Borrowing Constraints, Child Labor and Welfare*

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Abstract

This paper shows that in a standard overlapping-generations model where parental altruism results in transfers that children allocate to consumption and education, a constraint on children and parents’ borrowing can reduce child labor and increase welfare. However, a constraint on the ability of parents to borrow, conditional on children not being allowed to borrow, reduces welfare and increases child labor. Understanding this distinction is crucial for the design of public policy.

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1 Introduction

A growing theoretical literature points to the lack of access to credit as one of the main causes of the prevalence of child labor. For instance, Baland and Robinson (2000) and Ranjan (2001) find that inefficient child labor may arise in equilibrium as a result of credit constraints. Empirical evidence has found a strong relation between the intensification of credit constraints and the incidence of child labor (see Grootaert and Kanbur, 1995; Jacoby and Skoufias, 1997; Dehejia and Gatti, 2005; Edmonds, 2003; Beegle, Dehejia and Gatti, 2003).

In this paper, I analyze the impact on child labor and welfare of constraints on the ability of both parents and children to borrow against future income. I then focus on the impact of a constraint on parents’ ability to borrow in an environment where children do not have access to credit markets. While credit constraints are widely viewed as a crucial factor behind the persistence of child labor, most of the existing literature focuses on the ability of parents to borrow and little or no attention has been given to the inability of children to borrow. On the one hand, the lack of attention paid to this topic may be a result of the strong presumptions about the impact of borrowing constraints on child labor. On the other hand, the study of the relation between borrowing constraints and child labor has been typically pursued in models that allow for closed form solutions and hence require a set of simplifying assumptions that precludes allowing for borrowing constraints to impact simultaneously on different generations of agents. It is important to evaluate separately the impact of these borrowing constraints as it allows for a better understanding of their implications but more importantly because they can result in different policy recommendations. If borrowing constraints on parents and children have a negative welfare impact on child labor and welfare, we should set up policies that replicate, in the constrained economy, the allocation of resources that would be obtained in an unconstrained economy. For example, Becker and Murphy (1988) defend that welfare policies should replicate social arrangements that in the past implemented the allocation of resources that would be obtained in the presence of complete markets. Rangel (2003) and Boldrin and Montes (2005) argue that public funding of education and social security policies can be set up to mimic the unconstrained equilibrium. However, if only the credit constraints to parents have a negative welfare impact, the policy recommendations should focus on implementing public policies that mitigate the negative impact of these specific constraints such as developing credit markets.
without lifting restrictions on borrowing by children.

I show that, in a simple overlapping generations model where children work to fund their consumption and education, a borrowing constraint that affects both children and parents can decrease child labor and increase welfare. As in Baland and Robinson (2000) who focus on the short-run implications of incomplete capital markets in an environment where children invest in human capital accumulation, I find that borrowing constraints raise child labor in the short-run. However, the long-run analysis generates contrasting results as liquidity constraints reduce the long-run incidence of child labor. The increase in savings, resulting from the borrowing constraints, offsets the consequent decrease in human capital and make agents wealthier in the long-run. The ensuing increase in parental transfers compensates children for the decline in borrowed resources, generating a decrease in their supply of labor. Furthermore, as in Soares (2008), constraining borrowing is welfare improving and, even when it leads to an increase in child labor, the impact of a borrowing constraint on social and children’s welfare is positive both in the short and in the long-run. A borrowing constraint forces an increase in the affected agents’ savings and induces an increase in inter-vivo transfers from their parents, leading to an increase in their welfare as well as in the average levels of welfare in the short-run and in the long-run.

So, not only borrowing constraints are not sufficient for supra-optimal levels of child labor to occur in standard overlapping-generations environments with altruism, as was the case in the environment in Baland and Robinson (2000), but these constraints might actually be welfare improving and can contribute to the reduction of child labor in the long-run.

When I study the impact of a borrowing constraint on parents in an environment where children are never allowed to borrow, the findings are in line with the related literature. The channel described above does not emerge in this case. When children cannot borrow, inter-vivo transfers between parents and their adult offspring are in a corner solution and do not respond when the constraint on parents is introduced. Hence the negative impact on welfare of a constraint on parents’ ability to borrow is contingent on the constraint on children’s ability to borrow as well as on the non-negativity constraint on inter-vivo transfers between adults.

