PARENTAL ALTRUISM AND SELF-INTEREST: CHILD LABOR AMONG LATE NINETEENTH-CENTURY AMERICAN FAMILIES

DONALD O. PARSONS and CLAUDIA GOLDIN*

Intergenerational relationships within late nineteenth-century industrial families are analyzed using several large-scale, contemporary household surveys. Nonaltruistic behavior by parents was pervasive. Even among families with positive assets, child labor was common in certain industrial settings, suggesting that child labor (or nonschooling) did not simply reflect parental borrowing constraints. Neither did physical asset transfers offset human capital losses among working youth. A quantitative estimate of parental nonaltruism is derived from an equilibrium labor market model: approximately 90 percent of all child earnings was implicitly competed away through lower adult wages as families migrated to areas with abundant child labor opportunities.

> Insofar as machinery dispenses with muscular power, it becomes a means of employing laborers of slight muscular strength, and those whose bodily development is incomplete, but whose limbs are all the more supple...The value of labour-power was determined, not only by the labour-time necessary to maintain the individual adult laborers, but also by that necessary to maintain his family. Machinery, by throwing every member of that family on the labor market, spreads the value of the man's labour-power over his whole family. In order that the family of four may live, four people must now, not only labour, but expend surplus-labour for the capitalist. Previously, the workman sold his own labour power, which he disposed of nominally as a free agent. Now he sells wife and child. He has become a slave dealer.
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> Marx [1906 (1867), 431–32]

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I. INTRODUCTION

Parental preferences have profound implications for the dynamic behavior of market economies. Barro [1974] has argued that government deficits have no effect on aggregate behavior when parents are altruistic; perceiving that the government debt will be paid by their children, parents will increase their private savings. In a society of less altruistic parents, a government deficit has a rather different impact on asset formation, according to Drazen [1978]. Schooling and other human capital investments are also sensitive to parental tastes, because youth cannot independently contract for the resources required to support such investments. This paper reports on an empirical investigation of intergenerational transfer mechanisms, including child labor (or conversely schooling) and physical asset accumulation among industrial families in the United States in late nineteenth-century America. Isolation of a quantitative measure of parental altruism leads to the conclusion that non-altruistic behavior among these industrial families was pervasive.

Child labor was prevalent in nineteenth-century America, although levels varied greatly by industry. Technologies utilized in some industries generated little demand for child labor, while others offered ample opportunity. The differences in child labor across a number of industries are illustrated in Table I, based on data from the Wright study described in detail below. Employment probabilities by age and sex of family members in these working-class households are reported separately for families in textile industries (both cotton and woolen) and nontextile industries (primarily mining, glass, and iron and steel). Differences in the employment rates of children were greatest among young males and among females of all ages. The employment rate of boys eleven to thirteen years of age in textile families was 41.1 percent but only 11.0 percent for boys in nontextile families. The employment differential was even larger for females. Among females fourteen to fifteen years of age in textile families, 73.4 percent were working; in nontextile families only 14.1 percent were employed.

Earnings generated by child labor in textiles were a substantial share of family income. Child labor provided 24 percent of textile-family income as opposed to only 7 percent in nontextile families in the Wright study. As a consequence, although the earnings of adult males in the child-labor-intensive textile sector were 32 percent below those of adult males in nontextile industries, total family income in textiles was only 5 percent less than in other industries.

Schooling was the principal alternative to work activity among these children. Table II shows that by the age of eleven, children in these industrial families were either in school or at work. Schooling was lower in textiles where child labor was common, higher in heavy industry where it was not. A male child between eleven and thirteen years old had a 41 percent probability of being in school if he were the son of a textile worker, but a 76

TABLE I
Employment Probabilities for Children by Age, Sex, Industry, and Father's Earnings, c. 1890

	Total		Low Earnings[a]		High Earnings[b]	
Sex/Age	Textile (1)	Nontextile (2)	Textile (3)	Nontextile (4)	Textile (5)	Nontextile (6)
Child						
5–10	0.064	0.020	0.104	0.020	0.036	0.023
Male						
11–13	0.411	0.110	0.546	0.258	0.130	0.067
14–15	0.846	0.543	0.919	0.796	0.646	0.411
16–17	0.930	0.757	0.813	0.836	1.008[c]	0.694
18+	0.773	0.814	0.716	0.782	0.852	0.800
Female						
11–13	0.345	0.014	0.480	−0.006[c]	0.131	0.021
14–15	0.734	0.141	0.798	0.215	0.525	0.130
16–17	0.977	0.218	0.985	0.412	0.642	0.146
18+	0.850	0.234	0.845	0.518	0.645	0.137

Source and Notes: Derived from a regression analysis using the *Sixth Annual Report* [1890] and the *Seventh Annual Report of the Commissioner of Labor* [1891]. Because these family records report only the cumulative number of working children, the age-sex estimates given above were obtained by regressing the number of children working on the age and composition of the family. Because of the method of construction, the total figures in columns (1) and (2) are not linear combinations of those in (3) and (5), and (4) and (6), respectively. The number of family observations is 6610.

[a]Father's earnings less than or equal to $400 (1890 dollars).

[b]Father's earnings more than $400 (1890 dollars).

