The Macroeconomics of Child Labor Regulation*

Matthias Doepke
UCLA

Fabrizio Zilibotti
Institute for International Economic Studies

May 2005

Abstract

We develop a positive theory of the adoption of child labor laws. Workers who compete with children in the labor market support the introduction of a child labor ban, unless their own working children provide a large fraction of family income. Fertility decisions lock agents into specific political preferences, and multiple steady states can arise. The introduction of child labor laws can be triggered by skill-biased technological change that induces parents to choose smaller families. The theory can account for the observation that in Britain regulations were first introduced after a period of rising wage inequality, and coincided with rapid fertility decline.

*An earlier version of this paper was presented under the title "Voting with Your Children: A Positive Analysis of Child Labor Laws." The authors thank two anonymous referees, along with Richard Blundell, Moshe Hazan, Narayana Kocherlakota, Dirk Krueger, Robert Lucas, Yishay Maoz, Kiminori Matsuyama, Lee Ohanian, Torsten Persson, Victor Rios-Rull, Richard Rogerson, Jean-Laurent Rosenthal, Ken Sokoloff, Nancy Stokey, Kjetil Storesletten, and seminar participants at several conferences and workshops for helpful comments. We also thank Christina Loennblad for editorial assistance. Doepke acknowledges financial support from the National Science Foundation (grant SES-0217051). Zilibotti acknowledges financial support from the the Bank of Sweden Tercentenary Foundation and from the Jan Wallander's and Tom Hedelius' Research Foundation. Matthias Doepke and Fabrizio Zilibotti are, respectively, a research affiliate and a research fellow of the CEPR. Doepke: Department of Economics, UCLA, 405 Hilgard Ave, Los Angeles, CA 90095. E-mail address: doepke@econ.ucla.edu. Zilibotti: IIES, Stockholm University, SE 10691 Stockholm, Sweden. E-mail: fabrizio.zilibotti@iies.su.se.

The aim of this paper is to develop a positive theory of child labor regulations (CLR). In the current political debate, the need to regulate child labor is often taken for granted: child labor is portrayed as an evil that ought to be eradicated for humanitarian reasons. From a historical perspective, however, this view of child labor is of a relatively recent origin. In Western countries, until the nineteenth century most children worked, and working was generally considered to be beneficial for children. Much more feared than child labor was its opposite, idleness of children, which was thought to lead to disorder, crime, and lack of preparation for a productive working life.[1] Opposition to child labor and, ultimately, child labor laws arose only after the rise of the factory system. CLR were first introduced in Britain in the nineteenth century, and have by now been put into place in all industrialized countries. In contrast, in many developing countries child labor continues to be widespread, CLR are either lacking or weakly enforced, and public support for the introduction of stringent CLR is low.

These observations raise the question of why in some countries attitudes towards child labor shifted over time and led to the adoption of CLR, whereas in other countries child labor continues to be the accepted norm. In this paper, we argue that a society's views on child labor depend on economic incentives. In our theory, the main motive that leads some people to support CLR is the drive to limit competition: unskilled workers compete with children in the labor market, and therefore stand to gain from higher wages if child labor is restricted. In this sense, we regard CLR as similar to other forms of labor regulation. There is, however, a key feature that distinguishes CLR from labor restrictions aimed at, say, union outsiders or foreign workers: in the case of child labor, the potential competition comes at least partly from inside the unskilled workers' families. For this reason, workers' attitudes regarding CLR depend not only on the degree to which they compete with children in the labor market, but also on the extent to which their family income relies on child labor.

We analyze the implications of this tradeoff for the political economy of CLR within a dynamic general equilibrium model. The model economy is populated by overlapping generations of altruistic agents who choose their family size (fertility) and the education of their children, facing a Beckerian quantity-quality tradeoff. The al-

[1]Similar arguments were still to be heard in the twentieth century. Opponents of a child labor bill discussed by the state legislature of Georgia in 1900 argued that the "danger to the child was not in work, but in idleness which led to vice and crime." (Davidson 1939, p. 77). The bill was defeated.

ternative to education is child labor. We assume that working children compete with unskilled adults in the labor market;[2] more precisely, the participation of children in the labor market increases the wage of skilled workers and reduces the wage of unskilled workers.

CLR, in the form of a ban on child labor, are introduced when a majority of the adult population supports them. When deciding whether to support or oppose CLR, adults weigh two effects. First, child labor provides income for parents whose children are working. Second, CLR affect current and future wages. Skilled workers are opposed to CLR, since excluding children from the labor market lowers skilled wages. Unskilled workers (the "working class") face a tradeoff: they weigh the loss of child labor income against the positive effect on adult unskilled wages. This tradeoff can lead to divided opinions on child labor within the working class. Young unskilled workers who have not yet chosen fertility have a margin of adjustment: if child labor is banned, they can opt to have smaller families and educate their children. Most adults, however, have already decided on their number of children in the past, and are stuck with a given family size. This affects their views on CLR. In particular, the potential loss of child-labor income is especially severe for workers who have many children.

We show that the irreversible nature of fertility decisions can lead to multiple politico-economic steady states. In one steady state, child labor is legal, unskilled workers have many working children, and there is little support for the introduction of CLR. In the other steady state, child labor is banned, families are small, and CLR enjoy wide support. In each case, the existing political regime induces fertility decisions that lock parents into supporting the status quo. The existence of multiple steady states can explain why some developing countries persistently get locked into equilibria where a large proportion of children work and political support for the introduction of CLR is weak, while other countries at similar stages of development have strict regulations and a low incidence of child labor. [3]

[2]The fact that child labor and adult labor are substitutable has been documented by Levison, Anker, Ashraf, and Barge (1998) in a case study of India's carpet making industry, among others. This particular industry is an important example, because carpet making is one of the areas where it is often claimed that children perform specialized tasks due to a productivity advantage over adults related to their dexterity and "nimble fingers." Contrary to these claims, the authors document that adult and child workers perform similar tasks, and are about equally productive at them.

[3]Weiner (1991) provides an example of the political lock-in discussed in this paper. He argues

Historically, we observed a change in attitudes towards child labor after the industrial revolution, and a growing pressure of the union movement for CLR. How can this change be explained? According to our theory, the political support for CLR can rise over time if the return to education increases.[4] In an economy where all children of unskilled parents initially work, a steady, gradual increase in the return to schooling eventually induces some of the newly-formed families to have fewer children and send them to school. The proportion of small families keeps increasing until, eventually, a majority of the unskilled workers support CLR. This explanation for the introduction of CLR is consistent with the observation that CLR were first introduced in Britain (as well as in other Western countries) in the nineteenth century after a period of increasing wage inequality. Moreover, the introduction of CLR was accompanied by a period of substantial fertility decline and an expansion of education, which is again consistent with the theory.

A key prediction of the model is that the change in workers' attitudes towards CLR occurs gradually. During the early stages of the transition, the working class does not back CLR unanimously, since families with many children continue to depend on child labor. We would therefore expect to observe conflicting opinions about CLR within the working class before and right after the introduction of CLR. Consistent with these predictions, Cunningham (1996) observes that during the introduction of the first restrictions in Lancashire "child labor found its strongest and most persistent advocates within the working class, much to the embarrassment of trade union leaders." Similarly, when restrictions on child labor were proposed in the mill villages in the southern U.S., many workers, particularly those with large families, were opposed precisely because their own children were working: "For an adult male operative whose entire family worked in the mill, factory legislation would reduce family income. Such operatives tended to oppose child labor laws" (Nardinelli 1990 p. 142).

Our emphasis on the attitudes of unskilled workers is motivated by the observation that in Britain as well as the United States, the trade union movement played

that in India there is little political pressure to ban child labor, in spite of high child labor rates and widespread child illiteracy. The resistance against passing and enforcing child labor laws is shared among politicians with different ideological motivations. In contrast to other countries, even trade unions do not promote the introduction of regulations, because CLR would be unpopular among poor workers with large families.

[4]The underlying driving force can be either skill-biased technological change or the partial disappearance of specialized tasks for children. The latter has been argued to be an important feature in the second half of the nineteenth century (see Kirby 1999, 2003).

a key role in lobbying for the introduction of CLR.[5] According to Nardinelli (1990), the unions' actions were driven mainly by a concern about children competing with unskilled adults in the labor market, and therefore exerting downward pressure on wages. A natural question to ask is whether the labor movement had the political strength to impose its desired child labor policy. A thorough investigation of the role of political institutions is beyond the scope of our analysis. We note, however, that in spite of the limited voting rights of the poor in the nineteenth century, unions were able to achieve improvements in labor legislation in favor of their members (such as shorter working hours, safety regulations etc., see Marimon and Zilibotti 2000) through other actions such as strikes or public campaigns. A complementary argument is that the same forces that led unions to campaign for CLR also led other, politically powerful groups to weaken their resistance against restrictions. We examine this possibility in an extension that analyzes the effect of skill-biased technological change on capitalists' views on CLR.

In the next section, we relate our work to the existing literature. Section 2 describes the model economy. In Section 3 we analyze steady states for fixed policies and provide conditions for existence and uniqueness. Political economy is introduced in Section 4, where we provide conditions for the existence of multiple steady state political equilibria (SSPE). Section 5 demonstrates how exogenous changes in the skill premium can trigger the introduction of CLR, and Section 6 considers how capital owners are affected by this transition. Section 7 concludes.