The paper is organized as follows. In Section 2, I present the economic environment. In section 3, the parameters of the economy are calibrated to match long run features of the US economy.
Section 4 presents and analyses the different equilibria. Finally, section 5 concludes and suggests some directions for future research.

2 The Economic Environment

I study an economy where a large number of identical agents are born in each period and live for \( T \) periods, first as children then as adults. Individuals maximize their discounted lifetime utility, which, for an agent born in period \( t \), is given by

\[
V_{1,t} = \sum_{i=1}^{T} \beta^{i-1} U(c_{i,t+i-1}, l_{i,t+i-1}) + \beta \beta_a f V_{1,t+1},
\]

(1)

where \( \beta > 0 \) is the intertemporal discount factor, \( c_{i,t} \) is consumption and \( l_{i,t} \) is leisure of an \( age - i \) individual in period \( t \). Agents are assumed to have \( f \) children in the second period of their lives and \( \beta_a \in [0, 1/(\beta f)] \) is the discount factor for their offspring’s lifetime utility. The share of \( age - i \) individuals in the population, given by the measure \( \mu_i \), \( i = 1, 2, ..., T \), is constant over time and \( \mu_{i+1} = \mu_i/f \), with \( \sum_{i=1}^{T} \mu_i = 1 \). The “momentary” utility function is assumed to take the constant relative risk aversion form of a Cobb-Douglas consumption-leisure index,

\[
U(c, l) = \frac{(c^\sigma l^{1-\sigma})^{1-\rho}}{1-\rho},
\]

(2)

where \( \rho \) is the coefficient of risk aversion, and \( \sigma \) is the coefficient of consumption on the Cobb-Douglas index.

Individuals have one unit of time each period to allocate to leisure and work. In the first period of their lives, they can also allocate time to education. In period \( t \), \( age - i \) agent supplies \( h_{i,t} \) hours of labor to earn \( w_t h_{i,t}s_{i,t} \) where \( w_t \) and \( s_{i,t} \) are the real hourly wage rate per unit of human capital and \( age - i \) agent’s level of human capital in period \( t \), respectively.

The budget constraint facing an individual of age \( i \) at time \( t \) is described by

\[
a_{i+1,t+1} = (1 + r_t)a_{i,t} - g_{i,t} + g_{i+1,t}/f + w_t h_{i,t}s_{i,t} - c_{i,t} - e_{i,t},
\]

(3)

where \( a_{i,t} \) represents the asset holdings of an \( age - i \) individual at the beginning of period \( t \), and \( r_t \).
denotes the rate of return on these assets. The variable $g_{i,t}$ denotes the resources given by an age $-i$ parent to her age $(i-1)$ children, so $g_{i+1,t}/f$ are the resources received by age $-i$ agent from her age $(i+1)$ parent. For simplicity, I assume that these transfers only occur in the second period of parents’ lives, when their offspring are children, in periods when their offspring are borrowing constrained, and in the last period of parents’ lives. Finally, $e_{i,t}$ describes private investment in education.

In regards to the strategic behavior of agents in the game played between parents and their children, I assume that parents and children are Cournot players, that is each agent takes as given the decisions of the other when making her own decisions, and analyze Nash-Cournot equilibria. According to O’Connel and Zeldes (1993) findings, as long as we assume that the offspring are Cournot players the equilibrium is the same whether we assume that parents are Cournot players, Stackelberg leaders or make all decisions in behalf of their children.

Gifts from older parents to their offspring cannot be negative. However, gifts from age $-2$ parents to children, $g_{2,t}$ can be negative. That is, age $-2$ parents can make children transfer resources to them which, in this environment, is equivalent to assume that parents manage all the family’s resources brought home by them and their children.

