annual labor income and annual hours worked. Labor income as well as other monetary variables are all converted into 1984 dollars using the GDP deflator. Wages less than half the 1984 federal minimum wage of 3.35 dollars and larger than 200 dollars were omitted. In the case of zero hours when hourly earnings is not available, I set the wage rate equal to the minimum wage earned by the corresponding individual (excluding the above extreme values). The idea is that individuals who do not work should be willing to work at least at the minimum wage they have ever earned. As in the case of work hours, I consider the logarithm of wages in the discussion below.

Another important variable considered in this study is earnings. In particular I am interested in the permanent component of log earnings. I define this variable as the sum of the permanent components of log hours and log wages.

In my analysis I also need household consumption. Unfortunately, the PSID does not contain direct measures for household or individual total consumption. However, it does provide some components of it such as food consumption both at home and away, the market value of owned homes, rent, utilities, and number of automobiles. Using these data I construct a measure of household overall consumption based on estimates provided by Skinner (1987). He finds weights on different components of consumption available in the PSID by regressing total consumption on the same consumption categories using data from the Consumer Expenditure Survey (CEX).

⁷See Hill (1992) for a detailed description of the PSID.

⁸Very few observations are thrown away because of this last requirement.

⁹More specifically I approximate $\log(x)$ with $\log(x/2 + \sqrt{(x/2)^2 + 1})$. Note that for values of $x > 10$ these two functions are basically identical. In my data base, except for very few observations, positive hours are all larger than 10. Thus, this approximation is practically equivalent to setting zero hours to 1.

He estimates two sets of regressions coefficients, one from the 1972-1973 CEX and the other from 1983 CEX. Using his 1972-1973 baseline coefficients, I then impute total consumption data to all my PSID households.

Table 1 presents some summary statistics of the sample. It consists of 3,265 individuals and 48,208 single-year observations. From those individuals, 1,984 were head of household and 1,281 were children in 1968. Only 748 heads in 1968 had at least one son in my sample. Instead, almost all children in 1968 had their father sampled. Thus, I obtain 1,200 father-son pairs which I use for the estimations below.¹⁰

3.3 Estimation results

In this section I present estimates for ψ in equation (6) following the estimation strategy outlined in Subsection 3.1. Although I am mainly interested in the intergenerational persistence of work hours and preferences for leisure, I also report estimates for the father-son correlation of wages, earnings and consumption. Furthermore, I examine the relationship between human capital and education. Hereafter, I work with the log of these variables.

Table 2 presents the second-stage estimates of the intergenerational persistence ψ in (6). I report both OLS and IV estimates. In the case of the IV regression, I exclude fathers with less than 8 observations in order to guarantee that each one of them has at least 4 observations when estimating the fixed effect model (7) for each half subsample. Besides regression coefficients, I also report their Huber-White standard errors and the number of both father-son pairs and fathers in each regression.¹¹ A general observation from this table is that, as expected, OLS estimates are significantly smaller than IV estimates presumably due to measurement error.

Earnings. The first row of Table 2 displays results for log earnings as defined above. These estimates show an elasticity of son's earnings with respect to parental labor income lower than what has been reported in recent studies. For instance, my IV estimate is 0.25. Instead, the most cited estimates lie in the neighborhood of 0.4.¹² Typically, these studies omit observations with zero earnings. In contrast, my measure of permanent log earnings implicitly includes those observations. As pointed out by Couch and Dunn (1997), it appears that such exclusion biases the intergenerational persistence upward.

To explore that possibility, I follow my estimation strategy with the actual annual labor income reported by individuals in my PSID data for two different cases: (i) excluding annual observations with zero earnings as in most of the previous studies, and (ii) considering all (non-missing) observations.¹³ Results are shown in Table 3. Notice that the estimates when omitting zero earnings are much larger than their

¹⁰I also considered the full sample with all individuals regardless of whether 1968 heads have at least one son or 1968 children have their father in the sample in the first-stage estimation of the permanent component in equation (7). Results are essentially the same as the ones shown below.

¹¹Standard errors need to be corrected because there are parents with more than one son in my sample. Thus, residuals are not independent within a particular family.

¹²See, for example, Solon (1992), Zimmerman (1992), Bjorklund and Jantti (1997), among others. For an extensive review on these estimates, see Solon (1999).

¹³In the second case, I approximate the log function with the same function used for work hours

counterpart when using the whole sample; IV estimates are 0.44 and 0.27, respectively. This seems to confirm that excluding zero earnings tends to increase the estimated intergenerational persistence of earnings. The IV estimate of 0.44 is within the range reported by other studies. In contrast, the IV estimate of 0.27 is significantly smaller than the benchmark estimate found in the literature of 0.4. Also observe that the latter estimate is close to the one reported in Table 2 of 0.25. Thus, the apparently low intergenerational persistence estimated with my constructed measure of permanent log earnings seems to be the result of considering observations with zero hours and thereby no labor income.

Wages. I also report estimates of the father-son correlation of wages in Table 2. Looking at the IV estimate, I find a persistence of the log hourly wage across generations of 0.41. This figure is within the range found in the literature. Zimmerman (1992), using data from the NLS, finds an estimate of 0.39 when regressing sons' log hourly wage in 1981 on a 4-year average of fathers' log hourly wage. Solon (1992) provides an IV estimate of 0.45 for the persistence of log wages with intergenerational data from the PSID. Mulligan (1997a) also reports estimates of this intergenerational elasticity using the PSID. He finds an estimate of 0.33 when regressing sons' log of average hourly earnings on the same variable for fathers.

Hours. The results for the intergenerational persistence of work hours are shown in the third row of Table 2. The OLS estimate is quite low, around 0.04. In contrast, my IV estimate of 0.20 is significantly larger.

A comparable estimate found in the literature is the one by Altonji and Dunn (1991). They regress time averages of the logarithm of annual work hours of sons on time averages of the same variable for fathers using data from the NLS. Their OLS and IV estimates are 0.095 and 0.19, respectively.