1 Related Literature

A number of authors have recently developed arguments about why ruling out child labor might be socially desirable. In Basu and Van (1998), CLR can be beneficial be-

[5] In Britain, some regulation of child labor was introduced as early as 1802 with the "Factory Health and Moral Acts" targeted at apprentices in the cotton and woolen industries. The first effective regulation of the employment of children was introduced with the Factory Acts of 1833, but the scope of the restriction was limited to the textile industry. A series of Factory Acts extended the restrictions first to the mines, in 1842, and then to other non-textile industries in the 1860s and 1870s. While humanitarian organizations were a major driving force behind the first regulations, the labor unions were the main supporters of additional legislation in the second half of the nineteenth century. CLR came later in the U.S., with state regulation being introduced mainly between 1880 and 1910, and federal statutes starting to appear between 1910 and 1920.

cause parents dislike child labor, but have to send their children to work if their income falls below a subsistence level. Ruling out child labor can increase the wage sufficiently to push family incomes above the subsistence level even when children do not work. The model is extended by Bardhan and Udry (1999, Ch. 4) to incorporate a fertility decision. They show that multiple equilibria with different fertility rates can emerge if preferences are such that poor parents send their children to work, while richer parents do not. Both models feature static multiple equilibria in the labor market, and CLR can be used to select the "good" equilibrium, ruling out the possibility of a coordination failure. In contrast, our model has a unique equilibrium in the absence of regulation, and the multiplicity of steady states relies on a politico-economic mechanism that is not present in the existing literature.[6]

Other reasons why child labor may be inefficient are presented by Baland and Robinson (2000), Dessy and Pallage (2001), and Ranjan (2001), who explore the role of imperfections in financial markets and additional forms of coordination failure. Krueger and Tjornhom (2004) study, as we do, the distributional conflicts associated with the introduction of CLR. However, they focus on human capital externalities and abstract from fertility choice and endogenous policies. Basu (1999) and Brown, Deardorff, and Stern (2003) provide recent overviews of the economic literature on child labor.

An important empirical question is whether CLR actually mattered, in the sense of being binding or legally enforced. A number of studies have assessed the effects of legal restrictions on labor supply and the education of children. Peacock (1984) documents that the British Factory Acts of 1833, 1844 and 1847 were actively enforced by inspectors and judges, resulting in a large number of firms being prosecuted and convicted from 1834 onwards. Galbi (1997) finds that the number of children employed in English cotton mills fell significantly after the introduction of the restrictions in the 1830s. Moving to the U.S., Acemoglu and Angrist (2000) use state-by-state variation in child labor laws to estimate the size of human capital externalities. Using data from 1920 to 1960, their results suggest that CLR were binding in most of this period. Similar findings are reported by Lleras-Muney (2002) and Angrist and Krueger (1991), who show that compulsory schooling laws had a significant effect on schooling in

[6]Related political-economy papers in which policy-contingent choices by private agents induce a status-quo bias include Coate and Morris (1999) and Hassler et al. (2003, 2005). We believe that fertility choice provides a particularly powerful lock-in mechanism, because having a child is a an irreversible decision with long-term consequences for a family's opportunities.

the twentieth century. Margo and Finegan (1996) focus on earlier data from the 1900 census, and find that the combination of compulsory schooling laws with child labor regulation was binding in the sense that it significantly raised school attendance, while compulsory schooling laws alone had insignificant effects.[7]

To the extent that the introduction of CLR in our model coincides with a demographic transition, our analysis is related to a recent macroeconomic literature that examines the causes of fertility decline in the course of development. This includes Berdugo and Hazan (2002), Doepke (2004), Galor and Moav (2002), and Galor and Weil (2000).[8] The ultimate driving force behind the demographic transition in these models is similar to the skill-biased technological change that triggers the introduction of CLR in our theory, although we do not endogenize the source of technological progress. Our theory extends existing theories of demographic change by showing that fertility decline can trigger changes in social policies, which in turn accelerate the progress of the demographic transition.

Our theory is also related to Galor and Moav (2003), who use a model with financial market imperfections to show that an increase in the return to human capital may have induced capitalists to support education subsidies for the poor. Since CLR are an instrument to expand education, their theory implies that capitalists might also support CLR. We show in an extension that our theory has a similar prediction: CLR may benefit capitalists by inducing parents to educate their children, which increases the average skill of the work force. Unlike Galor and Moav, however, we choose to place most of the emphasis on the political preference of the working class, since historically unions rather than factory owners were the main active campaigners for CLR. Nevertheless, the success of the unions' actions may have been facilitated by diminished opposition from the industrialists. We therefore view explanations based on the attitudes of the working class versus the capitalists as complementary.

[7] However, Moehling (1999) finds a limited effect of state-by-state differences in minimum age limits from 1880 to 1910. In Section 5 we argue that, according to our theory, these results are consistent with binding CLR.

[8] Among these papers, Berdugo and Hazan (2002) is the most closely related to ours. Berdugo and Hazan discuss the effect of an exogenous change in CLR, and show that it may expedite the demographic transition and temporarily foster growth.

2 The Model

The model economy is populated by overlapping generations of agents differing in age and skill. There are two skill levels, high and low ($h \in \{S, U\}$), and two age groups, young and old. Agents age and die stochastically. Each household consists of one parent and her children, where the number of children depends on the parent's earlier fertility decisions. Adults die in each period with probability λ. Whenever a parent dies, her children become adult. As soon as they become adult, agents decide on their number of children. For simplicity, there are only two family sizes, large (grande) and small (petite) ($n \in \{G, P\}$, where G and P are integers).

All adults work and supply one unit of (skilled or unskilled) labor. Children may either work or go to school. Working children provide $l < 1$ units of unskilled labor in each period in which they work. Children in school supply no labor, and there is a schooling cost, p, per child. When they become adult, children who worked in the preceding period become skilled with probability π_0, whereas children who went to school become skilled with probability $\pi_1 > \pi_0$. For simplicity, we assume that only schooling received in the period before aging determines an agent's probability of becoming skilled. The education choice is denoted by $e \in \{0, 1\}$, where $e = 1$ corresponds to school and $e = 0$ to child labor.

In the model economy, all decisions are made by adults. Young adults choose once and for all how many children they want, and they also decide on the education of their children in the current period. Old adults are locked into the family size that they chose when becoming adult and, consequently, only choose the current education of their children, $e \in \{0, 1\}$. For an adult who has already chosen her number of children, the individual state consists of her skill level and her number of children. Adults are altruistic towards their children, in the sense that the children's future (adult) utility enters the parent's utility function. More precisely, V_{nh} denotes the utility of an old agent with n children and skill h. Preferences are defined over consumption c, discounted future utility in case of survival, and the average discounted utility of the children in the case of death. The utility of an agent with n children and skill h is given by

$$V_{nh}(\Omega) = \max_{e\in\{0,1\}} \left\{ u(c) + \lambda\beta z \left(\pi_e \max_{n\in\{G,P\}} V_{nS}(\Omega') + (1-\pi_e) \max_{n\in\{G,P\}} V_{nU}(\Omega') \right) \right\}$$
$$+ (1-\lambda)\beta V_{nh}(\Omega'), \tag{1}$$

where the maximization is subject to the budget constraint

$$c + pne \leq w_h(\Omega) + (1-e)\, nlw_U(\Omega).$$

Here, $u(\cdot)$ is an increasing and concave function, Ω is the aggregate state of the economy (to be defined in detail below), Ω' the state in the following period, w_h the wage for skill level h, and e denotes the education decision. Consumption is restricted to be nonnegative. The probability of survival is $1-\lambda$, and future utility is discounted by the factor β. With probability λ, an adult passes away and applies discount factor βz to the children's utility. The parameter z is allowed to differ from one, so that parents can value their children's utility more or less than they value their own future utility. For utility to be well-defined, we assume that $\beta z < 1$. With probability π_e, which depends on the educational choice e, the offspring will be skilled. After their skill has been realized in the next period, aging children will have the possibility of choosing their optimal family size, hence the term $\max_{n\in\{G,P\}} V_{nh}(\Omega')$.

The budget constraint has consumption and, if $e = 1$, the schooling cost on the expenditure side. The revenue side is made up of the wage income of the adult plus, if $e = 0$, the wage income of the n working children. Note that children do not consume, although this assumption could easily be relaxed. Once family size has been chosen by a young adult, the only remaining decision is whether to educate the children or send them to work. In making this decision, parents weigh the higher income and consumption that they can derive in the present when their children work against the additional expected utility that their children will enjoy in the future if they receive education.

The young adults' decision problem on fertility $n \in \{G, P\}$ is simplified by the fact that the number of children n does not enter utility directly, since they only care about their children's average utility. Parents will therefore have a large number of children only if they expect to send them to work, because in that case having more children results in a higher income. The model thus incorporates a particularly stark form of the quantity-quality tradeoff on which much of the economic literature on fertility choice is based. Despite the simple formulation adopted here, the model delivers one of the key implications of quantity-quality fertility models, namely that parents economize on family size when they invest heavily in the education of their children. This implication would still hold if parents also had some direct concern about family size, as long as for families who choose education for their children the motive to economize on the education cost is sufficiently strong.