Children are born with a level of skills, $s_{1,t}$, and can accumulate human capital by going to school. The education process is represented by the following technology:

$$s_{2,t+1} = \theta e_{1,t}^{\eta_d} d_{1,t}^{\eta_e}.$$  \hspace{1cm} (4)

The level of human capital accumulated by each child increases with the time allocated to learning, $d_{1,t}$, and the level of physical resources invested in education, $e_{1,t}$. The parameters $\eta_d$ and $\eta_e$ are respectively the coefficients of time and physical resources in the learning technology while $\theta$ is the total factor productivity of the education process. Adults cannot accumulate human capital and their skill level are given by

$$s_{i,t} = \varepsilon_i s_{2,t-i+2} \quad \forall i = 3, ..., T,$$

where the sequence $\{\varepsilon_i\}_{i=3}^T$ captures the exogenous evolution of skills along an agent’s lifetime.

\footnote{By reducing the resources that children can allocate to education, borrowing constraints affect the accumulation of human capital. This can be crucial in determining the long-run impact of borrowing constraints as it affects future parents’ wealth and hence future parental transfers.}
A single good is produced using the following technology:

\[ Y_t = K_t^{1-\alpha} L_t^\alpha, \tag{5} \]

where \( \alpha \in (0, 1) \) is the labor share of output, and \( Y_t, K_t, \) and \( L_t \) are the levels of output, capital input and effective labor input, respectively.

The effective labor input is given by the number of hours worked by agents in the economy weighted by their levels of human capital,

\[ L_t = N_t \sum_{i=1}^{T} \mu_{i,t} s_{i,t} h_{i,t}, \tag{6} \]

where \( N_t \) is the population size in period \( t \).

The capital stock, equal to the aggregate asset holdings, depreciates at a constant rate \( \delta \) and evolves according to the law of motion,

\[ K_{t+1} = (1 - \delta)K_t + I_t. \tag{7} \]

A large number of identical competitive firms maximize profits, taking the wage, \( w_t \), and the interest rate, \( r_t \), as given and solve

\[ \max_{K_t, L_t} \Pi = Y_t - \delta K_t - w_t L_t - r_t K_t. \]

The corresponding first-order conditions yield:

\[ r_t = (1 - \alpha)(\frac{K_t}{L_t})^{-\alpha} - \delta, \tag{8} \]

\[ w_t = \alpha(\frac{K_t}{L_t})^{-1-\alpha}. \]

I first study the implications of borrowing constraints by comparing the equilibrium in the economy where children and parents can borrow against future income to the equilibrium in the economy where children and parents do not have access to credit markets. I then analyze the impact of a constraint on the ability of parents to borrow by comparing the equilibrium in the
economy where parents can borrow but children cannot to the equilibrium where neither children nor parents have access to credit markets.

3 Calibration

To solve the model numerically, I calibrate the model parameters so that the steady-state of the borrowing constrained economy matches observed values for the U.S. economy around 1870-80, when child labor laws had not been adopted. The calibration resorts mostly to observations for the period in question. For some parameter values, I have not found any sources for the 1870’s, and I use common parameterizations from the macroeconomics literature.

Agents in this economy live for six 10 years long periods. They become economically active at the age of 5 and full-time workers at age 15, working 50 years more to a total lifetime of 65 years.

Fertility Rate

The exogenous fertility rate is calibrated to match the average population annual growth rate in the US economy around 1860-90, 2.34% (US Department of Commerce).

Preferences

The value for the discount factor, $\beta$, is chosen so that the annual real interest rate is approximately 7.78%, the average ex-post real interest rate for the period 1870-1893 computed by Jovanovic and Rousseau (2005) using Commercial paper rates data from Homer and Sylla (1991) and implicit price deflator for GNP data from Berry (1988). The coefficient of consumption in the utility function, $\sigma$, is calibrated to 0.44 so that, on average, adult agents allocate 32.6% of their available time to work, corresponding to about 1600 hours a year assuming a net time endowment of 94 hours per week (see Ramey and Francis, 2006). The coefficient of relative risk aversion $\rho$ is set to the standard value, 2.

Altruism

As in Krueger and Donahue (2005), the altruism discount factor is chosen to target the average ratio of spending on education per child to GDP per capita in the US economy. The cost of an year of education per child in current dollars was $15.55 in 1870 and $12.71 in 1880 (US Department of Education, 1997) while the ratio of enrollment in kindergarten to grade 12 to 5- to 17- year olds
for those years was 57.04 and 65.54, respectively (see Goldin, 1999). The average level of GDP per capita in current dollars between 1869 and 1888 was $187.5 ($170 in 1870) (US Department of Commerce). So the altruism discount factor is chosen to match a ratio of spending on education per child to per capita GDP of 4.6%.