Couch and Dunn (1997) and Mulligan (1997b) also provide empirical evidence on the intergenerational correlation of work hours using the PSID. The former, in a comparative study between the U.S. and Germany, report a regression coefficient of 0.14 when regressing single-year annual hours of work on six-year averages of fathers annual hours (in levels), which is equivalent to a correlation of 0.19. Mulligan's estimate is somewhat larger than my IV estimate. He reports a regression coefficient of 0.25 using average weekly work hours.

In general, my results are in line with other studies' findings. Namely, the significant and positive correlation between father's and son's hours worked.¹⁴

Table 4 contains IV estimates of ψ when variables indicating family characteristics are included in the second-stage regression of equation (6). I consider race dummy variables, number of brothers, number of parents living with the children, a dummy variable indicating whether a child is the oldest son, and fathers' years of schooling.

The first column copies the results from Table 2. Column 2 shows the results when including race dummy variables only. The coefficient on the dummy variable for black

so that zero-earnings observations are not thrown away.

¹⁴If I exclude zero hours from the estimation, I obtain larger point estimates for the intergenerational persistence of hours. The OLS estimate increases to 0.13, and the IV estimate slightly goes up to 0.21. Couch and Dunn (1997) also find the same pattern when excluding observations with zero hours.

is significant and negative, indicating that black children tend to work somewhat less hours. That appears not to be true for latinos and asians since the coefficient on their respective dummy variable although negative is not statistically different from zero. Race also has an effect on the intergenerational persistence of work hours. The coefficient on father's hours falls from 0.20 to 0.17. This suggests that the degree of persistence across generations is explained partially by racial background. To investigate further this issue, I estimate equation (6) for whites separately (results are not shown in table). I find an intergenerational persistence of 0.25 (with a corrected standard error of 0.127). For blacks only I obtain an estimate of 0.02 (0.185), which is not significantly different from zero.¹⁵

In column 3, I included regressors related to family composition. Both the number of brothers and whether a son is the oldest of all brothers seem not to matter at all. Their coefficients are not statistically different from zero. Instead, whether a child lived with two parents or only one has an effect on both the level of work hours of sons and the persistence coefficient. The latter falls slightly more when this variable is added. When I estimate the intergenerational persistence conditional on the number of parents, I obtain significantly different results (not shown in table). In the case of only one parent living with the child, I get an estimate of 0.29 (0.165). In the other case, I find an estimate of 0.15 (0.079). Further research is needed to explain the difference in the degree of intergenerational transmission when controlling for family composition.

Results in column 4 show that fathers' years of schooling, as proxies for parental income or economic status, has a positive effect on children work effort. It also has a large negative impact on the persistence estimate. This suggests that the intergenerational transmission of income associated with parental education level is an important source of correlation of work hours across generations.

Summarizing the results, I find a significant link between work hours of fathers and adult sons. My IV estimate indicates that this father-son correlation is around 0.20. Moreover, this seems to be partially explained by observable characteristics of the parent or family unit where these children were raised.¹⁶

Consumption. The fourth row in Table 2 presents estimates of intergenerational correlation of consumption. Using the logarithm of my measure of imputed consumption explained above, I find that the intergenerational persistence is 0.71. When I consider log of consumption adjusted by family size (not reported), the correlation is about the same, around 0.73. Aughinbaugh (2000) and Mulligan (1997a) find similar persistence across generations. They both use data from the PSID and impute consumption to household using Skinner's (1987) estimated coefficients. My estimates are not directly comparable to theirs because they use the actual level of consump-

¹⁵I use 64 father-son pairs in this regression. The relatively small number of observations might explain the high standard error on the father's hours coefficient.

¹⁶In this paper, I do not explore the effect of the mother's labor market status on the son's status. This, in principle, might have an impact but considering the very weak correlation found by Altonji and Dunn (1991) between work hours of sons and mothers, I do not think that including mothers' hours in the regression would significantly change the results reported here. However, more research is needed to give a final answer regarding this issue.

tion, not the log of it. However, the message is the same: consumption seems to be considerably more persistent across generations than other measures of economic status.

Leisure preferences. One reason why we observe a significant correlation of work hours across generations might be because parents transmit their preferences for leisure to their children. “Parents and children share genes and, for at least part of their lives, live in the same environment. There is thus reason to suspect that their preferences should be similar.”¹⁷

Unfortunately, preferences are not directly observable. However, using my PSID data I construct a proxy for the leisure taste parameter θ . Choices reflect, at least partially, preferences. In other words, choices reveal preferences. Consider the static first order condition associated with individual i 's decision problem (2) outlined in Section 2,

$$\theta_i n_i^{-\gamma} = w_i c_i^{-\sigma},$$

where $n_i \equiv (1 - l_i)$ denotes work hours and $w_i \equiv \omega h_i$ is the hourly wage rate. Taking logarithm on both sides of that expression and rearranging, it becomes

$$\log \theta_i = \log w_i - \sigma \log c_i + \gamma \log n_i. \quad (8)$$

Thus, with the previously estimated permanent component of log wages, work hours and household consumption for each individual, I use equation (8) to generate a proxy for the leisure parameter.¹⁸ I assume that $\sigma = 1$ and $\gamma = -2$, but consider other parameter values for robustness. Estimates for σ in the literature range from 0.5 to 3. As for γ , microeconomic studies have found an intertemporal elasticity of labor supply, $-1/\gamma$, between 0 and 0.6.¹⁹ Thus, both parameters take values consistent with previous empirical findings.

I then use this measure of the leisure taste parameter to estimate the intergenerational model given by equation (6). The last row of Table 2 reports estimates of the intergenerational correlation of leisure preferences. Judging from the IV results, I find a strong persistence across generations of 0.29.

When I consider combinations of $\sigma = \{1, 1.5, 2\}$ and $\gamma = \{-4, -3, -2\}$ instead, IV estimates (shown in Table 5) remain in the neighborhood of 0.29. In fact, the nine estimates average 0.293. This suggests that the observed strong correlation across generations appears to be fairly robust within a reasonable range for σ and γ .