We now move to the production side of the economy. The consumption good is produced with a technology that uses skilled and unskilled labor as inputs. The technology features constant returns to scale and a decreasing marginal product to each factor. Formally, we can write output per unskilled worker, y, as

$$y = f(x),$$

where $x \equiv X_S / X_U$ is the ratio of skilled to unskilled labor supply, and f is an increasing and concave function. Labor markets are competitive, and wages are equal to the marginal product of each factor:

$$w_S = f'(x), \qquad w_U = f(x) - f'(x)\,x. \tag{2}$$

The main role of the production setup is to generate an endogenous skill premium. Notice that skilled and unskilled labor enter the production technology in an essentially symmetric way. Apart from the fact that education makes a worker more likely to be skilled, the key feature that distinguishes the two types of labor is that children provide unskilled labor, and therefore are substitutes for unskilled adult workers. If child labor is restricted, the supply of unskilled labor falls, and therefore the unskilled wage rises. This wage effect is one of the key motives that determines agents' political preferences regarding CLR (the other motive being potential child labor income, which, in turn, depends on the number of children).[9]

We still need to determine the supply of workers at each skill level. It simplifies the

[9] The unskilled workers would never support child labor laws if child labor and unskilled labor were complements instead of substitutes. Interestingly, almost all early child labor laws in Europe and the U.S. explicitly excluded agriculture, where it is often argued that adult and child labor are indeed complementary.

exposition to restrict attention to economies where all children who do not work go to school. This is necessarily a feature of the equilibrium if the cost of education is sufficiently small. We will denote by x_{nh} the total number of adults of each type after family size has been determined by the young adults, and define

$$\Omega = \begin{pmatrix} x_{PU} \\ x_{GU} \\ x_{PS} \\ x_{GS} \end{pmatrix}$$

as the state vector.[10] The child labor supply is equal to

$$L = l\left(\left(1 - e_{GU}\right) x_{GU} + \left(1 - e_{GS}\right) x_{GS}\right) G + l\left(\left(1 - e_{PU}\right) x_{PU} + \left(1 - e_{PS}\right) x_{PS}\right) P, \quad (3)$$

where e_{nh} denotes the average educational choice of parents of type n, h. Here e_{nh} can be between zero and one if positive fractions of parents of type n, h decide to send their children to school and work, respectively. The supply of skilled and unskilled labor is now given by

$$X_S = x_{PS} + x_{GS},$$
$$X_U = x_{PU} + x_{GU} + L.$$

The state vector Ω follows a Markov process such that

$$\Omega' = \left(\left(1 - \lambda\right) \cdot I + \lambda \cdot \Gamma\left(\Omega\right)\right) \cdot \Omega, \quad (4)$$

[10]Note that young adults choose their family size at the beginning of the period, before anything else happens. After their choice, they become old adults. The state vector summarizes the number of workers of each type after this decision has been taken. Thus, formally, this decision is subsumed into the law of motion.

where I is the identity matrix, and $\Gamma(\Omega)$ is a transition matrix given by:

$$\Gamma(\Omega) \equiv$$
$$\begin{bmatrix} \eta_U(1-\pi_{PU})P & \eta_U(1-\pi_{GU})G & \eta_U(1-\pi_{PS})P & \eta_U(1-\pi_{GS})G \\ (1-\eta_U)(1-\pi_{PU})P & (1-\eta_U)(1-\pi_{GU})G & (1-\eta_U)(1-\pi_{PS})P & (1-\eta_U)(1-\pi_{GS})G \\ \eta_S\pi_{PU}P & \eta_S\pi_{GU}G & \eta_S\pi_{PS}P & \eta_S\pi_{GS}G \\ (1-\eta_S)\pi_{PU}P & (1-\eta_S)\pi_{GU}G & (1-\eta_S)\pi_{PS}P & (1-\eta_S)\pi_{GS}G \end{bmatrix}.$$

Here η_U and η_S denote the fractions of young unskilled and skilled adults choosing a small family, and π_{nh} is the fraction of children of type-nh parents who become skilled:

$$\pi_{nh} = e_{nh}\pi_1 + (1-e_{nh})\pi_0.$$

Γ is written as a function of Ω since the η_h and π_{nh} depend on the state of the economy.

We restrict attention to economies where the skilled wage is higher than the unskilled wage. In fact, we impose the stronger requirement that skilled adults always receive higher consumption than unskilled adults, even if the former choose a small family and educate their children, whereas the latter choose a large family of working children. To this aim, recall that wages are given by marginal products and depend on the ratio of skilled to unskilled labor supply. The highest possible ratio of skilled to unskilled labor supply is given by $\underline{x} \equiv \pi_1/(1-\pi_1)$, which yields the lowest possible wage premium. We then formalize the desired restriction by the following assumption.

Assumption 1

$$f'(\underline{x}) - pP > [f(\underline{x}) - f'(\underline{x})\underline{x}](1+Gl)$$

We are now ready to define an equilibrium for our economy. In the definition, we assume that the child labor policy is exogenous, i.e., the amount of unskilled labor l that children can supply is fixed. It is easy to extend the definition to the case of an exogenous but time-varying policy, by adding a time subscript to l and switching to a sequential definition of an equilibrium. Later on, we will also consider equilibria with an endogenous policy choice.

Definition 1 (Recursive Competitive Equilibrium) *An equilibrium consists of functions (of the state vector Ω) V_{nh} , e_{nh}, w_h, and η_h, where $n \in \{G, P\}$ and $h \in \{U, S\}$, and a law of motion m for the state vector, such that:*

- *Utilities V_{nh} satisfy the Bellman equation* (1)*, and education decisions e_{nh} attain the maximum in* (1)*.*
- *Decisions of young adults are optimal, i.e., for $h \in \{U, S\}$:*

$$\begin{aligned}
&\text{If } \eta_h(\Omega) = 0 : V_{Gh}(\Omega) \geq V_{Ph}(\Omega), \\
&\text{if } \eta_h(\Omega) = 1 : V_{Gh}(\Omega) \leq V_{Ph}(\Omega), \\
&\text{if } \eta_h(\Omega) \in (0,1) : V_{Gh}(\Omega) = V_{Ph}(\Omega),
\end{aligned}$$

- *Wages w_h are given by* (2)*.*
- *For $\Omega' = m(\Omega)$, the law of motion m satisfies* (4)*.*

We conclude the description of our theoretical framework with a discussion of the model assumptions. The modeling strategy is aimed at preserving analytical tractability while allowing a quantitative exploration of the economic issues analyzed. The model focuses on three dimensions of heterogeneity in the population: age, family size, and skills. Heterogeneity in family size and skills is essential to our theory, since it is along these dimensions that attitudes towards CLR differ across agents. Age heterogeneity is introduced to distinguish between three states of an individual: childhood, young adulthood (before fertility is chosen), and old adulthood (after fertility is chosen). The distinction between young and old adulthood is an essential ingredient as well, since it is the irreversible nature of fertility decisions (i.e., decisions that old adults made in the past) that locks agents into particular attitudes towards CLR, and ultimately gives rise to multiple politico-economic steady states. Our specific formulation with stochastic aging was chosen because it generates the three stages of life in a parsimonious way, while abstracting from additional life-cycle aspects that are unrelated to the issue at hand. As an alternative, the analysis could have been cast in a multi-period OLG model with deterministic aging. Such a model, however, would be much more complicated, since we would have to explicitly distinguish multiple periods of adulthood. In our stochastic formulation, in contrast, once fertility is chosen age does not matter, and families are only distinguished by their skill type and their number of children.[11] Despite the fact that stochastic aging is not realistic in a literal sense, the model captures the essential distinction between young and old adults.

A number of assumptions concerning the reproduction and upbringing process are motivated by tractability and by the desire to facilitate the computation of political equilibria. First, we assume that the fertility choice is made in the first period of adulthood. This assumption avoids complicated interactions between the age of an individual and the number of children she can have, which would dramatically increase the dimension of the state space. Second, we assume that a child ages only when her parent dies. Without this assumption, additional types of agents would have to be introduced (namely, parents without dependent children and orphans). The assumption can be justified economically if we interpret age not literally, but as a particular role in life that children have to fill once their parents pass away. Third, while the structure of the model entails a Beckerian quantity-quality trade-off, our setup differs from the standard altruistic family model of Becker and Barro (1988) in that, in our model, altruism does not depend on the number of children, and only two choices each for education and fertility are possible. Despite the simplifications, the key implications of our model are similar to richer models with a continuous fertility choice.[12]

The heterogeneity in skill is introduced in the form of a stochastic return to education (i.e., for some agents education turns out not to be effective). This is in our view a realistic description of the mapping between education and skill acquisition, which encompasses the more traditional model where education always leads to skill acquisition. Our more general specification is consistent with steady-state equilibria where

[11]We also could have cast the analysis in the framework of a stylized two-period OLG model, where agents have children in the beginning of the second period. However, in such a model, the entire adult population would be replaced in every period, preventing smooth demographic transitions accompanied by a gradual change of attitudes towards CLR. Moreover, static multiple self-fulfilling equilibria would be an endemic feature of such a specification.

[12]Doepke (2004) considers the choice of education versus child labor in an otherwise standard Barro-Becker model with skilled and unskilled workers. As in our model, unskilled workers are more likely to choose child labor, and fertility is higher conditional on choosing child labor. The main difference is that in Doepke (2004) the fertility differential is endogenous, while it is exogenously fixed in our setup.

One can interpret the large family size in our model as corresponding to a physiological upper bound on the number of children an individual can have. In our model, agents who do not educate their children would like to have as many children as possible, so this would be a corner solution of the fertility choice. The number of children in the small family can instead be related to the cost of rearing and educating children.

all agents educate their children, and allows us to characterize economies where, as in the real world, child labor disappears altogether. The assumption that skill is solely determined by education received in the final period of childhood (right before turning adult) also simplifies the analysis, because otherwise additional state variables would have to be introduced. The economic interpretation of this assumption is that skill is subject to depreciation, and therefore renewed education is necessary if skill is not immediately put to use. The basic mechanism in our model does not depend on this assumption, and we conjecture that a model where education takes place over multiple periods would lead to similar results.