**Production Technology**

The coefficient of capital in the production function is the capital share of income reported by Williamson and Lindert (1980) for the US in 1871, 0.34. The annual depreciation rate, 3%, was taken from Williamson, 1974.

**Education Technology**

The coefficient of expenditures on education in the education production function, $\eta_e$, is set to 0.25. This value is above the value used in Fernandez and Rogerson (1994) which is based on the estimates for current levels of the elasticity of the increase in educational attainment with respect to spending per pupil. The reason is twofold: first the current estimates capture a broader definition of education, primary and secondary education, while this paper focuses on more basic levels of education achieved by the average children in the late XIXth century which have a higher return (see "Returns on education: an updated international comparison" and "Returns to Investment in Education: A Further Update" Psacharopoulos?), in addition a higher value for this parameter increases the willingness to borrow against future income and tends to make a borrowing constraint more costly. The total factor productivity in the education sector, $\theta$, is set to 10 and the coefficient of time allocated to education in the education production function, $\eta_d$, is calibrated to match the average percentage of available time dedicated to education. According to Goldin (1999) between 1869 and 1900 children attend school for 60 days per year on average. Assuming that, children that attend spend average 6 hours at school, the average percentage of time available allocated to education is about 7.36%.

Finally, the exogenous level of children’s skills, $s_1$, is selected to match the percentage of available time

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2If the level of children’s skills, $s_{1,t}$, is appropriately adjusted, total factor productivity in the education technology has only a scale effect; it does not affect the time allocations or factor prices and impacts on the absolute levels of all other variables by a factor of $\theta^{\frac{1}{1-\eta_e}}$. I chose its value to be 10 instead of 1 for computational reasons.
time children allocate to work. Carter and Sutch (1996) report a labor force participation rate in 1880 of 32% for boys and of 12% for girls which corresponds to an average participation rate of about 22%. If we assume that, on average, children that work supply 8 hours per day, the average time children spend working is of about 13% of the available time.

The sequence \(\{\varepsilon_i\}_{i=3}^T\), which describes the exogenous evolution of skills along an agent’s lifetime, is set to approximate the age specific endowments of efficiency units of labor from Hansen (1993).

The parameter choices for the benchmark model are summarized in table 1.\(^3\)

4 Findings

4.1 Impact of a borrowing constraint

In this section, I consider the impact on child labor of borrowing constraints that do not allow children nor their parents to borrow against future income.

To analyze the short-run as well as the long-run impact of the borrowing constraints on child labor and on welfare, I study the transition from the steady-state of the economy where agents can borrow to the steady-state of the credit constrained economy.

I first shut down the general equilibrium effects of the borrowing constraints and look at a partial equilibrium where I maintain the factor prices constant. I set the wage and interest rate to their equilibrium levels in the steady-state of the economy where children and parents can borrow.\(^4\) This allows me to study the impact of the borrowing constraints while abstracting from their pecuniary externalities. I then take into account the pecuniary effect of the borrowing constraints by looking at the general equilibrium where factor prices are endogenous.

The initial steady-state is shown in the first column of table 2. Children and parents are net borrowers, parental transfers are relatively small, and children allocate about 21% of their available time to work. Upon the introduction of the borrowing constraint, the economy converges to the steady-state represented in the third column, in partial equilibrium, and to the one described in the fourth column, in general equilibrium.

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\(^3\)The equilibria are found by solving for the optimality first order conditions and the market equilibrium conditions using a standard non linear equation solver. An Appendix describing details of the computational procedure is available on request.

\(^4\)Using this economy as a benchmark allows for a straightforward analysis of the short-run and long-run impacts of the incidence of the borrowing constraint.
4.1.1 Partial Equilibrium:

In the initial steady-state, although both children and parents are net borrowers, agents improve their net asset position in the second period of their lives. Once children are not allowed to borrow, future age-2 agents do not have to repay any debt and become net lenders (see figure 1 panel f). Therefore, in partial equilibrium, after the initial period, the borrowing constraint is binding only for children. This will not be the case in general equilibrium, as we will see later.