Table 6 displays IV results when including some family background variables as regressors. First notice that blacks seems to have higher preferences for leisure. This may be explained by the fact that a higher fraction of Afro-Americans are under the poverty line and thereby under some welfare program, which has been shown to create disincentives to working. Moreover, adding race dummies decreases the intergenerational persistence coefficient from 0.29 to 0.23. As in the case of hours, when I run different regressions for whites and blacks, the former exhibit a much larger preference persistence than the latter do (0.30 vs. 0.00). More research is

¹⁷Charles and Hurst (2003, p. 1173).

¹⁸Hall (1997) provides a similar derivation to study preference shifts in a business cycle framework.

¹⁹See, for example, Ghez and Becker (1975), MaCurdy (1981), and Altonji (1986).

needed to investigate the robustness of this result given that the only-blacks estimate is found with only 60 father-son pairs.

The family composition variables that I consider in the third column do not appear to be important either for the level of θ or for its intergenerational correlation. But fathers' years of schooling does have a significant impact. The negative regression coefficient on fathers' education might be caused by a number of reasons. One could be self-selection. Individuals with high preferences for leisure tend to work less and, therefore, have a lower rate of return on human capital investment when compared to hard working people. Hence, they are inclined to acquire less education. Since leisure preferences are correlated across generations less educated parents are more likely to have relatively lazier children. Another reason could be that children's preferences for leisure not only depend on parents' preferences but also depend on the actual amount of hours worked by parents.²⁰ Since more educated individuals tend to have better wages and thereby work more, children of more educated parents observe them working harder and end up having relatively less preferences for leisure or, in other words, a higher *willingness* to work.

Human capital and education. Children's human capital is at least partially a consequence of parents' choices. One of those decisions is how much to invest in children education. As discussed in Section 2, that creates a link between father's and son's human capital. Here I explore that relationship.

First notice that the permanent component of log wages may be interpreted as the permanent level of *human capital*.²¹ When I include children's years of schooling in (6) for log wages, the regression coefficient on parental permanent log human capital decreases dramatically. The same pattern arises when I include instead a dummy variable indicating whether the child has a college degree (i.e. years of schooling greater or equal than 16). This results suggest that around one fourth of the intergenerational correlation of wages or human capital is due to parental college education investment in children.

4 Calibration

As mentioned above, one of the main goals of this paper is to explain the observed patterns in work hours, as well as in wages, earnings and consumption, across generations given the persistence of leisure tastes and the role of college education. I

²⁰See Mulligan (1997b) for a more extensive illustration of this alternative channel of transmission.

²¹To see this, consider that each agent's wage w is the product of the *efficiency-unit* wage rate, ω , which is constant across individuals, and her human capital measured in efficiency units, h , (i.e., $w_{it} = \omega h_{it}$). Taking logarithm on both sides, I obtain $\log w_{it} = \log \omega + \log h_{it}$. Furthermore, consider that the life-cycle profile of $\log h_{it}$ is given by $\log h_{it} = \log h_i + \zeta Z_{it} + e_{it}$, where h_i denotes permanent human capital, Z_{it} represents a set of life-cycle characteristics, and e_{it} is an error term. Combining these two expressions, I get

$$\log w_{it} = \log \omega + \log h_i + \zeta Z_{it} + e_{it}. \quad (9)$$

Note that (9) and (7) are essentially identical. Hence, we can interpret the estimated fixed-effect component in (7) for log wages as $\log h_i$.

pursue this objective by simulating my model economy. To that end, I first need to calibrate the model's parameters to the U.S. economy. The parameters are β , σ , γ , θ_l , θ_h (preferences); ρ (technology); τ (schooling cost); \underline{h} and \bar{h} (human capital); ω and Markov matrices Π_0 , Π_1 , and Γ that govern the model's intergenerational uncertainty.

A priori information. I assume that individuals become adults at age 24, and die at age 65 to match the most common retirement age. Considering an annual real interest rate of 3 percent, the rate of return ρ is set to 2.03. Also, I normalize the efficiency-unit wage rate, ω , to 1.

The child weight or intergenerational discount parameter, β , is set to 0.375 which is equivalent to an annual discount factor of 0.96. As discussed in the previous Section when describing my constructed proxy for θ , I set $\sigma = 1$ and $\gamma = -2$.²²

Estimated and matched parameters. Labor productivity parameters \underline{h} and \bar{h} are set to approximate the observed wage distribution found in the empirical section. Furthermore, their transition probability matrices Π_0 and Π_1 are chosen to reproduce the intergenerational correlation of wages conditional on the education level shown in Table 7 in Subsection 3.3. In particular, I choose to match the process implied by the IV estimation when controlling for whether the child gets a college degree (fourth column in Table 7). To that end, I follow the method outlined by Tauchen (1986), and obtain $\underline{h} = 0.53$, $\bar{h} = 1.64$, and transition probability matrices

$$\Pi_0 = \begin{pmatrix} .82 & .18 \\ .31 & .69 \end{pmatrix} \text{ and } \Pi_1 = \begin{pmatrix} .59 & .41 \\ .12 & .88 \end{pmatrix}.$$

I proceed in similar fashion to pin down transition probabilities for the leisure preferences parameter θ . That is, I take the estimated intergenerational correlation of $\log \theta$ (or more accurately, its constructed proxy) reported in Section 3 and, following Tauchen's procedure, calculate its transition matrix.²³ I obtain

$$\Gamma = \begin{pmatrix} .64 & .36 \\ .36 & .64 \end{pmatrix}.$$

While the generated proxy for individuals' taste parameter is useful for estimating its transition probabilities, it is not suitable for choosing parameters θ_l and θ_h because in the model their value are implicitly associated with the time available for working, which I normalize to 1. Thus, I set the average of $\log \theta$ so that the model matches the average fraction of time a person works during a period. I find that the average person in my PSID data set works 2,089 hours annually. If we take the maximum to be 4,160 hours (80 hours \times 52 weeks), the average individual works approximately 50 percent of his time.²⁴ Therefore, the solution of the model must satisfy

$$\int_S (1 - g^l(s)) d\lambda(s) = 0.50. \quad (10)$$

Another parameter that also has yet to be calibrated is the cost of college, τ . I set this parameter to match the fraction of 1968 children in my PSID data that

²²In the sensitivity analysis below I consider other values for σ and γ .