3 Steady States with Fixed Policies

We begin the analysis of the model by examining steady states with exogenous policies.[13] A steady state is an equilibrium where the fraction of each type of adult in the population is constant, and a constant fraction η_U of unskilled parents decide to have small families. Define $N_t = x_{PU,t} + x_{GU,t} + x_{PS,t} + x_{GS,t}$ to be total number of adults. The steady-state fractions of a given type of adult is given by $\xi_j \equiv x_j / N$, the (column) vector of these fractions is denoted by $\Xi = \{\xi_{PU}, \xi_{GU}, \xi_{PS}, \xi_{GS}\}$, and the population growth rate is denoted by $g_t = N_{t+1}/N_t - 1$. Using this notation, in steady state the law of motion (4) specializes to

$$(1+g) \cdot \Xi = ((1-\lambda) \cdot I + \lambda \cdot \Gamma(\eta_U, \eta_S)) \cdot \Xi, \tag{5}$$

$$1 \cdot \Xi = 1. \tag{6}$$

Note that the transition matrix Γ is now written as a function of η_U and η_S only. This can be done because in steady state education decisions are fixed, as all agents with small families educate their children, while all agents with large families choose child labor. Equations (5) and (6) define a system of five linear equations in five unknowns, $\xi_{PU}, \xi_{GU}, \xi_{PS}, \xi_{GS}$ and g. The fractions η_U and η_S have to satisfy the usual equilibrium conditions. In Appendix A.2, we formally establish the following intuitive properties of steady states:

[13] In the analysis of this section, we assume child labor to be unrestricted. However, the analysis encompasses steady states with CLR, since ruling out child labor is formally equivalent to setting the parameter l (labor supply per child) to zero.

1. If at least some skilled parents choose to have large families, all unskilled parents strictly prefer the large family size; conversely, if at least some unskilled parents choose small families, all skilled parents have small families (Lemma 1).

2. In the solution of the system (5)–(6), the average population growth rate falls in the fraction of agents deciding to have small families (Lemma 2).

3. In the solution of the system (5)–(6), the fraction of skilled adults in the population strictly increases in both η_U and η_S, i.e., more education implies a larger skilled-to-unskilled ratio (Lemma 3).

The intuition for Lemma 1 is that since skilled adults have a higher income, their utility cost of providing education to their children is smaller. Therefore, skilled parents are generally more inclined towards educating their children than unskilled parents, and educating the children implies choosing the small family size. The lemma allows steady states to be indexed by the sum $\tilde{\eta} \equiv \eta_S + \eta_U$, where $\tilde{\eta} \in [0, 2]$ (recall that η_i is the fraction of adults of skill type i who choose to have small families). Furthermore, Lemma 3 implies the steady state skill premium is decreasing in $\tilde{\eta}$. [14] Five candidate types of steady states can be distinguished:

1. All agents educate their children, $\tilde{\eta} = 2$.

2. All skilled workers and a positive proportion of the unskilled workers educate their children, $\tilde{\eta} \in (1, 2)$.

3. All skilled workers and no unskilled workers educate their children, $\tilde{\eta} = 1$.

4. A positive proportion of the skilled workers and no unskilled workers educate their children, $\tilde{\eta} \in (0, 1)$.

5. No agents educate their children, $\tilde{\eta} = 0$.

In steady states with either $\tilde{\eta} = 2$ or $\tilde{\eta} = 0$, all agents behave identically. When $\tilde{\eta} = 2$, the wage premium is at its lower bound, all children receive an education, and all families are small. Conversely, when $\tilde{\eta} = 0$, the wage premium is at its upper bound,

[14] Note that whenever $\tilde{\eta}$ takes on an integer value, i.e., $\tilde{\eta} \in \{0, 1, 2\}$ all agents in (at least) one group strictly prefer one of the two educational choices. If $\tilde{\eta} \in (0, 1)$, skilled workers are indifferent, whereas if $\tilde{\eta} \in (1, 2)$, unskilled workers are indifferent.

all children work, and all families are large. In the steady state with $\tilde{\eta} = 1$, at the equilibrium wage, all unskilled parents have large families with working children, while skilled workers find it optimal to educate their children. Finally, when $\tilde{\eta} \in (1,2)$ or $\tilde{\eta} \in (0,1)$ either the skilled or the unskilled parents are just indifferent between having large uneducated or small educated families. The formal conditions for each of the steady states to obtain as an equilibrium are provided in the appendix.

We now analyze the conditions for the existence and uniqueness of a steady state. In particular, we show that under an additional condition that bounds the curvature of utility, a unique steady state exists. This can be done by establishing that, for all adult agents, the difference between the utilities from having a small educated versus a large uneducated family is strictly increasing in the wage premium.

The argument can be illustrated with the aid of Figure 1. In the plot, the downward-sloping schedule SS_1 represents the negative relationship between the wage premium w_S/w_U and $\tilde{\eta}$ that follows from Lemma 3. Intuitively, an increase in the relative supply of skills, parameterized by $\tilde{\eta}$, decreases the skill premium because of decreasing marginal returns to skilled labor in the production function. The piecewise linear schedule EE, in contrast, represents the optimal steady state educational choice of parents as a function of the wage premium.[15] In particular, for a range of low wage premia, all agents prefer not to educate their children ($\tilde{\eta} = 0$), because the returns to education are too low. For an intermediate range of wage premia, education is chosen only by skilled agents ($\tilde{\eta} = 1$). For a range of high wage premia, all agents prefer education ($\tilde{\eta} = 2$). Between these regions, there exist threshold wage premia $\underline{w}_S/\underline{w}_U$ and $\bar{w}_S/\bar{w}_U$ at which, respectively, either skilled workers ($\tilde{\eta} \in (0,1)$) or unskilled workers ($\tilde{\eta} \in (1,2)$) are indifferent.

A steady state is characterized by an intersection of the SS_1 and EE schedules, because here the fertility and education choices of the agents are optimal given the wage premium implied by these choices. If the difference between the utilities from educating or not educating children is strictly increasing in the wage premium, the thresholds $\underline{w}_S/\underline{w}_U$ and $\bar{w}_S/\bar{w}_U$ are unique, the EE schedule is monotonically increasing, and the

[15]Educational decisions not only depend on the ratio, but also on the level of both the skill and unskilled wage. In the particular case of CRRA utility and no cost of education ($p = 0$), the educational choice only depends on the ratio, however. While the figure is correct for a given technology, comparative statics (e.g., a change in the skill bias of technology that shifts the SS schedule while not affecting the EE schedule) are legitimate only under CRRA utility and $p = 0$.

SS_1 and EE schedules intersect exactly once, as in Figure 1. We then obtain a unique steady state.

In general, however, there could be multiple thresholds (i.e., the EE curve could be locally decreasing), implying the possibility of multiple steady states. While the threshold $\underline{w}_S/\underline{w}_U$ is always unique, there may be multiple thresholds $\bar{w}_S/\bar{w}_U$. The source of this potential multiplicity is the ambivalent effect of an increase of the skill premium on the incentives for unskilled parents to provide education for their children. On the one hand, a high skill premium renders education more attractive, since the utility derived from skilled children increases. On the other hand, a high skill premium also implies that unskilled parents earn a lower wage, which increases the utility cost of paying the fixed cost of education. If the curvature of utility is high, the latter effect may dominate, giving rise to the multiplicity.

The underlying cause for the possibility of multiple steady states in our model is closely related to the mechanisms described by Bardhan and Udry (1999), Kremer and Chen (2002), and Moav (2005). In what follows, we want to concentrate on an alternative source of multiplicity that arises only if CLR are endogenous. In order not to confuse the effects of endogenous CLR with more traditional sources of multiplicity, we now impose a parameter restriction that rules out multiple steady states in the absence of endogenous policies. Assumption 2 ensures, under CRRA preferences, the uniqueness of the steady state by imposing bounds on the curvature of utility in the relevant range.

Assumption 2

$$(1+Gl)\frac{1-\beta\left(1-\lambda\right)}{1-\beta\left(1-\lambda\left(1-z\left(\pi_1-\pi_0\right)\right)\right)} > \frac{u'(w_{U,2}-pP)}{u'\left(w_{U,2}(1+Gl)\right)}.$$

Given this assumption, the uniqueness of steady states in the absence of endogenous CLR can be established (the proof of the proposition is provided in Appendix A.3.).

Proposition 1 *Under Assumption (2) and CRRA preferences, there exists a unique steady state.*

Later on, we will analyze the effects of a shift in the skill bias of the technology on outcomes in a political economy framework. With the uniqueness of steady states established, we can use Figure 1 to assess the implications of such a change for the steady state given a fixed, exogenous child labor policy. Consider, for example, a Cobb-Douglas technology, where the skill bias can be parameterized by the share of output that is used to compensate skilled labor. Suppose that, initially, the share of skilled labor is low. The corresponding supply schedule is described by the SS_0 line, so that $\tilde{\eta} = 0$ obtains in the steady state. An increase in the share of skilled labor shifts the SS schedule to the right (i.e., the ratio of skilled to unskilled wages for any given relative supply of skills increases), while the EE curves remain unaffected. Thus, in the new steady state $\tilde{\eta}$ will be higher. If the supply schedule shifts to SS_1, in the new steady state all skilled and some unskilled workers educate their children, i.e., $\tilde{\eta} \in (1, 2)$. For a sufficiently large shift in the skill bias, all workers eventually educate their children (see schedule SS_2).

An increase in skill bias therefore induces more families to educate their children, even if child labor continues to be legal. We will see below that if CLR are endogenous, an increase in skill bias can also trigger the introduction of stringent CLR, even at a level of the skill bias where, absent regulation, many families would still find it optimal to send their children to work. Before turning to a transition of this type, however, we first need to discuss steady states with endogenous CLR.

4 Steady States with Endogenous Policies

So far, we have established that the model has a unique steady state when parents can choose freely whether to make their children work. Imposing a child labor ban corresponds to setting l to zero. More generally, we can think of CLR as equivalent to reducing the parameter l: for instance, CLR may impose restrictions on the maximum working hours or forbid the use of child labor in "dangerous activities" (e.g., mines) where children have a comparative advantage, forcing parents to shift child labor to other working activities. Therefore, the results of the previous section can be interpreted as showing that there is a unique steady state for any child labor policy that is exogenously fixed.[16]

[16]Note that decreasing l moves both the SS and the EE curves to the left in Figure 1. Thus, the wage premium unambiguously falls, whereas the effect on the educational choice is, in principle, ambiguous.