When the borrowing constraints are introduced, the transfers from parents increase significantly (see figure 1 panel a). Parents care about the lifetime utility of their children and give them more resources when the borrowing constraint becomes effective. Transfers from age 2 and age 3 parents to their borrowing constrained children increase immediately. Because I do not allow for parental transfers from age-4 and age-5 agents, there is an increase in bequests from age-6 parents to their offspring that trickles down the family line to the borrowing constrained agents. We can see in figure 1 panel f, that age-5 agent uses the bequest made by age-6 agent, $g_{6,1}$, to increase her savings, $a_{6,2}$, in order to increase next period’s bequests to current age-4, $g_{6,2}$. The current age-4 agent increases her savings in the initial period, $a_{5,2}$, and in the following period, $a_{6,3}$, to be able to increase her bequest to current age-3 agent, $g_{6,3}$. Finally, current age-3 agent increases her transfers to her children and decreases her savings drastically, implicitly borrowing against the bequests that will trickle down from her progenitors and that she will receive in the last period of her life.

Child labor, $h_{1,t}$, goes up with children’s non-labor resources, $g_{2,t}/f - a_{2,t+1}$. So, ceteris paribus, the increase in children’s savings resulting from a binding borrowing constraint, decreases children’s non-labor resources, $g_{2,t}/f - a_{2,t+1}$, and hence child labor. However, because the increase in children’s savings also affects the amount of resources they receive from their parents, its impact on the amount of labor supplied by children depends on the magnitude of the response of parental transfers. In the short-run when children’s savings, $a_{2,t+1}$, go up, parental transfers, $g_{2,t}/f$, also increase but by less than $a_{2,t+1}$ and therefore $g_{2,t}/f - a_{2,t+1}$ decreases. Thus, children increase the supply of labor in the short-run to supplement the transfers received from their parents and compensate for the shut-down of the borrowing market.

The initial decrease in resources available to children stemming from the borrowing constraint generates a drastic decrease in the resources allocated to education (figure 1 panels c and d).
As future parents’ wealth increases due to the increase in savings (figure 1 panel f) and despite the initial decrease in human capital, parental transfers to children increase further. As a result, the accumulation of human capital bounces up to its new steady-state level, which still remains significantly below its initial levels (figure 1 panel e and table 2) but contributes to a higher increase in parents’ wealth. In the long-run, the resulting increase in parental transfers to children more than offsets the decline in children’s resources due to their inability to borrow. That is, in the long-run, \( g_{2,t}/f - a_{2,t+1} \) increases and, consequently, children decrease the amount of labor supplied (see table 2). Moreover, agents are much better off in the steady-state of the economy with borrowing constraints (see figure 2 and table 2).

The findings also support the claim from Soares (2008) that by forcing an increase in children’s savings and inducing an increase in parental transfers, borrowing constraints can lead to an increase in children’s welfare as well as in the average levels of welfare both in the short-run and in the long-run.

Although the initial generations of children and age-2 parents become borrowing constrained, both generations are better off with the introduction of the borrowing constraints. With the increase in parental transfers, the credit constrained agents’ wealth increases leading to an increase in consumption and leisure, and their lifetime utility increases immediately, as shown in Figure 2 panel a and b. In fact, the borrowing constraints result in an increase in the net parental transfers received by all agents, except the oldest whose parents are no longer living. Consequently, in the period where the borrowing constraints take effect, all agents but age-6 agents’ welfare increases (see Figure 2). In order to increase transfers to their borrowing constrained offspring initial period parents raise their lifetime supply of labor (see Figure 1 panel b) and reduce their lifetime consumption. Thus, the “selfish” component of utility of the initial period’s older parents decreases. However, the significant rise in their offspring’s lifetime utility more than off-sets the previous effect and the lifetime utility of the initial period’s age-3 to age-5 agents increases slightly. Age-6 agents are the only ones that increase transfers to their offspring without benefiting from an increase in transfers from their parents and they bear the welfare cost of the introduction of the borrowing constraint; the increase in their offspring utility is not high enough to compensate for the decrease in their leisure and consumption levels. It is also clear, in Figure 2 panel c), that the
average lifetime utility of agents increases immediately in response to the borrowing constraint and the increase in welfare is stronger in the long-run. The intuition behind these results is described in more detail in Soares (2008).