²³I take as benchmark the IV estimation in the last row of Table 2.

²⁴The maximum amount of 4,160 hours corresponds to the 99th percentile in my data.

graduated from college. As shown in Table 1, that fraction is 0.30. Thus, I look for a stationary equilibrium satisfying the following condition,

$$\int_S g^e(s) d\lambda(s) = 0.30. \quad (11)$$

Calibrating the preference parameters and the cost of higher education requires solving the model and finding its associated stationary distribution $\lambda(s)$ as implied by equations (10) and (11). This yields $\log \theta_l = 0.65$, $\log \theta_h = 4.08$, and $\tau = 0.063$. Table 8 presents a summary of the calibrated parameters.

5 Simulation results

In this Section I examine the performance of the model in terms of its ability to match the intergenerational correlation not only of work hours but also of wages, earnings and consumption. A successful quantitative model should be able to reproduce simultaneously these statistics. To explore this I simulate 20,000 families for three generations where each “grandfather” is drawn from the stationary equilibrium distribution, and study the correlation of the second father-son pair in each family. Intergenerational persistence is measured in the same way as in Section 3. Namely, I regress the logarithm of sons’ outcome on fathers’ outcome. I also make some experimental simulations to explore the importance of different sources of intergenerational persistence on work hours, wages, earnings and consumption. Table 9 reports the simulation results.

Benchmark economy. The model predicts a intergenerational persistence coefficient of hours of 0.21 versus 0.20 for the U.S., whereas for wages I obtain a coefficient of 0.42 versus 0.41 in the data. The predicted father-son consumption correlation of 0.65, although falls short of my estimate of 0.71, is reasonably close to estimates found in the literature.²⁵ The persistence of earnings of 0.31 is slightly off target compared to my estimated correlation of 0.25. However, it is within the range between my estimate and the highly cited correlation of 0.40. In general, it appears that the benchmark model does a good job matching what we observe in the data. Especially in the case of work hours and wages. The model is able to reproduce these facts even though both productivity and the leisure preference parameter take only two possible values each.

5.1 Alternative economies

A more standard economy. Here I look at an economy with no heterogeneity in preferences. The idea of this exercise is to investigate the relevance of this particular feature of the model. In other words, could a much simpler model explain the intergenerational patterns observed in the data? Do we really need this heterogeneity in order to reasonably match the U.S. data?

²⁵Mulligan (1997a) reports an estimate of 0.68 for the U.S. See also Aughinbaugh (2000).

To simplify further the exercise I abstract from educational investment. Thus, the only two sources of intergenerational persistence are bequest and the *innate* transmission of human capital across generations. The complete calibration of this simpler model is shown in the Appendix. It is worth stressing that the *a priori* calibrated parameters remain unchanged.

The simulation results of this economy are reported in the third row of Table 9. The main observation from this exercise is that it appears that a model with homogeneous preferences for leisure is not capable of reproducing the strong positive correlation of work hours across generations. In fact, the simulations reveal a significant negative relationship between fathers' and sons' work effort. The intuition is simple. High wage individuals who work harder than average tend to have children who take more leisure due to the negative bequest effect on labor supply which dominates the positive effect coming from the strong persistence of wages.

The message from this exercise is clear. Leisure preference heterogeneity plays an important role in explaining the intergenerational pattern observed in hours.

No education. Another similar question is whether modelling college investment is a relevant characteristic of the model in order to explain the correlation of hours and earnings across generations.

The fourth row in Table 9 presents the simulation results of the model abstracting from college decisions.²⁶ By design, the model is able to reproduce exactly the persistence in wages. Work hours are slightly less correlated across generations than what the benchmark model predicts, and earnings are significantly less persistent in this economy relative to the baseline model. The intuition for these drops is that with no college choice, a child's wage does not depend on the probability of being hard worker. In other words, in the model without education investment, the persistence of abilities and preference are completely independent. Instead, in the benchmark model those two are related via college choice. For example, consider a parent endowed with θ_l (i.e., high willingness to work). This individual is more likely to have a θ_l child than a lazy parent is. Moreover, the rate of return of sending his child to college is higher because this child is more likely to work more hours when adult. Therefore, hard working parents who tend to have higher earnings, are more prone to send their offspring to college and, in consequence, have high earnings children.

This simpler economy with no education is capable of explaining most but not all of the persistence in hours observed in the data. As for earnings, even though it predicts less correlation than the benchmark model, its prediction is closer to what I find in the empirical section. Nevertheless, it is farther away from the most popular intergenerational persistence of 0.4 in the literature. Despite of this "lack" of persistence in earnings, consumption correlation is within the range of estimates found by other studies due to wealth transfers. I leave as an open question which model, overall, gets closer to the data. However, if one wants to investigate the contribution of higher education on the intergenerational transmission of economic status or the impact of public policies on college education, the benchmark model is clearly more suitable.

²⁶Recalibration in the Appendix.

5.2 Experiments

Economy without persistence in preferences. To assess the role of the persistence in leisure preferences across generations I return to my benchmark model and completely shut down this channel by making such persistence zero (i.e., $p(\theta'|\theta) = 1/2$ for all $\theta', \theta \in \Theta$). In order to isolate the effect of preferences, I recalibrate $\tau = 0.058$ in order to satisfy (11). Notice, however, that when solving for the stationary equilibrium I cannot completely isolate the impact of preference persistence because parents react to this change by adjusting wealth transfers. For instance, hard working parents will leave a larger bequest to insure their children against a *bad* preference shock which is now more likely to occur.