[c]The estimating procedure yields probabilities outside the (0, 1) interval. See Source and Notes.

percent probability if he were a son in a nontextile industrial family. Among females in the same age group, the schooling probabilities are 49 percent and 86 percent respectively. A multivariate analysis (not presented here) controlling for parental income reveals a difference in median schooling levels of 3.3 years between male offspring whose fathers were employed in textiles and those whose fathers were not; the difference of 2.9 years for females is comparable (see Goldin and Parsons [1981]). The long-run economic returns to schooling were apparently large, raising important questions about the subsequent financial well-being of offspring across industries.[1]

1. See Becker [1975] for the earliest systematic analysis of the rates of return to schooling in the United States; the study uses 1939 data and is limited to males. In 1939 the returns to schooling were substantial. While these estimates capture only the later stage in the life cycle of late-nineteenth century school children, the narrowing of the skill differential among males in the early 1900s suggests that returns to schooling would have been even higher earlier in their life cycle (as in Keat [1960] and Goldin [1984]). Estimates of the effect of schooling on female earnings in Goldin and Parsons [1981] indicate systematic, positive effects. Benham [1974] and Leibowitz [1974] present evidence on the more difficult to measure nonmarket effects of schooling for females.

TABLE II
Employment and Schooling Probabilities of Children in Families of U.S. Industrial Workers, c. 1890

	At Work (1)	At School (2)	At Work or School[a] (3)
Child			
5–10	0.02	0.53	0.55
Male			
11–13	0.24	0.60	0.84
14–15	0.69	0.25	0.94
16–17	0.86	0.05	0.91
18+	0.78	0.01	0.79
Female			
11–13	0.21	0.65	0.86
14–15	0.49	0.39	0.88
16–17	0.72	0.04	0.76
18+	0.74	−0.02[b]	0.72

Source and Notes: *Sixth Annual Report* [1890] and *Seventh Annual Report of the Commissioner of Labor* [1891]. The notes to Table I explain the estimation technique.

[a]The sum of columns (1) and (2),

[b]The estimating procedure does not constrain the estimates to the (0, 1) interval.

An important locational feature constrained the employment opportunities of these nineteenth-century American families. Not only did industrial technologies differ greatly in child labor opportunities, but industrial production was highly localized as well. Production centers in iron, cotton, glass, and woolens were often geographically isolated from each other, although the local labor markets were closely integrated through high labor mobility. Although the young were occasionally housed in dormitory-like living arrangements in manufacturing areas, thereby separating the location of child and parent, such facilities were not a major factor in the housing of the child labor force. The locational decision was, therefore, a family computation, a precursor of the current two-earner family problem (see Sandell [1977] and Mincer [1978]). Family income differences across industrial centers were presumably the equilibrium outcome of the locational decisions of households, based on labor and capital market conditions and on parental preferences.

Three alternative models of parental decision-making are used to examine the equilibrium relationships among child labor, family income, and asset accumulation across local labor markets.[2]

2. In this analysis parents are treated as a single decision-making unit. For theoretical treatments of economic exchange between husband and wife, see Becker [1981], Parsons [1980], and Stapleton [1987].

Hypothesis 1: The Family Wealth Maximization Model. Families are assumed to be able to borrow and lend at market interest rates and to be interested solely in aggregate income flows, not the source (the parent or the offspring). In this Fisherian model, parents are indifferent to variation in child labor opportunities; they adjust physical and human capital stocks to maintain the desired time sequence of consumption activities in different child labor regimes.

Hypothesis 2: The Capital Constraint Model. The perfect capital market assumption of Hypothesis 1 is relaxed and it is assumed, instead, that the family's borrowing rate is systematically higher than its lending rate. The capital market imperfection has implications for parental valuation of schooling and in turn for their valuation of child labor opportunities, because the family will receive income flows earlier if the child works. The model also has implications for how equilibrium adult wages vary across locations that differ in child labor opportunities.

Hypothesis 3: The Altruism/Entitlements Constraint Model. Hypotheses 1 and 2 assume parents are free to allocate all family wealth, including their offspring's income as an adult. If not, parents will, ceteris paribus, prefer sectors with ample child labor opportunities, and they will shift offspring earnings from adulthood to an earlier period when they fully control offspring income (see Ishikawa [1974] and Parsons [1984]).

These three hypotheses yield different predictions for the locational and asset-holding choices of families, and for the equilibrium wage structure supported by these decisions.

The data sets employed here are unusual for any period in American history, particularly the late nineteenth century. They are large-scale micro data sets rich in economic information. The primary one is a survey of approximately 6800 industrial families in 1889–90 (collected initially to inform the government on tariff-related issues). The responses to a variety of household and economic questions are reported in full in the *Sixth Annual Report* [1890] and *Seventh Annual Report of the Commissioner of Labor* [1891]. Carroll Wright was the Commissioner of Labor; the data set is referred to in this paper as the "Wright study." While this data set is unusual, it has been extensively used.[3] Two related surveys of child labor conducted in 1907, *Report on Conditions of Women and Child Wage-Earners* [1910–11], will also be used and will be called the "1907 report." The first of these includes 2686 children working in the clothing industry in Chicago and New York City and in the cotton textile industry in Massachusetts and North Carolina.

3. This sample is described in detail in Haines [1979] and Lindert [1978]. The data set was provided to us by Michael Haines. The data set is available through Inter-University Consortium for Political and Social Research (ICPSR).

The second consists of 1319 young women working in manufacturing and retail stores in New York City. These large-scale micro data sets permit a detailed examination of family child labor and asset behavior.

In the next section, the alternative models of parental behavior are developed more formally in a labor market framework reflecting turn-of-the-century conditions. Implications for family asset behavior and for the equilibrium adult/child wage structure across areas are then derived for each. In section III, the alternative predictions are tested empirically; a quantitative measure of parental altruism is also constructed.