As can be seen in Figure 3, individuals’ responses to the introduction of the borrowing constraint lead to a surge in savings resulting from the reduction in debt, while the aggregate level of human capital decreases considerably in the period following the imposition of the borrowing constraint rebounding to a level significantly below the steady-state. However, because of the decrease in the amount of hours worked, the rebound in the effective labor supply is not very sharp.

4.1.2 General Equilibrium:

In general equilibrium, the economy converges to an equilibrium where both children and parents are borrowing constrained. The changes in the aggregate variables impact on factor prices and consequently on agents’ decisions. As agents respond to the borrowing constraint by increasing their supply of labor, the effective labor supply increases significantly in the initial period (figure 4 panel b) resulting in a initial decrease in wage rates (figure 4 panel c). However, the initial increase in aggregate savings resulting from the borrowing constraint is sustained in general equilibrium and leads to a raise in physical capital and hence in wages. The increase in the wage rate raises labor income and the return to education. Consequently, parents’ income augments and wealthier parents transfer more resources to their offspring. In the long-run, the rise in parental transfers is stronger than in partial equilibrium and more than enough to compensate for the impossibility of borrowing, so children’s supply of labor decreases more substantially than when factor prices remain unchanged. In addition, children allocate a higher share of their resources to education. As a result, there is a significant increase in investment in education and, hence, in human capital which reinforces the increase in parent’s wealth and in parental transfers. Human capital converges to a level above the initial one and the decrease in child labor is more significant than what we saw in partial equilibrium.

Moreover, both in the short-run and in the long-run, physical and human capital levels are higher than in partial equilibrium, the rise in young agents’ and average welfare is also more significant (figure 6). However, the initial decrease in wages and subsequent decrease in real interest rates
makes the initial age-4 and age-5 agents worse off. Age-6 agents are worse off because they bear the burden of the increase in parental transfers, as in partial equilibrium, and also because their offspring are worse off.

An aspect of the impact of the borrowing constraints that will be crucial in the next section is that while the transfers from parents to children, $g_{2,t}$, increase significantly and permanently, the transfers from age – 3 agents to their offspring, $g_{3,t}$, only increase in the first period and are zero thereafter. Everything else constant, parents would prefer their children to be able to borrow. Although, they are willing to increase parental transfers to their credit constrained children, $g_{2,t}$, they would like to lend the additional transfer. That is they would like future transfers, $g_{3,t+1}$, to be negative by the amount of the additional transfer and the corresponding interest. Hence, the non-negativity restriction on parental transfers to adult offspring is crucial. Absent this restriction, parents would replicate the equilibrium of the economy where agents can borrow by lending additional resources to their offspring by increasing parental transfers and getting the repayment of the loan with interest through a subsequent negative parental transfer.

These findings expose a crucial effect of borrowing constraints on child labor that has not been accounted for in the literature: the increase in savings associated with the borrowing constraint generates an increase in the level of parental transfers. While leading to an increase in child labor in the short-run, a borrowing constraint generates a decrease in child labor in the long-run. This long-run relationship between borrowing constraints and child labor contrasts sharply with the one advanced by Baland and Robinson (2000), and cast doubt on the presumption that inadequate access to credit markets pushes children into the labor market in the long-run.

In the following section I focus on the impact on child labor of the type of a borrowing constraint that diminishes parents’ ability to borrow in an environment where children can never borrow. The purpose is to gauge whether credit market imperfections that only affect parent’s ability to borrow can also increase welfare and decrease child labor.

### 4.2 Impact of constraint on parents’ borrowing

I compute the transition from the steady-state of the economy where children cannot borrow but their parents can to the steady-state of the economy where no agent can borrow. I first look at a
partial equilibrium where I maintain the factor prices at their equilibrium levels in the initial steady-state. I then take into account the pecuniary effect of the borrowing constraint on individuals’ welfare by looking at the general equilibrium where factor prices are endogenous.