The results of simulating this modified economy are shown in the fifth row of Table 9. First notice the counterfactual prediction of this model regarding work hours. The correlation of hours becomes negative as in the case with no heterogeneity in θ . It drops dramatically to -0.12 mainly because differences in work hours among individuals are mostly driven by differences in preferences. Disparities in wages do not play a leading role explaining discrepancies in work hours since the elasticity of labor supply is not sufficiently large. Furthermore, the bequest effect mentioned above reinforces the effect in hours. Hard working (lazy) parents tend to transfer more (less) wealth than in the benchmark economy which causes their children to work even less (more) hours for any type they end up drawing. I however find that this bequest effect on hours correlation is small relative to the preference persistence effect.²⁷

This experiment also allows me to observe the impact of leisure preference persistence on the intergenerational correlation of earnings. The latter significantly falls from 0.31 to 0.08 due to the sharp decrease in the persistence of work effort. Note that the intergenerational transmission of wages remains the same because both Π_e and the college decision have not changed. Finally, the correlation in consumption goes slightly down. This decrease is relatively small because wage correlation remains unchanged and wealth level persistence is still very strong due to intergenerational transfers.

Economy without college choice. I can also investigate the contribution of the transmission of wages across generations on the correlation of work hours, earnings and consumption. In the case of wages, there are two sources of persistence in the model: the endogenous educational choice and the exogenous transmission of abilities.²⁸ I can actually study their effects on their own and together.

I first focus on the contribution of college. To explore this issue I make college a

²⁷One way to control for changes in wealth transfers is by simulating the modified economy and forcing parents to make transfers as if they were in the benchmark economy. Then I compare the simulated correlations and any difference is attributed to bequest effects. When I run such experiment I find that hours correlation is instead -0.08 and earnings persistence is 0.08. Thus, it appears that the impact of adjusting bequest is sizable.

²⁸By exogenous I mean in the model. Remember that I do not attempt to model how this type of intergenerational transmission takes place. This exogenous persistence may depend on genetic factors, nurture, and parental investment in early education as shown by Restuccia and Urrutia (2004).

complete *random* outcome which parents cannot affect at all. In particular, each child has a probability of 0.3 to receive a college degree so that condition (11) holds. Notice that this experiment is different from the exercise where I abstract from education altogether. The sixth row in Table 9 presents the results. Given the evidence in Subsection 3.3, we should expect a fall in the father-son correlation of wages. That is indeed what I find in this exercise. It decreases from 0.42 in the benchmark calibration to 0.31.

I find a rather small drop in the persistence of work hours consistent with the observation made above regarding differences in hours being mostly explained by differences in leisure taste. The transmission of earnings and consumption also weakens mainly driven by the reduction of the wage correlation.

The intuition for this fall in the intergenerational persistence of all the relevant variables is somewhat similar to the one for the economy with no education. That is, wages and preferences are completely independent. In this case, children who receive higher education are not necessarily those who are more likely to be high ability type and/or hard working individuals since college is randomly assigned. Those children who are more likely to draw \bar{h} and/or θ_l are precisely the offspring of parents that tend to have higher wages and earnings, and work more hours. If these parents were allowed to provide their children with higher education, the latter would also tend to have higher wages, work longer hours and, therefore, earn a higher income.

Economy with no exogenous persistence of ability. Now I turn to the case when I shut down the exogenous persistence of human capital. In this case, the probability of being high or low ability individual only hinges on the college decision and so I obtain the following transition matrices,

$$\Pi_0 = \begin{pmatrix} .58 & .42 \\ .58 & .42 \end{pmatrix}, \text{ and } \Pi_1 = \begin{pmatrix} .32 & .68 \\ .32 & .68 \end{pmatrix}.$$

As in the first experiment, I adjust $\tau = 0.061$ so that calibration target (11) is still met.

The results indicate that the persistence in wages is mainly driven by the model's exogenous transmission of ability mechanism. Now the persistence in wages falls much further, to 0.06. The same pattern emerges for the father-son correlation of earning which drops to 0.13. Considering that the exogenous transmission of human capital depends not only on natural elements and nurture but also on investment in early education, it is reasonable to find a much substantial contribution of these "exogenous" factors to the persistence of wages and earnings relative to the importance of college education. In fact, Restuccia and Urrutia (2004) show that parental investment in early education accounts for most of the intergenerational persistence of earnings attributed to total investment in education, which they split in two: early and college education.

As in the previous experiment, the correlation of work hours do not change substantially for the same argument as before: hours persistence mostly reflects preference persistence. Regarding consumption, it is now slightly less correlated across generations due to the sharp fall in the transmission of earnings.

Economy without wage persistence. Another experiment to further explore the importance of the intergenerational transmission of human capital is to combine the last two exercises. That is, I shut down the exogenous persistence in ability and simultaneously randomize college education. By design, wages of parents and children are not correlated at all. As expected, work hours are now much less persistent across generations than when only one source of wage correlation is turned off. However, they remain significantly positive correlated since the leisure taste parameter still displays the same intergenerational persistence as in the benchmark case. This suggests that the transmission of preferences from parents to children is a fundamental source of persistence of work effort, much more important than the intergenerational wage transmission. The persistence of earnings becomes counterfactually almost zero, 0.02, fundamentally because of the nonexistent father-son correlation of wages.

It is worth noting that in this experiment, as well as in the case of the model without college choice or exogenous ability persistence, adjustments in bequest relative to the benchmark economy do not play any role in explaining changes in intergenerational correlations. For instance, when I control for bequest changes (see footnote 27), hours and earnings persistence remain almost unchanged (0.15 and 0.03, respectively). In other words, variations in the degree of transmission of hours and earnings due to changes in the persistence of wages are explained almost not at all by the ability of parents to adjust their transfers given the *new* environment.

Economy without intergenerational transfers. In this experiment I look at the effect of wealth transfers across generations. To this end I make ρ sufficiently low so that no parent finds it optimal to leave a bequest. Again, τ must be recalibrated to satisfy (11), so I set it to 0.053. Notice especially that the correlation of work hours notably increases since the negative effect of bequest on hours no longer exists. That is, high-earning parents do not discourage their children from working by transferring wealth to them. Consequently, earnings are more persistent in this case. Furthermore, since parents are unable to smooth consumption across generations by transferring wealth, the correlation of consumption is much weaker than in economies with the possibility of bequeathing, and is basically determined by the persistence of earnings. This indicates that intergenerational wealth transfers, either inter vivos transfers or bequest, are an important source of transmission of economic status from parents to children.