II. PARENTAL DECISION MAKING: ALTERNATIVE MODELS

The labor market in late nineteenth-century America was characterized by 1) localized and specialized production centers 2) large differences in child labor demand across production technologies and 3) a highly mobile work force across these geographically isolated production centers. In this section, explicit models of child labor (or schooling), family asset holdings, and total family income are developed under these conditions for each of the three alternative sets of assumptions on parental behavior (hypotheses 1 through 3). Particular attention is given to observable implications that permit distinction among the three hypotheses.

Parental Decision Making

Consider the intergenerational relationship of a parent/child pair in a three-stage model of the life cycle (youth, adult, and aged) over the two periods in which the pair overlap.[4] Central to the analysis is the allocation of consumption and income claims across both time and generations for the pair. Define C_{ij} and I_{ij} as consumption and income respectively of the ith generation in the jth period. In the current framework it is convenient to specialize the indexation in the following way: $i=p, c$ (parents, child); $j=1, 2$, so that, for example, C_{p1} refers to the parents' consumption in the first period and C_{c2} to the offspring's consumption in the second period, when the offspring is an adult. For simplicity assume that the consumption of parents and the consumption of children in the first period are in fixed proportions, perhaps because of the consumption technology, so the offspring's consumption as a child (C_{c1}) can be subsumed in the parents' consumption (C_{p1}).

The utility structure underlying the parental decision mechanism is assumed to be a positive function of the parents' own consumption in both

4. The model ignores the continuous interlinkage among the generations and focuses myopically on one relationship. More complete intergenerational models can be found in Razin and Ben-Zion [1975], Blinder [1976b], Becker and Tomes [1979], and Loury [1981].

periods and, if the parents are altruistic, the second period consumption of the offspring. For concreteness consider the log-linear utility structure discussed by Becker [1974]. The parental utility function is then[5]

$$U = (C_{p1})^{\alpha} (C_{p2})^{\beta} (C_{c2})^{\gamma}, \qquad \alpha, \beta, \gamma > 0, \tag{1}$$

with γ the altruism parameter (if $\gamma = 0$, the parents are not altruistic). In the discussion that follows, the utility parameters are normalized to sum to one: $\alpha + \beta + \gamma = 1$. In a world of complete parental control, the parents' consumption choices are constrained only by the family's total wealth during the parents' lifetime and by the capital market; aggregate consumption cannot exceed total family wealth (W):

$$C_{p1} + \delta C_{p2} + \delta C_{c2} \leq W, \tag{2}$$

where

$$W = I_{c1} + I_{p1} + \delta(I_{c2} + I_{p2}) \tag{3}$$

and $\delta \equiv$ the discount factor, $1/(1+r)$, with r the appropriate interest rate. Assume for the moment that the financial market is "perfect," implying the borrowing and the lending rates are equal and the appropriate interest rate is unambiguously defined.

The parents' well-being is maximized in this framework, with perfect capital markets and complete parental control of offspring income, by the following allocation:

$$C_{p1}^{*} = \alpha W, \tag{4a}$$

$$C_{p2}^{*} = (\beta / \delta) W, \tag{4b}$$

and

$$C_{c2}^{*} = (\gamma / \delta) W, \tag{4c}$$

where asterisks (*) denote optimal values. The allocation of wealth among consumption uses is proportional to the respective utility parameters, adjusted for the second-period discount factor (δ).

The life-cycle profile of earnings of the second generation (I_{c1}, I_{c2}) is not given exogenously, but is dependent on the child labor/schooling choice made by the parents and on the market rate of return to schooling. Assume

5. This preference structure can be derived from a more fundamental one which values own consumption in the two periods and the offspring's utility.

that earnings in the first two periods of life can be represented as a linear function of the child's schooling,

$$I_{c1} = (1 - \varphi)I_0 , \qquad 0 \leq \varphi \leq 1 , \tag{5a}$$

and

$$I_{c2} = (1 + \varphi\pi)I_0 , \tag{5b}$$

where $\varphi \equiv$ the fraction of child time devoted to schooling; $I_0 \equiv$ full-time earnings of unskilled labor, assumed equal in the two periods; and $\pi = (1 + \rho)$, one plus the rate of return to education. Assume that the rate of return to schooling is equal to the market interest rate, $\rho = r$.[6] In the family analog to the individual schooling choice model, parents are indifferent to the schooling levels of their offspring. If schooling activity is reduced, physical asset accumulation is increased to offset the shift toward current income; the optimal consumption plan is unchanged.

An Equilibrium Model of Family Income

Consider now an equilibrium model of family income in an economy similar to that which existed in the United States at the turn of the century, an economy containing a large number of separate industrial centers having substantially different demands for child labor. The demand for child labor is assumed to be fixed by the production technology at each production center. Consider one such center. The family's child labor choice is restricted by the production technology to the fixed ratio $(1 - \varphi_F)$.

The child labor restriction would raise no problem in families characterized by the wealth maximization model. The traditional Fisherian dichotomy of investment activities and consumption activities holds if 1) parents can borrow and lend at a fixed interest rate; and 2) they control the income of all family members, including that of their offspring, as children and as adults. Child labor opportunities will affect the parents' optimal asset portfolio in this Fisherian world, but not its optimal consumption plan. When child labor opportunities are plentiful, parents may have their children work more and invest less in human capital. The parents will maintain the long-term wealth of a working child by saving an equivalent sum in physical assets.[7] If the return to schooling are identical to the return on physical assets (which in equilibrium it is in this model, ceteris paribus), then parents will be indifferent to variations in child labor opportunities across localities, and

6. This assumption eliminates efficiency concerns in the schooling/child labor decision and permits us to focus solely on the intrafamily distribution issue.