We now want to establish that multiple steady states can exist if CLR are determined endogenously. It is easy to construct examples where, for instance, all parents choose large families with working children ($\tilde{\eta} = 0$) if there are no CLR, but the introduction of CLR moves the economy to a steady state equilibrium where all parents choose small families with educated children ($\tilde{\eta} = 2$). Assume that the cost of schooling is infinitesimal ($p \to 0$) and that CLR takes the form of a complete ban, i.e., $l = 0$. Then, it is immediate that, under CLR, all parents would choose small families and send their children to school (in Figure 1, the EE line would be horizontal at $\tilde{\eta} = 2$). In the absence of CLR, an equilibrium with $\tilde{\eta} = 0$ holds if parents value the current consumption that can be derived from making their children work more than the additional expected utility their children would obtain through education.[17] This condition is satisfied if the weight z that parents attach to the utility of their children is sufficiently low. Thus, we can construct cases in which all families are small and children go to school if CLR are in place, whereas the steady state features widespread child labor if CLR are lacking.

While CLR was treated as exogenous in this example, the objective of this section is to establish the possibility of multiple steady states with different policies when the choice of policy is *endogenous*. In other words, in addition to showing that different child labor policies result in different steady-state behavior, we conversely need to establish that in each steady state the corresponding policy has the required political support. In order to carry out this analysis, we must specify a political mechanism in the model. We assume that CLR can be irreversibly introduced when a majority of adult agents support them.[18] This "referendum" decision is a stand-in for more

[17] The precise condition is given by equation (14) in the appendix. If preferences are logarithmic, for instance, this can be expressed as

$$\ln (1 + Gl) \geq \beta \lambda z \frac{\pi_1 - \pi_0}{1 - \beta (1 - \lambda)} \ln \left(\frac{w_{S0}}{w_{U0}} \right), \tag{7}$$

where the wage premium depends on G, π_0 and π_1, but not on the discount factor $\beta \lambda z$.

[18] The assumption that a policy reform is introduced with commitment, i.e., with the understanding that it cannot be reversed in future, is made to avoid complications related to repeated voting. This simplification is common in politico-economic models (see for example Boadway and Wildasin 1989). Within the political-economy literature, our approach is closest to Hassler et al. (2005), who define steady-state political equilibria (SSPE) in a way which is very similar to our definition below. Recently, a number of papers explicitly address dynamic voting by characterizing the set of Markov-perfect equilibria (e.g., Acemoglu and Robinson 2001 and Hassler et al. 2003). We conjecture that if we followed this alternative strategy, our main results would be unchanged, although the characterization would be more complicated.

complicated decision processes wherein different groups in society can exert political pressure to introduce restricting laws. A possible interpretation of our reduced-form political mechanism is that unions can impose their will on the issue of CLR. Unions represent the interests of all workers, and decide according to the will of the majority of their members, where the majority is unskilled.[19] This approach abstracts from institutional factors affecting the success of the unions' actions. Nevertheless, we regard it as useful to focus on the political attitude of unskilled workers, as in our model they are the only group that could potentially gain from (and that indeed historically supported) CLR. In short, our analysis pins down the conditions under which the "working class" supports the introduction of CLR. We will also ask the opposite question. Namely, would a majority in an economy where CLR have been in effect for a long time prefer that CLR be abandoned?

The main result of this section is that multiple steady states can arise. If the economy is initially in a steady state with no CLR, a majority of the adults (the skilled and some or all of the unskilled) will be opposed to the introduction of CLR. Conversely, if CLR are in place, a majority of the adults (some or all of the unskilled) will prefer to keep the restrictions in place. For simplicity, we will state the analytical results under the assumption that the child labor policy includes compulsory schooling.[20]

Definition 2 (Steady State Political Equilibrium) *A steady state political equilibrium (SSPE) consists of a child labor policy (child labor is either ruled out or not), an $\tilde{\eta} \in [0, 2]$ denoting the distribution of educational choices, utilities V_{PS}, V_{GS}, V_{PU}, V_{GU} of each type of family, a child labor supply L, constant fractions ξ_{PS}, ξ_{GS}, ξ_{PU}, and ξ_{GU} of each type of family, and a population growth rate g such that:*

(i) Given the policy, the steady state satisfies all equilibrium conditions in Definition 1.

(ii) A majority of adults obtain higher utility under the current child labor policy than if the opposite policy were permanently put into place.

From the perspective of old unskilled agents, CLR imply both gains (higher wages) and losses (no child labor income). The tradeoff determines whether they support

[19] We could alternatively assume that skilled and unskilled workers are unequally represented within the union. This would not change the qualitative results.

[20] If the CLR does not include a compulsory schooling provision, the result establishing multiplicity of steady states still goes through, but requires additional, if natural, assumptions on the production function.

CLR. The key factor leading to multiple SSPE is the lock-in in terms of family size decisions. The loss of child labor income is larger for families with many children. CLR induce smaller families who support CLR, while the absence of CLR induces larger families, who oppose CLR. Assume that unskilled agents are decisive (if skilled agents were decisive, there would be no equilibrium with CLR). Consider first an SSPE where child labor is unrestricted. In this steady state, unskilled families are large, and their children work. If CLR were introduced, there would be an immediate increase in the unskilled wage since children are withdrawn from the labor force. For the SSPE to be sustained, the gain from this general equilibrium effect must be more than offset by the loss of child labor income. The fact that families are large and earn a large fraction of their income from child labor makes it more likely that unskilled workers prefer the status quo. Conversely, in a candidate SSPE where child labor is banned families are initially smaller. If CLR were lifted, unskilled families would have little to gain from making their children work. Once again, agents would prefer the status quo (CLR in this case). Building on this intuition, Proposition 2, proven in Appendix A.3, formally establishes the existence of multiple SSPE.

Proposition 2 *There exists a non-empty set of parameters such that:*

(i) The old unskilled are the majority.

(ii) In the absence of CLR, the steady state features $\tilde{\eta} < 2$.

(iii) Both CLR and no CLR are SSPE.

We now illustrate the theoretical results obtained so far by analyzing steady states in a parameterized version of our economy. Table 1 displays the parameter values used. Preferences are CRRA with risk-aversion parameter $\sigma = 0.5$. The production function is of the constant-elasticity-of-substitution form

$$Y = [\alpha X_S^\kappa + (1-\alpha) X_U^\kappa]^{\frac{1}{\kappa}} .$$

The fertility values for small and large families are $P = 1$ and $G = 3$. A family of two would therefore have two children if they prefer education, or six children if they opt for child labor. This fertility differential approximates the fertility differential between mothers in the lowest and highest income quintiles in countries with widespread child labor, such as Brazil or Mexico (see Kremer and Chen 2002). The choice for λ implies that adults on average live for $6\frac{2}{3}$ periods. Assuming that a model period corresponds to six years, people survive 40 years on average after becoming adults. The probabilities $\pi_0 = 0.05$ and $\pi_1 = 0.4$ of becoming skilled are chosen so that the fractions of skilled agents in pre-industrial (i.e., where no children receive formal education) and post-industrial (i.e., where all children receive formal education) societies are, respectively, 5 percent and 40 percent. The choices of λ, π_0, and π_1 jointly imply that the old unskilled always constitute the majority of the population. β is chosen so that it implies a rate of time preference that would generate an annual interest rate of 4 percent per year (if assets could be traded), which is the standard basis for calibrating β in the RBC literature. The choice $l = 0.1$ for the supply of child labor implies that a large family with working children derives about a quarter of family income from children, which is in line with evidence from Britain in the period of early industrialization (Horrell and Humphries 1995) and recent data from developing countries. The elasticity parameter $\kappa = 0.5$ sets the elasticity of substitution half way between the Cobb-Douglas and the linear production technology. The weight α of skilled labor in the production function is left unspecified for now. We will use α to parameterize the skill premium and compute outcomes for a variety of α.

We start by determining which steady states and SSPE exist for different values of α. Recall from Section 3 that as long as Assumption 2 is satisfied, there is a unique steady state in the economy without CLR. Figure 2 displays the steady state $\tilde{\eta}$ as a function of α. For low α, the skill premium is low. Consequently, education is not very attractive, and there is a range of α where all parents prefer child labor ($\tilde{\eta} = 0$). As the skill premium rises, we reach a threshold for α at which a fraction of skilled adults educates their children ($\tilde{\eta} \in (0, 1)$), and ultimately all skilled parents choose education ($\tilde{\eta} = 1$). For even higher α, there is a wide region in which unskilled parents are indifferent between education and child labor ($\tilde{\eta} \in (1, 2)$). Throughout this region, higher α are offset by a higher supply of skilled labor, which keeps the unskilled parents indifferent. Ultimately, all parents educate their children ($\tilde{\eta} = 2$).

Figure 3 considers the model with endogenous policy choice, and shows which SSPE exist as a function of α. For low values of α, the only SSPE is no CLR. In other words, the return to education is so low that even a population of adults all of whom have small families would prefer to abandon CLR. For an intermediate range of α there are multiple SSPE: both CLR and no CLR are steady states supported by a majority of the population. In the range of multiplicity, in the absence of CLR at least a fraction of unskilled agents would choose child labor and large families. However, if CLR are already in place, unskilled parents are locked into having small families, and therefore prefer to keep CLR. As the wage premium increases, we enter a region where CLR is the only SSPE. In this region, even unskilled parents with large families prefer to introduce CLR. The immediate income loss after the introduction of CLR is made up for by higher unskilled wages in the present (because other parents' children can no longer work) and in the future (which they care about because they care for their children).