Economies with only one source of intergenerational persistence. The last five rows in the last panel of Table 9 present the results of simulations where, as opposed to previous exercises, I only “activate” one source of persistence across generations. For example, in the first experiment where I only consider preference correlation, bequeathing is not allowed, college education is randomly assigned, and the persistence of innate abilities is shut down. These exercises are another way of assessing the contribution of each source of intergenerational correlation to similarities in hours, wages, and earnings between fathers and sons. In general, the interpretation of these results is the same as in the case of the previous experiments.

5.3 Further Discussion

Hours. The set of results summarized in Table 9 reveals that preference persistence is a fundamental channel to explain the observed intergenerational correlation of work hours. Once such persistence is removed from the model, it counterfactually predicts that children of hard working parents tend to work much less. The last group of experiments also points in the same direction. Notice that the only source of persistence that is capable of producing on its own a significant degree of positive correlation in hours is the leisure preference persistence. As far as hours correlation is concerned, the contribution of innate or exogenous correlation of abilities across generations, and college education are about the same. In general, similarities of wages between fathers and sons account for a sizable fraction of the similarities of hours. However, they do not seem to be nearly as important as preferences transmission. Wealth transfers, as opposed to the other sources of intergenerational correlation study here, dampen the positive correlation of work effort as one could expect.

Wages. In line with the findings of Restuccia and Urrutia (2004), the simulation results show that the model's exogenous persistence of ability is much more important than college education to account for the persistence of wages. When I turn off the former intergenerational linkage, wages transmission is much weaker than when college education is no longer a choice (randomized to be precise). The same conclusion may be drawn looking at last set of experiments (last panel of Table 9). This result is nevertheless a direct consequence of my calibration strategy. Recall that the calibrated stochastic process for ability reproduces the observed intergenerational persistence of wages conditional on college choice. Moreover, I also seek to match the fraction of children going to college. Therefore, the simulation of the baseline model must be consistent with the empirical findings suggesting that around 3/4 of the correlations of wages is accounted for by factors different from higher education investment.

Earnings. The similarity of earnings along family lines are mostly explained by the persistence of wages across generations. Notice that when I shut down this channel, earnings exhibit almost no correlation. Instead, the lack of preference persistence, even though it has a considerable impact on earnings dynamics, is not able to completely offset the effect of wage correlation. Again, looking at the last set of experiments, the same observation emerges. If I only allow for wage correlation in the model the persistence of earnings is much larger than when only preferences or transfers are the only intergenerational linkage.

6 Sensitivity analysis

This section analyzes the sensitivity of the simulation results to changes in the calibrated parameters σ and γ . In particular, I consider values for the intertemporal elasticity of substitution of 2/3 and 0.5 (σ equal to 1.5 and 2, respectively), and for the compensated labor supply elasticity of 0.25 and 1/3 (γ equal to -4 and -3). As discussed in Subsection 3.3, these parameter values are within a reasonable range

according to previous studies.

Changing any of these two parameters requires recalibrating Γ , θ and τ given the same strategy described in Section 4. The transition matrix Γ is calibrated to match the estimated intergenerational persistence of $\log \theta$ found in Subsection 3.3 for the corresponding values of σ and γ (see Table 5). Moreover, θ_l , θ_h and τ are set so that the stationary equilibrium satisfies conditions (10) and (11).

Table 10 reports the results of simulating the alternative calibrated models for different combinations of σ and γ . The intergenerational correlation of key variables like hours, wages and earnings are very similar to those found using the benchmark calibration except for the case of $\sigma = 2$ and $\gamma = -2$, and in a lesser extent for $\sigma = 1.5$ and $\gamma = -2$, and $\sigma = 2$ and $\gamma = -3$. For those cases the intergenerational correlation of hours is higher due to a larger persistence in the leisure preference parameter as Table 5 shows. As expected, the correlation in hours is increasing in the persistence of preferences.

The persistence in consumption depends greatly on σ . For those cases with identical intertemporal elasticity of substitution, the correlations in consumption are quite close. Also notice that the larger the σ , the stronger the linkage in consumption across generation since parents with a lower intertemporal elasticity of substitution are more willing to transfer wealth to their children. In general, my estimate of the intergenerational persistence of consumption of 0.71 in the U.S. falls within the range found in these exercises (from 0.65 to 0.79).

The sensitivity analysis with respect to σ and γ suggests that the findings obtained in the previous section are reasonably robust to changes in these two important parameters. For only one case, the model yields significantly different quantitative results.

7 Concluding remarks

In this paper I find a significant intergenerational persistence of work hours. My estimates indicate that this correlation is around 0.20, which is close to what has been found in previous studies.

This result differs from what a relatively *standard* model with intergenerational linkages would predict. In particular, a model with only wealth transfers and (realistic) wage correlation across generations cannot reproduce the observed pattern in hours. This paper shows that one needs to consider not only heterogeneity, but also intergenerational persistence in leisure preferences in order to explain the correlation of work effort across generations. The importance of the transmission of taste for work is evident when shutting down the correlation in preferences in the benchmark economy. In that case, the model counterfactually predicts a negative persistence in hours. Moreover, similarities in work preferences along family lines appear to be more important than the correlation of wages in order to account for the intergenerational dynamics of work hours.

One of my objectives was to investigate whether the relation between economic success of fathers and sons was due to the intergenerational persistence of work effort

or wages. I find that the father-son correlation of earnings also depends importantly on the transmission of work ethic within a family. For instance, when the preference persistence is shut down, persistence of earnings across generations significantly goes down from 0.31 in the baseline model to 0.08. Even though preferences play a determinant role in the earnings dynamics, the intergenerational linkage of wages seems to account for a larger fraction of the earnings correlation. When the former is turned off, the latter falls to 0.02. If one looks at consumption as a measure of economic status, the same message emerges.