7. This substitution hypothesis is considered by Becker [1975], Ishikawa [1975], Blinder [1976a], Adams [1980], Tomes [1981], and Parsons [1984].

the wage required by the male household head to locate at a work site will be unaffected by variations in child labor demand.

Parents may face a borrowing rate significantly higher than the lending rate. When their optimal plan involves borrowing ($A^* < 0$), the capital market "imperfection" will affect their demand for child labor opportunities. But an alternative to the capital market is to "borrow" across generations. The family will realize income faster when the child works than when the child attends school to enhance future productivity. If all parents attempt to locate where demand for child labor is high, wages in those areas are likely to fall. In equilibrium parents will be willing to accept lower own-income to secure child work opportunities in a capital-constrained environment, and the severity of the wage offset will depend on the importance of the capital constraints. By definition assets and savings are zero in this regime.

An entitlements problem within the family may arise if the limitation on child labor is sufficiently severe that parents allocate more to their offspring than they would in their optimal program (see Ishikawa [1974] and Parsons [1984]).[8] Shifts in second-period income sources between physical assets controlled by parents and human assets controlled by offspring will have no effect on intergenerational consumption shares as long as parental transfers (T) to offspring are positive:

$$T^* = C_{c2}{}^* - I_{c2} > 0, \tag{6}$$

where an asterisk (*) denotes an optimal value.[9] But if the parental transfers are not positive, intergenerational consumption shares will depend on the source of income. Whether the entitlements constraint is effective depends on the level of parental altruism: the larger the desired allocation to the offspring, the less likely it is that the constraint will be effective.

Denote as φ_c the critical level of schooling intensity above which the parents encounter an entitlements problem and are forced to alter their optimal consumption allocation. The critical level of schooling intensity (φ_c) is a function of the amount of resources the family optimally planned to allocate to the offspring. It is also affected by the altruism parameter and the ratio of family wealth to the offspring's unskilled wage, both of which increase the parents' desired level of consumption for the offspring as an adult (C_{c2}^*). Specifically,

8. For a related analysis of parental control, see Bernheim, Schleifer, and Summers [1985]. Rubin, Kau, and Meeks [1979] as well as Parsons [1984] consider the fertility implications of the entitlements constraint. Borcherding and Smith [1984] and Thompson and Ruhter [1987] develop several important implications for social policies, including social security finance and deficit spending.

9. This is a straightforward application of Becker's [1974] "rotten kid" theorem.

$$\varphi_c = \begin{cases} 1, & \text{if } [(\gamma/\mu) - \delta] > 1; \\ [(\gamma/\mu) - \delta], & \text{if } 0 \le [(\gamma/\mu) - \delta] \le 1; \\ 0 & \text{if } [(\gamma/\mu) - \delta] < 0; \end{cases} \tag{7}$$

where $\mu \equiv I_0 / W$, the ratio of unskilled child labor income to total family wealth. In the altruism/entitlements constraint environment, parents allocate consumption between the two periods according to

$$C_{p1}^* = \alpha / (\alpha + \beta) \cdot W_1 , \tag{8a}$$

$$C_{p2}^* = (\beta / \delta) / (\alpha + \beta) \cdot W_1 , \tag{8b}$$

where $W_1 = (I_{p1} + I_{c1} + \delta I_{p2})$ is the present value of the parents' available resources. Where child labor opportunities are limited, parental consumption is positively and proportionally related to actual child labor income $[I_{c1} = I_0(1 - \varphi_F)]$.

Substitution between human assets and physical assets is dollar for dollar as long as parental altruism is sufficiently large that an absence of child labor opportunities does not force parents to alter their consumption plans. Formally, the model implies an asset (A) function of the following form:

$$A = \begin{cases} (1-\alpha)(I_{p1} + I_{c1}) - \alpha\delta(I_{p2} + I_{c2}), & \text{if } \varphi_F < \varphi_c \\ \beta/(\alpha+\beta) \cdot (I_{p1} + I_{c1}) - \alpha/(\alpha+\beta) \cdot \delta I_{p2} , & \text{if } \varphi_F \ge \varphi_c, \end{cases} \tag{9}$$

so that

$$\partial A / \partial I_{c1} = \begin{cases} 1 & \text{if } \varphi_F < \varphi_c, \\ \beta/(\alpha+\beta) & \text{if } \varphi_F \ge \varphi_c. \end{cases} \tag{10}$$

Child earnings will induce a dollar for dollar increase in the assets of the family when the parents are not constrained to "overendow" their children and a lesser accumulation rate when they are so constrained. It is important to note that in the altruism/entitlements constraint model, as in the family wealth maximization model, families may optimally save while their children work.