The initial steady-state is represented in the first column of table 3. Children cannot borrow while parents are net borrowers, parental transfers are sizeable and children allocate about 10% of their available time to labor. Upon the introduction of the borrowing constraint, the economy converges to the steady-states represented in the third and fourth column, corresponding respectively to the partial equilibrium and the general equilibrium.

4.2.1 Partial Equilibrium

In figure 7 panel a, we observe that when the borrowing constraint is introduced, the transfers from parents to children decrease significantly.

As mentioned previously, in the equilibrium where children are borrowing constrained, their parents, age-2 agents, are willing to increase parental transfers, however they would like their offspring to pay back the additional transfers and the corresponding interest. This means that age-3 agents would like to impose a transfer from their offspring, age-2 agents, by setting a negative parental transfer. Because of the non-negativity constraint on transfers between adults, they set parental transfers to zero. Once age-2 agents become credit constrained, their parents’ desired level of parental transfers increases, like we saw in the previous section, but because, in this case, the new desired level of parental transfers remains negative, there is no change in the actual level of age-3 agents’ parental transfers.

Consequently, when the borrowing constraint becomes effective age-2 agents have to decrease the resources they transfer to their children and children respond by increasing the amount of hours worked (figure 7 panel b), which is the standard result in the literature. It is important to underline however that this result depends on the joint impact of the constraint that affects parents’ ability to borrow and the non-negativity constraint on transfers between parents and their adult offspring.

The decrease in resources available to children generates a drastic decrease in the resources allocated to education (figure 7 panels c and d). As future parents’ wealth decreases due to the decrease in human capital (figure 7 panel e), parental transfers to children decrease further. As a result, human capital continues to decrease to its steady-state level, significantly below its initial
levels. In the long-run, the decrease in parental transfers to children, resulting from the decrease in parent’s human capital and their inability to borrow, is higher; consequently, the long-run amount of labor supplied by children is also higher (figure 7 panel b and and table 3). Assuming that financial development increases the ability of adults to borrow but does not affect the ability of children to borrow, which is legally constrained, these results replicate the empirical observations in Dehejia and Gatti (2005) who find a negative relation between the level of development of financial markets and child labor.

In the period where the borrowing constraint takes effect, all agents’ welfare decreases (see Figure 8). While children are worse off because they receive lower parental transfers, their parents are worse off because they cannot borrow against future income, they still do not get any transfers from their own parents, and their children are worse off. Older agents are not directly affected by the borrowing constraint, but their lifetime utility decreases for altruistic reasons as they care about their offspring’s well-being. After the initial period, children and parents’ welfare decreases further because of the decrease in human capital and the additional decrease in parental transfers. The observed increase in older agents well-being (figure 8 panels c-f) is due to the increase in the accumulation of assets resulting from the borrowing constraint. Because age-2 agents can no longer borrow, they do not have to repay the debt and can accumulate higher levels of assets, as can be seen in figure 7 panel f). Agents born in the steady-state of the economy where parents cannot borrow (see figure 8 panel a and and table 3) are much worse off.

In figure 9, we observe that the borrowing constraint generates an increase in aggregate assets, and a considerable decrease in the aggregate level of human capital. In the initial period, the increase in the amount of hours worked results in a surge in the effective labor supply, afterwards the effective labor supply drops sharply.

4.2.2 General Equilibrium

The effective labor supply increases significantly in the initial period (see figure 10 panel b) resulting in a initial decrease in wage rates in general equilibrium (see figure 10 panel c). The increase in aggregate savings leads to a subsequent raise in physical capital. The increase in physical capital together with the decrease in human capital generate a rise in wages. The increase in the wage rate raises labor income and the return to education. Consequently, parents’ income augments
which lessens the decrease in parental transfers. As a result, there is a significant rebound in the investment in education and, hence, in human capital (see figure 11 panels c, d and e) which further reduces the decrease in parental transfers. Human capital rebounds, although to a level still significantly below the initial one, and the increase in child labor is less significant than what we saw in partial equilibrium.