A question that comes up from these results is: What are their implications for public policies? To give a satisfactory answer to that question, one first must establish whether the transmission of work ethic from parent to children depends on the actual hours worked by the former. Further research is needed to investigate these issues. That would be, in my opinion, a natural extension of this paper.

A Appendix

A.1 Proof of Proposition 1

Let us show that T satisfies the Blackwell's sufficiency conditions. Let $W^0(x) \geq V^0(x)$ and $W^1(x) \geq V^1(x)$ for all $x \in X$. Denote $(c_0^*, l_0^*, b_0'^*)$ and $(c_1^*, l_1^*, b_1'^*)$ as the maximizers of (3) and (4), respectively. Recall that $x \equiv (z, b)$. To show monotonicity consider that

$$\begin{aligned}
(T\{V^0, V^1\})(x) &= \{u_\theta(c_0^*, l_0^*) + \beta E_{e_l}[V^0(z', b_0'^*)I^0(z', b_0'^*) + V^1(z', b_0^*)I^1(z', b_0'^*)], \\
&\quad u_\theta(c_1^*, l_1^*) + \beta E_{e_h}[V^0(z', b_1'^*)I^0(z', b_1'^*) + V^1(z', b_1^*)I^1(z', b_1'^*)]\} \\
&\leq \{u_\theta(c_0^*, l_0^*) + \beta E_{e_l}[W^0(z', b_0'^*)I^0(z', b_0'^*) + W^1(z', b_0^*)I^1(z', b_0'^*)], \\
&\quad u_\theta(c_1^*, l_1^*) + \beta E_{e_h}[W^0(z', b_1'^*)I^0(z', b_1'^*) + W^1(z', b_1^*)I^1(z', b_1'^*)]\} \\
&\leq \left\{ \max_{(c,l,b') \in \Lambda^0(x)} u_\theta(c, l) + \beta E_{e_l}[W^0(x')I^0(x') + W^1(x')I^1(x')], \right. \\
&\quad \left. \max_{(c,l,b') \in \Lambda^1(x)} u_\theta(c, l) + \beta E_{e_h}[W^0(x')I^0(x') + W^1(x')I^1(x')] \right\} \\
&= (T\{W^0, W^1\})(x).
\end{aligned}$$

Hence, $(T\{W^0, W^1\})(x) \geq (T\{V^0, V^1\})(x)$ (i.e., monotonicity).

I now show that the operator T satisfies the discounting property. Let $a > 0$. Thus,

$$\begin{aligned}
(T\{V^0 + a, V^1 + a\})(x) &= \left\{ \max_{(c,l,b') \in \Lambda^0(x)} u_\theta(c, l) + \beta E_{e_l}[(V^0(x') + a)I^0(x') + (V^1(x') + a)I^1(x')], \right. \\
&\quad \left. \max_{(c,l,b') \in \Lambda^1(x)} u_\theta(c, l) + \beta E_{e_h}[(V^0(x') + a)I^0(x') + (V^1(x') + a)I^1(x')] \right\} \\
&= \left\{ \max_{(c,l,b') \in \Lambda^0(x)} u_\theta(c, l) + \beta E_{e_l}[V^0(x')I^0(x') + V^1(x')I^1(x') + a(I^0(x') + I^1(x'))], \right. \\
&\quad \left. \max_{(c,l,b') \in \Lambda^1(x)} u_\theta(c, l) + \beta E_{e_h}[V^0(x')I^0(x') + V^1(x')I^1(x') + a(I^0(x') + I^1(x'))] \right\}.
\end{aligned}$$

Since $(I^0(x) + I^1(x)) = 1$ for any $x \in X$, then

$$\begin{aligned}
& (T\{V^0 + a, V^1 + a\})(x) \\
&= \left\{ \max_{(c,l,b') \in \Lambda^0(x)} u_\theta(c, l) + \beta E_{e_l}[V^0(x')I^0(x') + V^1(x')I^1(x')] + \beta a, \right. \\
&\quad \left. \max_{(c,l,b') \in \Lambda^1(x)} u_\theta(c, l) + \beta E_{e_h}[V^0(x')I^0(x') + V^1(x')I^1(x')] + \beta a \right\} \\
&= (T\{V^0, V^1\})(x) + \beta a.
\end{aligned}$$

Since $\beta \in (0, 1)$, discounting has also been established. Therefore, the operator T is a contraction. Then, the first part of Theorem follows from the Contraction Mapping Theorem.

The remaining of the proof comes directly from standard results in dynamic programming theory. ■

A.2 Recalibration of alternative models

As mentioned above, the *a priori* calibrated parameter stay as in the benchmark model. Since there is no college choice τ becomes irrelevant. For the same reason, there is only one transition matrix Π describing the stochastic process followed by h . This Markov matrix is chosen so that wages reproduce the intergenerational persistence of 0.41 observed in the data. Again, I follow Tauchen's (1986) method to find those transition probabilities and h . Thus, I set $\underline{h} = 0.51$, $\bar{h} = 1.67$, and

$$\Pi = \begin{pmatrix} .70 & .30 \\ .30 & .70 \end{pmatrix}.$$

In the case of the model with no leisure preference heterogeneity I only need to choose one parameter θ . I set this parameter so that condition (10) regarding the number of hours worked by an average individual is satisfied in equilibrium. Thus, $\theta = 7.03$. For the economy with no college, θ_l , θ_h , and Γ remain the same as in the baseline calibration.

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Table 1: Sample summary

Variable	All	1968 Heads	1968 Children	Fathers	Sons
Observations	48,208	30,309	17,899	15,642	17,064
Individuals	3,265	1,984	1,281	748	1,200
Age	42.4 (11.4)	42.3 (10.4)	33.7 (7.0)	48.5 (9.5)	33.6 (6.9)
Education (yrs.)	12.9 (2.9)	12.4 (3.1)	13.8 (2.3)	12.3 (3.1)	13.8 (2.26)
College graduate	.23	.19	.30	.20	.30
Work hours	2,089 (842)	2,042 (905)	2,170 (715)	2,041 (911)	2,183 (704)
Wage (1984 dollars)	13.0 (10.6)	13.2 (10.6)	12.7 (10.7)	13.6 (10.8)	12.8 (10.7)
Labor income (1984 dollars)	26,404 (26,032)	26,126 (26,107)	26,873 (25,898)	27,154 (28,162)	27,108 (26,285)

Note: Standard deviations in parentheses.