Equilibrium requires that the parents's utility in any sector must equal or exceed some competitively determined level V_0:

$$U(\cdot) \ge V_0(\cdot) .$$

Assume that the parents' earned income in the aged period is zero, $I_{p2} = 0$. The gradient between parental income in the first period (I_{p1}) and child earnings (I_{c1}) defined by this equilibrium will then be

$$\partial I_{p1} / \partial I_{c1} = (\gamma / \delta) / (\alpha + \beta) \cdot (W_1 / I_{c2}) - 1 < 0 \qquad \text{if } \varphi_F \geq \varphi_c, \quad (11)$$

and zero otherwise, where $\varphi_c = [(\gamma / \mu) - \delta]$, as before. The importance of parental altruism in the determination of the equilibrium gradient between parental income and child earnings is apparent here. As the altruism parameter (γ) increases, 1) the critical level at which schooling constrains the preferred parental allocation increases (the constraint becomes less binding), and 2) the gradient itself becomes less negative. In the extreme, as altruism approaches zero, the gradient approaches minus one:

$$\lim_{\gamma \to 0} \partial I_{p1} / \partial I_{c1} = -1. \quad (12)$$

When parents place no value on the future returns from educating their offspring, competition among families in the labor market will induce a dollar reduction in parental earnings for each dollar increase in child labor income.

Major Implications: A Summary

Hypothesis 1: The Wealth Maximization Model

i) In the capital market, parents will accumulate (or decumulate) physical assets equal in magnitude to the increase (or decrease) in child labor earnings.

ii) In the labor market, there will be no difference in parental wages (for given skill level) across local areas differing in child labor opportunities.

Hypothesis 2: The Capital Constraint Model

i) In the capital market, parental asset holdings will be zero if young children in the household are working; parents will not simultaneously hold savings and have their children work.

ii) In the labor market, parental wages will vary across areas inversely with child labor opportunities.

Hypothesis 3: The Altruism/Entitlements Constraint Model

i) In the capital market, positive savings and child labor may coexist.

ii) In the labor market, parental wages will vary across areas inversely with high child labor opportunities.

III. THE EMPIRICAL EVIDENCE

To distinguish among the three alternative family/capital market models that potentially underlie the behavior of nineteenth-century industrial families, it is necessary to explore both capital market behavior (savings behavior across child labor regimes) and labor market behavior (parental earnings and child labor activities). The principal data set is the Wright study, which contains information on family savings, asset holdings, earnings, and labor market activity. The Wright study and the two 1907 surveys of child labor will be used to estimate the impact of child labor opportunities on family savings and asset behavior, before turning to the analysis of the interindustry structure of adult earnings.

Physical Asset Behavior

The alternative parental behavior models produce distinct predictions concerning asset and saving behavior that provide tests of the alternative assumptions. To explore all potential avenues of parent-child asset transfers, it is necessary to examine both 1) parent savings and asset behavior, which may imply future compensating transfers to the offspring, and 2) current gift giving, most commonly in the form of "retained earnings" by the working child.

Parental Asset Accumulation Behavior. The optimal savings and asset holding behavior of the family will depend on the time stream of income flows and the desired time path of consumption. The focus here is on one aspect of this complex process, the impact of variations in child earnings on saving and asset holding behavior. Under the family wealth maximization hypothesis, child earnings do not increase total family wealth, but simply bring the fully discounted return flows forward in time. An additional dollar of child earnings, ceteris paribus, should increase family savings by one dollar as the parents readjust the physical asset component of their asset portfolio to maintain the planned consumption path. In the capital constraint model, modest variations in current income from any source should result in no additional savings—child labor and positive assets should not coexist if a borrowing constraint induces child labor. In the altruism/entitlements constraint model, child labor results because offspring income earned during the period of parental control is more valuable to parents than is income earned after. This implies positive wealth effects of child earnings on the parents' saving behavior. When parents are completely nonaltruistic toward their offspring, income from child earnings will be treated as income from any other source.

The savings and asset holding behavior of the parents is modeled here as a linear function of family income by source and the age/gender composition of the family. Family income is divided into two components, children's earnings and family income other than children's income. Consider formally the savings function for the ith family,

$$S_i = \alpha_0 + \alpha_1 Y_{F/C_i} + \alpha_2 Y_{C_i} + \alpha_3 AGE_i + \varepsilon_{S_i}, \quad (13)$$

where S ≡ annual savings,
$Y_{F/C}$ ≡ family income other than children's income,
Y_C ≡ children's earnings,
AGE ≡ a vector of family composition and age variables,
and ε_S ≡ a random error term with $E(\varepsilon) = 0$.

The parameter implications under the alternative hypotheses are

$H_1 : \alpha_2 = 1$,
$H_2 : \alpha_2 (= \alpha_1) = 0$,
$H_3 : 0 < \alpha_2 (= \alpha_1) < 1$.

Annual income and expenditure data for each household are available in the Wright study, and it is therefore possible to calculate a measure of the annual savings of each household. Savings is defined as total family income minus expenditures. Ordinary least squares estimates based on this savings measure are reported in Table III, Column 1. The sample is limited to families with incomes equal to or less than $1500, because significant nonlinearities are evident at the very highest income levels (only 200 out of the sample of 6600 were excluded on this basis). The hypothesis that the child earnings coefficient is either zero or one is emphatically rejected by these estimates. Indeed the modest difference in the estimated saving effects of father's income and children's income, a difference of less than 2 percent, suggests that asset accumulation was invariant to the earnings source. A t-test of the difference of savings out of other family income and out of child income indicates that the hypothesis of identical effects could not be rejected at the 95 percent confidence level ($t = -0.94$). The implications of the family wealth maximization model and the capital constraint model are not supported by these estimates. The data are consistent only with the entitlements constraint model.