To establish that the multiplicity result depends on endogenous fertility choice, we also computed outcomes without fertility differentials by setting $P = G = 1$, i.e., families of working and educated children are of the same size. We still find that, for low α's, no CLR is an SSPE, and for high α's CLR is an SSPE. However, there is no overlap, i.e., there is no region where both policies be supported in steady state, since the policies no longer lock agents into different fertility choices. In fact, there is a region where neither policy is an SSPE. The reason for the non-existence of SSPE for some α is the endogenous skill premium. If CLR are in place, the supply of skilled labor is high, and the skill premium is low. The low skill premium makes child labor attractive relative to education, so that a majority are in favor of abandoning CLR. If there are no restrictions, however, the supply of skilled labor is low and the skill premium is high. This makes education more attractive, and increases the gain from removing other parents' children from the labor market. As a consequence, a majority are in favor of introducing CLR. The endogenous skill premium therefore works against multiplicity of steady states. In the model with endogenous fertility, this effect is overcome since parents choose a different family size in each political regime, which induces them to favor the status quo. Fertility choice provides a powerful lock-in effect, both because fertility decisions are irreversible, and because children are important economically: households with working children derive a substantial share of their income from child labor, whereas households with children in school need to spend a lot on the children's education.

We conclude this section with a brief discussion of the empirical implications of our analysis. According to our theory, countries can get locked into different political steady states, where one SSPE features high fertility, high incidence of child labor, and little political support for the introduction of CLR, whereas another SSPE features low fertility, low (or no) child labor, and widespread support for CLR. In today's developing countries, we observe large cross-country differences in child labor rates, even among countries that are at similar levels of income per capita. If our mechanism were an important factor behind cross-country variation in child labor rates, we would expect to find a positive correlation between fertility and child labor rates, even after controlling for other variables that might affect child labor or fertility. To examine the empirical validity of this prediction, we regressed child labor rates on fertility rates for a panel of 125 countries from 1960 to 1990, with observations at ten-year intervals, controlling for time dummies, $log(GDP)$, $log(GDP)$ squared, the share of agriculture in employment, and the share of agriculture in employment squared.[21] The coefficient on the fertility rate is positive and highly significant. The point estimate is 1.3, and the White standard error is 0.29 (the R^2 of the regression is 0.89).[22] The estimate implies that a one standard deviation increase in fertility is associated with an increase in the child labor rate of 2.5 percent (the child labor rate varies in the sample between 0 and 59 percent with a standard deviation of 15 percent). If we add a measure of income inequality (Gini coefficient), the point estimate of the effect of inequality on child labor is positive, but statistically insignificant. If, in addition, we include country fixed-effects, the coefficient on fertility becomes smaller (point estimate of 0.41, with a standard error of 0.20), but remains statistically significant.

The evidence of a positive correlation between fertility and child labor incidence across countries is only a preliminary step in providing empirical support for our theory. Ideally, one would like to find additional evidence based on cross-country

[21]The child labor rate is defined as the percentage of children aged 10–14 who are economically active. The total fertility rate is defined as the sum of age-specific fertility rates, i.e., the number of births divided by the number of women of a given age. The fertility rate and the share of agriculture in employment are from the World Bank Development Indicators, Ginis are from the Deininger-Squire data set, GDP per capita is from the Penn World Tables, and child labor rates are from the International Labour Organization. We control for the share of agriculture because it is well known that child labor is more widespread in the agricultural sector. We ignore endogeneity problems; the regression is simply meant to document correlation between the variables of interest.

[22]Similar results hold if one runs four separate cross-country regressions (i.e., one for each year). The coefficient on fertility is always positive and highly significant, except in 1960 when it is positive but not significant. Including measures of democracy does not change the results. An additional observation that is consistent with our lock-in prediction is that cross-country differences in child labor are highly persistent over time. To demonstrate this, we sorted countries into quintiles according to the size of the residual in the decade-by-decade child-labor regressions. Among the 20 percent of countries with the highest child labor rate relative to the predicted value, on average 71 percent are still in the highest quintile 10 years later. Over the entire period 1960 to 1990, we find that 85 percent of the countries in the highest quintile in 1960 are still in the top two quintiles in 1990.

comparisons of direct measures of CLR. This is far from straightforward since regulations (and their enforcement) are difficult to measure and compare across countries. Given this difficulty, a more thorough empirical investigation is left to future research.

5 Transitions: The Introduction of CLR

So far, we have shown that the interaction of fertility choice and political preferences can lead to a lock-in effect, resulting in multiple SSPE, either with child labor and high fertility or no child labor and low fertility. This feature of the model can explain why there is a great deal of variation in the incidence of child labor around the world, even when controlling for income per capita. However, we also need to explain why many countries have adopted child labor bans over the last two centuries, starting from a situation where child labor was common all over the world. In our model, a transition from no CLR to CLR is possible if technological change increases the skill premium, and therefore the return to education. If the increase in the return to education is large, even some unskilled adults will prefer to have small families and educate their children, which ultimately creates a majority in favor of the introduction of CLR.

This explanation of the introduction of CLR is consistent with evidence on the evolution of the skill premium in the U.K. before the introduction of CLR. Figure 4 shows that the ratio of skilled to unskilled wages increased sharply at the beginning of the nineteenth century.[23] The skill premium reached a peak in 1850, declined subsequently, and by 1910 it had returned to its 1820 level. To show how an increase of the skill premium can trigger the introduction of CLR in our model, we computed a transition path for an economy that starts out in the steady state without CLR, and then experiences a phase of skill-biased technological change (which can be parameterized as an increase in the technology parameter α). We chose the specific transition path such that in the steady state without CLR, the ratio of skilled to unskilled wages in the model matches the observed value of 2.5 in the U.K. around 1820 (see Figure 4).

[23] The skill-premium data, from Williamson (1985), is computed as the ratio of the wages in twelve skilled and six unskilled professions, weighted by employment shares. This data source is criticized by Feinstein (1988), who presents alternative estimates indicating a smaller hump in skill premia. Even a flatter profile of the skill premium, however, would indicate a significant increase in the demand for skills, given the simultaneous increase in their supply associated with rising education in the labor force.

This is achieved by setting the initial α to 0.33 (apart from α, the model is parameterized as in Section 4, see Table 1). The endpoint of the transition was chosen such that in the steady state with CLR, the wage ratio matches 2.5 as well, as in the data around 1910. This implies a final value for α of 0.65. Notice that in the new steady state with CLR there is a higher supply of skilled labor, so that α has to be higher than at the beginning of the transition to generate the same skill premium. In the computed transition path, α is at 0.33 until period 2, and then increases linearly until the maximum of 0.65 is reached in period 9. Given that one model period is interpreted as lasting six years, the simulations represent a phase of skill-biased technological change that stretches out over a little more than 40 years.

Generally, the problem of computing transitions paths with an endogenous policy choice is complicated. Agents' decisions depend on the entire path of expected future policies. Future policies therefore partly determine the evolution of the state vector of the economy which, in turn, affects the political preferences over these same policies. In principle, this interdependence can lead to multiple equilibria (not just multiplicity of steady states), or the nonexistence of equilibria. It turns out, however, that unique results are obtained for the parameterized version of our model. To limit the number of time paths of future policies, we assume that once CLR are introduced, they cannot be revoked.[24] Future policies can therefore be indexed by the period when CLR are introduced.

The conditions for the introduction of CLR to occur in a given period T can be checked as follows. We assume that the economy starts in the steady state corresponding to the initial value of α. First, we compute private decisions and the evolution of the state vector under the assumption that CLR are indeed introduced at time T. In period T, we check whether a majority prefer the introduction of CLR to the alternative. The relevant alternative here is not to never introduce CLR, but to expect their introduction at $T + 1$ (the skill premium and therefore the incentive to introduce CLR increases over time, therefore if T is the equilibrium switching time, *a fortiori* a majority in favor of the introduction of CLR also exists at time $T + 1$). We also must check that CLR are not introduced before T. Once more, because the incentive to

[24]We conjecture that in our specific application the results would not change if we allowed CLR to be revokable in later periods, because we focus on an episode where the skill premium is increasing over time, which together with the lock-in effect of endogenous fertility choice tends to increase support for CLR over time.

introduce CLR increases over time, it is sufficient to check that given the path for the state variable resulting from expecting the switch at T, there is still a majority opposed to introducing CLR at time $T-1$. In summary, for T to be an equilibrium switching time, conditional on agents expecting CLR to be introduced at time T, a majority must oppose CLR at time $T-1$, and a majority must prefer CLR at time T. Since the evolution of the state vector depends on the expected policies, there could be, in principle, multiple or none such switching times, but in our parameterization there is a unique switching time.

In the computed transition path, a majority continues to oppose the introduction of CLR in the first periods of the increasing skill premium. Beginning in period 5, however, all young unskilled adults start to choose education and small families, in response to the increasing skill premium and the expected future introduction of CLR. Old unskilled families are stuck with many children and therefore continue to choose child labor. In periods 5 and 6, the number of unskilled parents with small families is still too small to successfully lobby for a policy change, but in period 7, unskilled families with a small number of children form the majority of the population and decide to introduce CLR.

The solid line in Figure 5 displays the evolution of the skill premium during the transition with endogenous policy choice. Initially, the skill premium increases due to an increasing α. Once CLR are introduced and children are withdrawn from the labor market the skill premium drops, however, since the increase in α is offset by the smaller supply of unskilled labor. After α stops increasing, the skill premium declines further, as the number of skilled workers continues to increase. The introduction of CLR also leads to a sharp decline in population growth (Figure 6). Notice, however, that the decline in population growth starts before CLR are introduced, because young unskilled parents start to have small families already in period 5. The switch in the decisions of young unskilled parents also triggers an immediate decline in the supply of child labor, as shown by Figure 7. Thus, child labor declines even before CLR are introduced.