Table 2: Estimates of ψ for different variables

Variable (log)	OLS	IV
Earnings	.11 (.026) [1178;731]	.25 (.109) [1063;656]
Wage	.32 (.034) [1178;731]	.41 (.048) [1063;656]
Hours	.04 (.019) [1200;748]	.20 (.101) [1075;664]
Consumption	.51 (.030) [1169;729]	.71 (.042) [1051;650]
θ	.06 (.017) [1152;716]	.29 (.099) [1041;643]

Notes: Huber-White standard errors in parentheses
Number of father-son pairs and fathers in brackets.

Table 3: Estimates of ψ for log earnings

Samples used in the first-stage estimation			
Excluding zero earnings		All observations	
OLS	IV	OLS	IV
.28	.44	.09	.27
(.043)	(.082)	(.027)	(.093)
[1173;728]	[1030;638]	[1192;742]	[1075;664]

Notes: Huber-White standard errors in parentheses.

Number of father-son pairs and fathers in brackets.

Table 4: IV estimates for the father-son persistence of log work hours

Variable	(1)	(2)	(3)	(4)
Father's log hours	.200 (.100)	.167 (.098)	.151 (.065)	.117 (.061)
Non-white/black		-.226 (.252)	-.149 (.153)	-.145 (.155)
Black		-.347 (.158)	-.373 (.157)	-.337 (.153)
Number of brothers			.000 (.021)	.004 (.021)
Number of parents			.098 (.048)	.117 (.046)
Whether oldest sibling			.009 (.051)	.015 (.051)
Father's years of schooling				.017 (.009)
Constant	.008 (.026)	.034 (.025)	-.102 (.096)	-.352 (.165)

Note: Huber-White standard errors in parentheses.

Table 5: IV estimates of the father-son persistence of $\log \theta$ for different values of σ and γ

σ	γ		
	-4	-3	-2
1	.260 (.104)	.270 (.103)	.288 (.099)
1.5	.274 (.105)	.288 (.104)	.315 (.101)
2	.289 (.106)	.309 (.105)	.345 (.102)

Note: Huber-White standard errors in parentheses.

Table 6: IV estimates for the father-son persistence of $\log \theta$

Variable	(1)	(2)	(3)	(4)
Father's log hours	.288 (.099)	.228 (.091)	.245 (.096)	.198 (.086)
Non-white/black		-.002 (.259)	.219 (.311)	.220 (.312)
Black		.884 (.325)	.868 (.326)	.792 (.315)
Number of brothers			.003 (.050)	-.002 (.049)
Number of parents			-.117 (.099)	-.160 (.096)
Whether oldest sibling			-.061 (.104)	-.070 (.103)
Father's years of schooling				-.038 (.017)
Constant	-.030 (.045)	-.079 (.043)	.144 (.211)	.690 (.343)

Note: Huber-White standard errors in parentheses.

Table 7: Intergenerational persistence of permanent log wage and education

Regressor	OLS	IV	OLS	IV
Parental log human capital	.216 (.031)	.278 (.036)	.252 (.033)	.316 (.049)
Child's years of schooling	.075 (.007)	.072 (.008)		
Whether college degree			.302 (.033)	.292 (.036)
Constant	-1.06 (.100)	-1.02 (.113)	-.134 (.017)	-.138 (.018)

Note: Huber-White standard error in parentheses.

Table 8: Calibrated parameter values for the U.S. economy

Parameter	Value	Source or target
β	0.375	A priori information
σ	1	A priori information
γ	-2	A priori information
ρ	2.03	3% annual interest rate
ω	1	Normalization
\underline{h}	0.53	Own estimation
\bar{h}	1.64	Own estimation
$E(\log \theta)$	2.36	Average time spent working (PSID)
$\log \theta_l$	0.65	Own estimation
$\log \theta_h$	4.08	Own estimation
τ	0.063	Fraction of children with college degree (PSID)

Table 9: Simulation results

Economy	Intergenerational correlation			
	Hours	Wages	Earnings	Consumption
U.S. data*	0.20	0.41	0.25	0.71
Benchmark model	.21	.42	.31	.65
<i>Alternative model economies:</i>				
Standard**	-.09	.41	.31	.60
No education	.18	.41	.23	.63
<i>Economies without the following source of persistence:</i>				
Preference persistence	-.12	.42	.08	.60
College choice	.18	.31	.19	.61
Exogen. ability persist.	.19	.06	.13	.60
Human cap. persistence	.15	.00	.02	.56
Bequest	.30	.42	.42	.41
<i>Economies with only the following source of persistence:</i>				
Bequest	-.10	.00	-.12	.49
Preference persist.	.29	.00	.13	.13
College choice	.03	.13	.15	.13
Exogen.-ability persist.	.00	.31	.15	.15
Human cap. persistence	.02	.42	.29	.27

* Figures taken from the fourth column in Table 2.

** Considers only exogenous ability persistence and bequest.

Table 10: Sensitivity analysis

Economy	Intergenerational correlation			
	Hours	Wages	Earnings	Consumption
Benchmark ($\sigma = 1, \gamma = -2$)	.206	.424	.306	.654
<i>Alternative parameter values:</i>				
$\sigma = 1, \gamma = -3$	.206	.411	.317	.651
$\sigma = 1, \gamma = -4$	.201	.420	.319	.656
$\sigma = 1.5, \gamma = -2$	.226	.356	.251	.722
$\sigma = 1.5, \gamma = -3$	.206	.403	.291	.745
$\sigma = 1.5, \gamma = -4$	.209	.415	.305	.748
$\sigma = 2, \gamma = -2$	.287	.315	.274	.793
$\sigma = 2, \gamma = -3$	.238	.369	.273	.789
$\sigma = 2, \gamma = -4$	.219	.410	.291	.799