The absolute levels of saving propensities appear rather high; the coefficient on parental income is 0.344 and that on child income, 0.331. Although the compilation of expenditures is in principle complete, it includes explicitly only expenditures on taxes, labor organizations, sickness and death, rent, and food. The remainder is included in an "other expenditure" category that comprises approximately 40 percent of the budget. This methodology may have led to underreporting of significant amounts of other expenditures.

The Wright study also contains information on asset holdings. The asset holding function should be similar in form and in parameter interpretation to that of savings because assets are the cumulation of saving. Although it generally makes little sense to assume that saving behavior is constant over the life cycle, this sample is limited to relatively young, working individuals, for whom such an assumption may not be unreasonable. The linear form of the model then would be

TABLE III

The Determinants of Annual Savings and Asset Holdings, Industrial U.S. Working-Class Families, c. 1890[a]

	Savings[b] (OLS) (1)	Savings > 0[c] (Probit) (2)	Assets > 0[d] (Probit) (3)
Constant	−207.0	−1.627	−1.055
	(10.10)	(6.97)	(2.61)
Family Income			
Total except Child	0.344	0.00227	0.00306
	(55.97)	(27.42)	(18.07)
Children's Earnings	0.331	0.00239	0.00238
	(24.31)	(14.54)	(6.52)
Demographic			
Father's Age	3.471	0.0407	−0.00137
	(3.37)	(3.46)	(0.07)
Father's Age Squared	−0.0279	−0.00041	0.00010
	(2.34)	(3.01)	(0.39)
Children (0–10) Years	−14.65	−0.153	−0.106
	(13.34)	(12.11)	(5.18)
Males 11–15	−22.84	−0.171	−0.192
	(8.15)	(5.31)	(3.49)
Males > 15	−28.55	−0.221	−0.127
	(7.20)	(4.83)	(1.47)
Females 11–15	−27.24	−0.218	−0.286
	(9.77)	(6.84)	(5.20)
Females > 15	−34.97	−0.309	−0.344
	(11.14)	(8.43)	(5.38)
R^2	0.36	–	–
Log of Likelihood Function	–	−3750	−1353
Sample Size	6376	6376	2414

Source: *Sixth Annual Report* [1890] and *Seventh Annual Report of the Commissioner of Labor* [1891].

[a]Families with adult male earnings of $50 per year or less or total family income exceeding $1500 were excluded from the sample. The absolute values of t-statistics are in parentheses.

[b]The dependent variable is the difference between total income and total expenditures of the family.

[c]The dependent variable equals one if annual savings are positive, and zero if annual savings are zero or negative.

[d]The dependent variable equals one if financial status is "surplus," and zero if "in debt" or "accounts balance."

$$A_i = \alpha_0^* + \alpha_1^* Y_{F/C_i} + \alpha_2^* Y_{C_i} + \alpha_3^* AGE_i + \varepsilon_{A_i}, \tag{14}$$

with $A \equiv$ family assets. The predicted coefficient signs under the various alternatives are similar to those for the savings function.

The survey did not secure estimates of net family assets (assets minus liabilities) but did include a question concerning the household's financial status, whether it was "in debt," held a "surplus," or had "accounts balance." The asset parameters must, therefore, be estimated in the following probability form:

$$P(A_i > 0) = F(\alpha_0^* + \alpha_1^* Y_{F/C_i} + \alpha_2^* Y_{C_i} + \alpha_3^* AGE_i) \tag{15}$$

with $F(\cdot)$ the cumulative distribution. A standard probit analysis is appropriate, when ε_A is normally distributed.

The qualitative asset data are available for only a subset of the respondents. To provide a comparison with the full sample, a comparable qualitative savings function was estimated on the full sample. The continuous savings data were converted into a zero-one dummy variable, indicating that annual savings were positive or not, and a probit analysis of the dichotomous savings variable was undertaken. The positive savings probit on the full sample, reported in Table III, Column 2, is remarkably similar in structure to the asset probit, so only the latter is discussed.

Probit estimates for the asset proxy are reported in Table III, Column 3. Both income components have a strong positive impact on the likelihood that a family reported positive net family assets. The large, positive effect of children's earnings on asset levels clearly rejects the hypothesis that child labor was simply a mechanism to avoid capital constraints on current consumption. It is also transparent that not all child earnings were saved. Indeed the estimated coefficient on children's earnings is marginally smaller than the coefficient on father's earnings. A t-test of the difference of savings out of other family income and out of child income indicates that the hypothesis of identical effects could not be rejected at the 95 percent confidence level ($t = -1.86$). The hypothesis that children's income was simply accumulated by parents for later transmission to the offspring is not supported by these data. As with the savings data, only the altruism/entitlements constraint model is consistent with the asset data.[10]

10. The possibility exists that the child earnings coefficients in both the savings and asset analyses are biased downward because of simultaneity problems in the estimation. Families with high levels of savings or assets may have desired their children to work fewer years and earn less. To test this proposition a two-stage model of assets and child earnings was developed and estimated. The results, not reported here, were comparable to those reported above.

Earnings Retained by the Working Child. Parental transfers to the working child need not have taken the form of assets accumulated on the child's behalf, but rather could consist of current gifts, most plausibly as the portion of earnings the child was allowed to retain. Several surveys conducted in 1907 permit exploration of this possibility. Data on the earnings children living at home were permitted (by the parents) to retain for their discretionary use were reported as part of extensive U.S. Senate [1910–11] hearings into the conditions of female and child labor called here, the 1907 report. It is not known whether these retained earnings were used for ordinary living expenses customarily provided in families that did not allow children to retain earnings; it seems likely that a substantial part of these retained earnings reflected physical wealth transfers to the working child above and beyond ordinary living expenses.