The dashed lines in Figures 5 to 7 show the outcomes that would have occurred without the endogenous introduction of CLR, i.e., under the assumption that child labor continues to be legal throughout. Even without the introduction of CLR, the increase in the skill premium ultimately induces some parents to educate their children, resulting in temporarily lower population growth, less child labor, and a reversal of the increase in inequality. At the same time, the decline in child labor is only a fraction of what is achieved with the introduction of CLR, and inequality remains much higher. Thus, in the model, neither technological change nor CLR are solely responsible for the decline in child labor; rather, both explanations are complementary. Given that the child labor rate levels out at 80 percent in the absence of CLR, in our example the introduction of CLR is responsible for four-fifths of the overall decline in child labor.

The simulation reproduces key features of the data. First, both the simulation and the data exhibit a hump-shape profile in the skill premium (see Figure 4). Second the model predicts that fertility rates start declining before the introduction of CLR. This timing is also featured by the data in the history of the introduction of CLR in Britain. The first major child labor restrictions (the "Factory Acts") were put into place in 1833 and 1842, and were extended to other non-textile industries in the 1860s and 1870s.[25] The total fertility rate (see Figure 8) peaked around 1820, then started declining before the introduction of the Factory Acts. Then, a second, more pronounced decline in fertility is observed after 1880, which continued throughout the first quarter of the twentieth century. Figure 9 shows the corresponding decline in child labor rates (the fraction of 10 to 14 year-olds who were economically active) and increase in schooling rates (the fraction of children aged 5–14 at school). The data are consistent with the predictions that fertility starts falling before CLR are introduced, and that CLR cause an acceleration in the fertility decline.[26]

A similar pattern can be observed in other European countries such as France, Germany and Italy. In these countries, as in Britain, CLR were introduced in the second half of the nineteenth century.[27] Moreover, the introduction of CLR is more closely

[25]The initial Factory Acts, however, only applied to some industries (textiles and mining), and Nardinelli (1980) argues that while the laws effectively restricted the employment of young children in these industries, the effect on overall child labor was short lived. The Factory Acts were extended to other non-textile industries in the 1860s and 1870s. The introduction of compulsory schooling in 1880 put an additional constraint on child labor. Compulsion was effectively enforced: in the 1880s, close to 100,000 cases of truancy were prosecuted every year (see Cunningham 1996), which made truancy the second-most popular offense in terms of cases brought before the courts (drunkenness being the first).

[26]However, the transition is sharper and more rapid in the simulation than in the data. This discrepancy may be due to the fact that in the simulation CLR are introduced and perfectly enforced instantaneously, whereas, in the data, this happens progressively. Also, our model does not allow for combinations of schooling with part-time work, while this practice was relatively widespread at the time.

[27]Both Germany and Italy introduced pervasive regulation after unification. Prussia had a child

related to changes in the fertility behavior than to structural characteristics of these economies. In Germany and Italy, CLR were introduced soon after the beginning of the demographic transition, and were followed by large further reductions in fertility (in France, however, the demographic transition had started substantially earlier). At the time of the introduction of CLR, England was an industrialized country, with the share of agriculture near ten percent, while in Italy, for instance, well over half of employment was still accounted for by agriculture. The differences in living standards were also large.[28]

In the U.S., birth rates and total fertility rates were falling from the beginning of the nineteenth century. However, the overall numbers mask substantial variation across states and regions. Since until about 1910 all child labor restrictions were state laws, this variation can be related to political developments. Most states introduced laws mandating a minimum age for employment in the period from 1880 to 1920. In 1880, only seven states had such laws; by 1910, 43 states did. The first states to introduce child labor restrictions were also the first to experience substantial fertility decline. Consider the comparison of the eight states which introduced a minimum age of employment of 14 before 1900 and the 14 states which introduced this limit only after 1910.[29] In the middle of the nineteenth century, birth rates were slightly higher in the group of early adopters (in 1860, the birth rate was 30 in the early group and 29 in the late group). However, after 1870 the fertility decline progressed faster in the states

---

labor law in 1839, which was extended to the whole German Empire after 1871. It was not until 1878, however, that the minimum age in factories was raised to 12, and enforcement became active (see Nardinelli 1990). In Italy, the first child labor law was passed in Lombardy in 1843, before unification. Education became compulsory in 1859, but initially there was little enforcement of this law. A national child labor law was passed in 1873. In France, a law passed in 1841 mandated a minimum age of eight for employment and specified a maximum workday of eight hours for children aged eight to twelve. In addition, working children under the age of twelve were also required to attend school. The law applied only to firms with at least 20 workers, however, and no effective provisions for enforcement were made (Weissbach 1989). In 1874, a law was passed that applied to all firms, set the minimum age to twelve, with minimum schooling conditions for workers under the age of 15. In 1892 the minimum age for employment was raised to 13. Inequality trends were also similar across Western countries in the nineteenth century, see Williamson (1985) on Britain, Williamson and Lindert (1980) on the U.S., and Brenner, Kaelble, and Thomas (1991) on Belgium, Germany, and Sweden.

[28]According to Maddison (1995), in 1890 GDP per capita in Italy was only 40 percent as high as in the U.K., and lower than GDP per capita in the U.K. in 1820. Relative to the U.K., in 1890 France and Germany were at 57 and 62 percent, respectively.

[29]The states in the first group are Illinois, Indiana, Massachusetts, Michigan, Minnesota, Missouri, New York, and Wisconsin. The group of late adopters is made up of Alabama, Delaware, Florida, Georgia, Mississippi, New Hampshire, New Mexico, North Carolina, South Carolina, Texas, Utah, Vermont, Virginia, and West Virginia. Birth rate figures are from the U.S. Census.

which adopted child labor laws early. By 1890, the average birth rate had fallen to 25 in the early group, but was still at 30 in the late group. This birth-rate differential persisted throughout the first part of the twentieth century; in 1928, the difference was still 19 to 24.

Our results also suggest a reason why econometric studies which find that child labor laws only have a relatively small effect on the supply of child labor may be misleading. Moehling (1999), for example, uses state-by-state variation in the introduction of CLR in the U.S. to estimate the effects of regulations, employing a "difference-in-difference" estimator. In our model, child labor declines even before CLR are introduced, since young families start to have small families of educated children in response to a higher return on education. This prediction is a robust implication of the theory, since a decline in the dependence of unskilled families on child labor income is exactly what is required to create a constituency in favor of CLR. The relative speed of the decline in child labor before and after the introduction of restrictions depends on average family size, the number of young families, and the enforcement of CLR. To a large extent, CLR work indirectly by reducing family size and changing families' education decisions, as opposed to directly removing children from the labor market who would otherwise have worked. It is possible that from an econometrician's perspective, the measured impact of the legislation appears to be small (i.e., there is a small or no difference in the decline of child labor before and after the introduction of CLR, either within or across states). The true effect of CLR would be larger than this empirical measure, since it is not generally true that the child labor rate would have continued to decrease without a law. In our example, if no CLR are introduced, child labor rates remain at 60 to 80 percent throughout. The restrictions therefore account for the major part of the ultimate decline in child labor. A difference-in-difference estimator would have compared the decline in child labor before and after the introduction of the law, which would suggest, misleadingly, a much smaller effect of the legislation.

6 Would Capitalists Support CLR?

A possible objection to the analysis of the previous section is that in the nineteenth century, unskilled workers may not have had the political power to impose CLR over the resistance of more wealthy and politically powerful groups. As discussed earlier, we believe that the unions' political activism may have played an important role, despite the lack of universal suffrage. In this section, we explore the complementary argument that other groups may have also benefited from the introduction of CLR. In particular, our analysis has not yet considered the political preferences of factory owners (capitalists). As pointed out by Galor and Moav (2003), if capital is complementary to skilled labor, it may be in the capitalists' interest to support, and even finance, policies that foster human capital accumulation. We now show that this possibility arises naturally in an extension of our model.

Consider the following generalization of the production technology:

$$Y = K^{\theta} \left[\alpha X_S^{\kappa} + (1-\alpha) X_U^{\kappa} \right]^{\frac{1-\theta}{\kappa}} .$$

This technology implies that, if markets are competitive, the owners of capital K appropriate a constant share θ of the total output. We assume that there is a constant stock of capital, which is owned by a separate class of agents. This feature is for simplicity; regardless of the amount of capital, the total income of capitalists depends on the composite labor input $\left[\alpha X_S^{\kappa} + (1-\alpha) X_U^{\kappa} \right]$. Therefore, the political preferences of capitalists would be similar if capital could be accumulated and responded to changes in its productivity.

We consider the following experiment. We analyze the same transition discussed above towards an expected date at which CLR are introduced. We then calculate the income accruing to the capitalists conditionally on the alternative assumptions that CLR are either passed or rejected. This comparison would determine the capitalists' choice if they had the power to veto CLR.

As Figure 10 shows, conditional on CLR (solid line) there is an initial drop (in period 7) in the capitalists' income after the introduction of CLR. This is due to children of large families being forced out of the labor force. However, this is followed by a recovery triggered by increasing education and a larger proportion of skilled workers in the population. In contrast, under no CLR (dashed line) there is no initial drop in output, and the skill ratio does not grow. Despite the increase in education under CLR, from period 11 onwards there is a clear output divergence in favor of the economy without CLR. This is due to the fact that fertility is higher in the long-run under no CLR. Although output per worker is higher in the economy with CLR, total output is smaller. Since capitalists appropriate a constant share of total output, their interests are harmed by the introduction of CLR in this example.