The levels of physical and human capital are higher than in partial equilibrium and the increase in physical capital is such that the levels of welfare rise significantly (see Figure 12 and table 3) in the long-run\textsuperscript{5}. The initial decrease in wages and subsequent decrease in real interest rates makes the initial age-4 and age-5 agents worse off, which then makes age-6 agents worse off for altruistic reasons. But the initial age-2 agents are now better off; they benefit from the future increase in wages.

\section{Final Comments}

In this paper, I found that, as in Baland and Robinson (2000), in an overlapping generations model with altruism, borrowing constraints raise child labor in the short-run. However, liquidity constraints might reduce child labor in the long-run. This result stands in sharp contrast to most of the existing literature on the relation between credit constraints and child labor. Furthermore, as in Soares (2008) and contrary to the prevalent intuition, I found that constraining the economy is welfare improving and, even when it generates an increase in child labor, the impact of a borrowing constraint on social and children’s welfare is positive both in the short and in the long-run. Therefore, not only the conditions advanced by Baland and Robinson (2000) are not sufficient for supra-optimal levels of child labor to occur in standard overlapping-generations environments, but borrowing constraints might actually be welfare improving, and contribute to the reduction of child labor in the long-run.

However, I also found that a constraint on parents’ ability to borrow, given that children are always borrow constrained, increases child labor and decreases welfare in the short-run and long-run.

The importance of these findings for public policy is clear. While improving financial markets

\textsuperscript{5}This effect is well-known and was analyzed in Altig and Davies (1989), although in a model without human capital accumulation.
is desirable, as it will increase the ability of adults to borrow against future income, often recom-
mended policies that seek to replicate the unconstrained equilibrium in constrained economies are
not desirable from the point of view of a social planner that wants to maximize average welfare.

While this paper extends our understanding of the implications of borrowing constraints on
child labor, the present framework abstracts from several features that are potentially interesting.

Having endogenized child labor and human capital education, it is then natural to also include
harmful forms of child labor by allowing for endogenous changes in health. However, the qualitative
results in that case should not differ from the ones in this paper which are driven mostly by the
nature of the game played between parents and their children.

Moreover the argument provided in this paper for the borrowing constrained equilibrium means
that the constraint on borrowing is at most a second-best solution and not an optimal policy. Al-
though the first-best is not achievable through purely redistributive policies in the unconstrained
economy, as changes in parental transfers would offset those policies, once there are binding con-
straints on borrowing, an appropriately designed transfer policy might place the economy at the
social optimum.
References


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Understanding Poverty, New York: Oxford University Press.


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[34] Williamson, J. G. (1974), Late Nineteenth-Century American Development: A General Equi-
6 Tables and Figures

### Table 1 - Calibration

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### Table 2

**Impact of a Borrowing Constraint**

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<th>Partial Eq.</th>
<th>General Eq.</th>
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Table 3

Impact of a Constraint on Parents’ Borrowing

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<th>Borrowing Constrained Economy</th>
<th>Partial Eq.</th>
<th>General Eq.</th>
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<td>Skills</td>
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<td>Labor</td>
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Figure 1: Borrowing Constraint - Individual Variables along Partial Equilibrium Path
Figure 2: Borrowing Constraint - Welfare Levels along Partial Equilibrium Path
Figure 3: Borrowing Constraint - Aggregate Variables along Partial Equilibrium Path
Figure 4: Borrowing Constraint - Aggregate Variables along General Equilibrium Path
Figure 5: Borrowing Constraint - Individual Variables along General Equilibrium Path
Figure 6: Borrowing Constraint - Welfare Levels along General Equilibrium Path
Figure 7: Borrowing Constraint on parents - Individual Variables along Partial Equilibrium Path
Figure 8: Borrowing Constraint on parents - Welfare Levels along Partial Equilibrium Path
Figure 9: Borrowing Constraint on parents - Aggregate Variables along Partial Equilibrium Path
Figure 10: Borrowing Constraint on parents - Aggregate Variables along General Equilibrium Path
Figure 11: Borrowing Constraint on parents - Individual Variables along General Equilibrium Path
Figure 12: Borrowing Constraint on parents - Welfare Levels along General Equilibrium Path