One of the data sets contains information on the earnings retained by children older than fifteen years who were, with few exceptions, working in the clothing and cotton textile industries.[11] It also contains various characteristics of the families of these workers. Fewer than 25 percent of the families with working children had positive retained earnings. Even among these families, transfers were not large relative to total child earnings. Among families in which retained earnings were positive, 36 percent of the children's earnings were allocated to the child's own use, while across the entire sample only 11 percent were. A second data set, on unmarried working women living at home, suggests that retained earnings became substantial only as daughters reached adulthood. Working daughters who retained some earnings never exceeded 50 percent at any age. The 50 percent figure was approached only when the women were in their late twenties; at age twenty-one the percentage was closer to 15 percent. In sum there is little evidence, either from the savings behavior and asset holdings of the parents or in the gift-giving to their offspring, to suggest that offspring who worked as youths were compensated with greater physical asset endowments.

The Equilibrium Parent/Child Wage Gradient

Adult male wages vary with child earning opportunities across areas (and industries) in different ways under each of the alternative models of parental behavior. Under the family wealth maximization model, equilibrium adult earnings will not be affected by variations in child earning opportunities because, by assumption, schooling offers the family an equivalent economic return. Under the capital constraint and the entitlements constraint models,

11. A more detailed analysis of these data can be found in Goldin and Parsons [1981].

parents will, ceteris paribus, prefer present to future child income. This preference will induce an equilibrium wage gradient across areas, such that parental wages will be reduced wherever child labor demand is great.

The labor market implications of the three models can be nested within the linear approximation to the adult male earnings function:

$$Y_{F_i} = \beta_0 + \beta_1 E(Y_{c_i}) + \beta_2' X_i + \varepsilon_i \tag{16}$$

where Y_{Fi} ≡ earnings of the male household head, the "father;"
$E(Y_{ci})$ ≡ the expected earnings of children in the industry;
X_i ≡ a vector of productivity variables that affect earnings, age, skill, location, and so on;
ε_i ≡ a random error term;

and the β_i denote fixed parameters. In summary, the implications of the three hypotheses are:

$H_1 : \beta_1 = 0$;
$H_2 : \beta_1 < 0$;
$H_3 : \beta_1 < 0$.

Because there may be positive income effects on child schooling and child leisure, it is important to control for the earning potential of the household head to isolate the impact of children's earnings on that of the adult. The Wright study includes information on the male household head's occupation, from which four skill dummies have been constructed: craft, white collar, skilled, and unskilled. Among these, the unskilled are probably the most homogeneous, and the father's wage analysis is performed both for the sample as a whole, with skill dummies incorporated, and for the unskilled group alone.

A measure of expected children's earnings was constructed for all industry-state cells. For families with unskilled household heads, aggregate children's earnings were regressed on family composition measures and a measure of agricultural wages in the state, for each of the seven industry groups represented in the sample (pig iron, bar iron, steel, coal-coke-iron ore, cotton, wool, and glass). The sample was limited to the families of unskilled adults to control for family income effects on child labor supply. Regional controls (South) and the presence of state compulsory schooling laws were included in one set of regressions but had no significant effects on child labor activities and are not included in the models reported here.[12] The average family composition over all industries in the sample was then used in the separate industry regressions, along with the agricultural wage

12. The compulsory schooling data were obtained from Landes and Solmon [1972].

TABLE IV

Determinants of Earnings of Male Household Heads, Industrial U.S. Families, c. 1890[a]

	Unskilled[b] (1)	Full Sample[c] (2)
Constant	434.58	–42.87
	(9.47)	(0.88)
Child-Earnings Index[d]	–0.904	–1.08
	(13.05)	(11.37)
Age	0.299	20.47
	(0.14)	(8.98)
Age Squared	–0.050	–0.265
	(1.98)	(9.85)
Annual Agricultural Earnings[e]	0.621	0.860
	(13.05)	(15.80)
Occupational Dummies:		
Unskilled	–	–
Skilled	–	162.73
		(20.69)
Craft	–	232.68
		(19.57)
White Collar	–	96.26
		(4.83)
R^2	.18	.17
Number of Observations	2041	6200

Source: *Sixth Annual Report* [1890] and *Seventh Annual Report of the Commissioner of Labor* [1891].

[a]Dependent variable is the annual earnings of the male household head. Absolute values of t-statistics are reported in parentheses. Families with adult male earnings of $50 per year or less were deleted from the sample.

[b]Sample is limited to families that reported an unskilled occupation for the male household head and annual earnings of $1200 or less.

[c]Nonrespondents to the occupation question were deleted from the sample.

[d]A measure of child labor earnings potential for an average industrial family by the industry of the male household head. For a more detailed derivation see the text.

eThe average agricultural service income in 1990 for the state of residence (Lee, Miller, and Brainerd, and Easterlin [1957, 755]).

level in the state of the respondent, to generate the expected value of children's earnings for an average family in each industry/state. The measure for the industry (and state of residence) is termed the "child-earnings index."[13]

With the variables in Equation (1) specified, the model can be estimated using ordinary least squares techniques. The OLS estimates of the model of annual earnings of the male household heads in the Wright study are reported in Table IV. In column (1) the results are given for the unskilled labor sample of 2041 families. The child earnings index is negative and significant ($t = -13.05$); adult earnings were systematically lower in industries that offered substantial child labor opportunities, and the coefficient of -0.904 indicates that the gain in child earnings to the typical family was almost completely offset by lower earnings to the adult male. The finding is inconsistent with the family wealth maximization hypothesis. Although this finding is consistent with both remaining hypotheses, the magnitude of the offset (90 percent) is implausible under the borrowing constraint model (hypothesis 2) because it implies too high an implicit borrowing rate. As with the asset analysis, only the altruism/entitlements constraint hypothesis is fully consistent with the data.

It should be noted that the estimates in Table IV for other variables are quite plausible and are consistent with earning functions estimated using other nineteenth-century and later samples. For unskilled workers, earnings appear to decline continuously with age over the adult years, but for the sample as a whole the familiar quadratic pattern of rising and falling earnings over the life cycle emerges, with a peak around age forty. The level of agricultural wages in the state systematically affected earnings of both the skilled and unskilled, and the skill dummies in the full sample have effects of expected sign, with craftsmen being the highest paid.

The full sample (column 2) produces similar results. The estimated effect of child earnings opportunities on male adult earnings was again close to -1.0 (point estimate $= -1.08$) and strongly significant ($t = -11.4$). Child earnings had little apparent effect on total family income for industrial families in nineteenth century America—a finding remarkably consistent with the Marxian indictment of the factory system. Higher children's earnings were almost completely offset by lower adult male earnings. Although larger-than-average families could have earned rents in this market, typical families could not. These working-class families apparently sold the schooling and potential future earnings of their offspring very cheaply.

13. The child earnings and family composition analyses are available from the authors as appendix Tables A1 and A2.

IV. CONCLUSION

The long-run performance of any market economy is dependent on the human and physical capital investment decisions of individual households, and these decisions, in turn, are a function of the structure of labor markets, capital markets, and family preferences. This paper has examined three alternative models of parental behavior that plausibly underlie the child labor, schooling, and asset accumulation behavior of industrial families in nineteenth-century America. Implications are derived for each and tested on large-scale individual survey data from the period.

The family wealth maximization model is unambiguously rejected by the analysis. This model, labelled hypothesis 1, assumes perfect capital markets and costlessly enforceable intergenerational contracts (or parents sufficiently altruistic that such contracts are not required), allowing resources to be moved freely across time and generations. The labor market evidence suggests that parents were willing to accept large reductions in their own wages to secure employment in areas having abundant child labor opportunities. They were implicitly willing to sell the labor services of their children very cheaply, indeed at a rate that suggests they placed little value on the foregone schooling (and future income) of their children. In their capital transactions, families with working children did not adjust their physical asset holdings to offset future human capital income reductions as the family wealth maximization model would predict. Neither did they permit children to retain their earnings for future use. The children were simply worse off under the high child labor regime.

The capital constraint model of child labor (hypothesis 2) is also rejected by the data. In this model parental behavior is circumscribed by borrowing constraints, and child labor serves to shift income forward in time. The model implies that parents would accept a reduction in their own wages to secure employment for their children, even if schooling yielded a rate of return equal to that on physical assets. This implication is consistent with the labor market evidence, although the magnitude of the equilibrium wage effect seems improbably high as the result of a borrowing effect alone. The asset accumulation implications of the capital constraint model, however, are strongly rejected. The parents of working children also accumulated physical assets. The saving or accumulation rate out of child earnings, although not 100 percent as implied by the wealth maximization model, is significantly positive and equal to that on income from other sources. The observed behavior is not consistent with the notion that parents used child labor to offset borrowing difficulties alone.

The altruism/entitlements constraint model (hypothesis 3) is the only one not rejected by the data. This model captures the idea that parents discount the adult earnings of children because they cannot appropriate that income. Parents may be willing to accept a lower own-wage to locate in a high child

labor demand region and bring their offsprings' human wealth forward in time. Parents could simultaneously accumulate assets and send their children to work, because the parental control problem is not motivated by a desire to fund additional current consumption. Rather the preference for current offspring earnings derives from property rights restrictions on the future earnings of the offspring.

The empirical results suggest that parents did not have strong (economic) altruistic concerns for their children. The presence of industries with a high demand for child labor sharply reduced the future wealth position of the offspring. Child labor had the obvious, almost definitional, negative effect on schooling attainment. At the same time, the family provided little in the way of offsetting physical asset transfers (in the form of gifts and bequests) to compensate children for their lost schooling and future earnings. The increased family income was apparently absorbed in higher current family consumption. Indeed much of the apparent gain to family income from child earnings was illusory; greater child earnings were almost wholly offset by lower earnings for the adult male, although unusually large families may have garnered rents in industries with strong demands for child labor.

The evidence implies a willingness on the part of working-class parents to sell cheaply the future income streams of their offspring for current consumption purposes. The most cautious interpretation of the evidence is that it provides no support for the positive intergenerational transfer models prevalent in much of the human capital, fertility, and macroeconomics literature. Among working-class parents at the turn of the century, relations between the generations were more complex than unidirectional models suggest. The large increases in schooling over time in the United States may have resulted, not from the altruistic motives of parents, but from the fact that more advanced industrial technologies find little value in the unskilled labor of children.[14]

14. The ratio of the wage of boys (males under age seventeen) to that of adult men first rose with industrialization (1820 to 1850) and later fell during the late nineteenth and early twentieth centuries, see Goldin and Sokoloff [1982; 1984] and Long [1960]. For a fascinating analysis of the technological displacement of child labor in southern agriculture in the post-war period, see Cogan [1982].

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