The outcome would be different if the increase in the skill bias of the technology were sufficiently large to push the economy to a steady state where all families educate their children even when CLR are never introduced. In this case, long-run population growth does not depend on the policy, and the income of the capitalists depends only on the relative supply of the two skills. To illustrate this case, Figure 11 shows the capitalists' income under the two policies if α increases to 0.85 instead of 0.65, resulting in a steady state where all families are small. A similar effect could be reached by a policy that subsidizes education. As before, the introduction of CLR initially harms the capitalists (solid line) due to the declining supply of unskilled labor. From the first period after the reform onwards, however, the capitalists gain from CLR due to the higher supply of skilled labor. In the steady state, the two policies yield the same income for the capitalists. Clearly, the capitalists would prefer CLR in this example, unless they are very impatient.

The analysis of this section could be further extended by distinguishing different types of capitalists who operate different technologies. From a historical perspective, the most important distinction is the one between land owners and factory owners, who were both politically influential in the period of the introduction of CLR in Britain (as evidenced by the debates on the Corn Laws and the Poor Laws). If we assume that land is complementary to child labor, whereas skill-biased technological change leads to complementarity between industrial capital and skilled labor, a conflict of interest between landowners and factory owners arises. The support for CLR would therefore also depend on the relative political power of these two groups. It is still the case, however, that skill-biased technological change would increase the likelihood of the introduction of CLR.

In summary, this section demonstrates that the same type of technological change that leads unskilled workers to support CLR may also shift capitalists' views in favor of CLR. Historically, we observe little evidence that capitalists actively supported the introduction of CLR, which is why we put most emphasis on the attitudes of the working class. Nevertheless, even if capitalists did not literally gain from restrictions, skill-biased technical change could make capitalists less adamant in their opposition. Changing views of the working class and the capitalists are therefore complementary explanations for the introduction of CLR.

7 Conclusions

The aim of this paper was to shed light on the political economy of child labor laws. The key novelty of our model is an interaction between demographic variables (the number of children per family) and political preferences. While it may seem obvious that whether or not a worker has working children will influence opinions about child labor laws, our model shows that this fact leads to surprising implications. Since children are long-lived, fertility decisions can lock agents into specific political preferences. Multiple steady states can then arise, because CLR induce individual behavior which, in turn, increases the support for maintaining the restrictions. This "lock-in" effect can explain why we observe large variations in the incidence of child labor and child labor laws across countries of similar income levels.

To account for the initial introduction of child labor laws, we extend the model to allow for a change in the economy which shifts political preferences in favor of CLR. Here, our preferred explanation is technological progress which raises the return to skilled labor, thereby providing incentives for parents to choose small families and educate their children even while child labor continues to be legal. We concentrate on skill-biased technological change because this explanation is consistent with evidence on trends in wage inequality in major industrializing countries in the nineteenth century. However, other factors can trigger a similar transition, e.g., a fall in the relative productivity of child labor, or exogenous factors affecting fertility rates.

Our theory can provide some guidance in the debate on the introduction of child labor laws in developing countries. The model predicts that even in countries where the majority currently opposes the introduction of CLR, the constituency in favor of these laws may increase over time once the restrictions are in place. However, for this to be true two conditions have to be met. First, the cost of schooling must be sufficiently low, so that poor parents actually decide to send their children to school once CLR are in place. Second, the value of children in household or marginal activities must not be too high, because otherwise the policy may fail to reduce fertility and induce the switch from quantity to quality. Everyone, including the children, might in this case be worse off after CLR have been introduced. CLR are more likely to be successful, and enjoy increasing political support, if they are accompanied by policies that reduce the cost or increase the accessibility of schools.

A Mathematical Appendix

A.1 Characterization of Steady States

In this section, we develop conditions under which each of the five types of steady states described in Section 3 obtains as an equilibrium. Each steady state prescribes which education and fertility decisions are optimal for each type of parent. The conditions for a candidate steady state to be an equilibrium can be checked by computing the steady-state utility that an agent receives under the prescribed decisions, and then verifying whether the agent could gain by making other than the prescribed choices. To simplify notation, we introduce *average discounted probabilities*, where $\Pi^{e_U,e_S}_{h\to h'}$ denotes the average discounted probability for an agent who is currently of skill level h to have descendants of skill level h'. The superscripts denote whether the skilled and unskilled parents educate their children. These probabilities are given by the following expressions:

$$\Pi^{1,1}_{U\to S} = \frac{\beta z \lambda \pi_1}{1-\beta(1-\lambda)}, \qquad \Pi^{0,1}_{U\to S} = \frac{\lambda \beta z \pi_0}{(1-\beta(1-\lambda(1-z(\pi_1-\pi_0))))},$$
$$\Pi^{0,0}_{S\to U} = \frac{\lambda \beta z(1-\pi_0)}{(1-\beta(1-\lambda))}, \qquad \Pi^{0,1}_{S\to U} = \frac{\lambda \beta z(1-\pi_1)}{(1-\beta(1-\lambda(1-z(\pi_1-\pi_0))))}.$$

We start with the steady state in which all workers educate their children, $\tilde{\eta} = 2$. In this steady state, $x_{GU} = x_{GS} = 0$ and $e_{PU} = e_{PS} = 1$. Hence, $L = 0$. The necessary and sufficient condition for this steady state to be an equilibrium is that, given wages, the unskilled adults find it optimal to educate their children. By Lemma 1 this implies, *a fortiori*, that the skilled adults also choose to educate their children. The steady state utility of unskilled adults in the steady state where all children receive education is given by:

$$V_{PU,2} = u(w_{U,2} - pP) + \lambda \beta z (\pi_1 V_{PS,2} + (1-\pi_1) V_{PU,2}) + (1-\lambda)\beta V_{PU,2},$$

where $V_{nh,\tilde{\eta}}$ denotes the steady-state utility of an agent of family size n and skill h conditional on $\tilde{\eta}$. A similar notation is used for wages. This equation can be solved and expressed as:

$$V_{PU,2} = \frac{u(w_{U,2} - pP) - \Pi^{1,1}_{U\to S}[u(w_{U,2} - pP) - u(w_{S,2} - pP)]}{1-\beta(1-\lambda(1-z))}. \tag{8}$$

For the candidate steady state to be sustained, deviations must be unprofitable, i.e., no agent can increase her utility by choosing a large family and making her children work. Consider an unskilled adult who deviates and chooses a large family and child labor. If this deviation is profitable for the parent, it would also be profitable for a potential unskilled child. We therefore check a continued deviation of an entire dynasty, i.e., we assume that the parent and all future unskilled descendants choose a large family and child labor. The resulting utility is:

$$V_{GU,2} = \frac{u(w_{U,2}(1+Gl)) - \Pi^{0,1}_{U\to S}[u(w_{U,2}(1+Gl)) - u\left(w_{S,2} - pP\right)]}{1-\beta(1-\lambda(1-z))}.$$

Comparing $V_{PU,2}$ and $V_{GU,2}$, we find that the deviation is not profitable as long as

$$\begin{aligned} u(w_{U,2}(1+Gl)) - u(w_{U,2} - pP) \leq \Pi^{0,1}_{U\to S}\left[u(w_{U,2}(1+Gl)) - u\left(w_{S,2} - pP\right)\right] \\ - \Pi^{1,1}_{U\to S}\left[u\left(w_{U,2} - pP\right) - u(w_{S,2} - pP)\right]. \quad (9) \end{aligned}$$

Note that, since we consider individual deviations, we have held wages constant at the steady state level. Inequality (9) is a necessary and sufficient condition for a steady state equilibrium where all agents educate their children ($\tilde{\eta} = 2$) to be sustained.

The steady state where all skilled and some unskilled workers educate their children exists if, for some $\tilde{\eta} \in (1, 2)$, the skilled and unskilled wages are such that $V_{GU,\tilde{\eta}} = V_{PU,\tilde{\eta}}$, i.e.,

$$\begin{aligned} u\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right) - u(w_{U,\tilde{\eta}} - pP) = \Pi^{0,1}_{U\to S}\left[u\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right) - u\left(w_{S,\tilde{\eta}} - pP\right)\right] \\ - \Pi^{1,1}_{U\to S}\left[u\left(w_{U,\tilde{\eta}} - pP\right) - u\left(w_{S,\tilde{\eta}} - pP\right)\right]. \quad (10) \end{aligned}$$

Recall that, by Lemma 1, $V_{GU,\tilde{\eta}} = V_{PU,\tilde{\eta}}$ implies that $V_{GS,\tilde{\eta}} < V_{PS,\tilde{\eta}}$. Hence, if the condition is satisfied, skilled adults strictly prefer small families with educated children. Equation (10) is therefore necessary and sufficient for this type of steady state to exist.

We now move to the steady state where all skilled and no unskilled workers educate their children, $\tilde{\eta} = 1$. In this steady state, $x_{PU} = 0$, $x_{GS} = 0$, $e_{GU} = 0$, and $e_{PS} = 1$. Hence, $L = lGx_{GU}$. Two conditions need to be checked: skilled workers must prefer to educate their children, and unskilled workers must prefer not to educate. Proceeding as before, we get the following two conditions:

$$\begin{aligned} u(w_{U,1}(1+Gl)) - u(w_{U,1} - pP) \geq \Pi^{0,1}_{U\to S}\left[u(w_{U,1}(1+Gl)) - u\left(w_{S,1} - pP\right)\right] \\ - \Pi^{1,1}_{U\to S}\left[u\left(w_{U,1} - pP\right) - u(w_{S,1} - pP)\right], \quad (11) \end{aligned}$$

$$\begin{aligned} u\left(w_{S,1} + w_{U,1}Gl\right) - u(w_{S,1} - pP) \leq \Pi^{0,0}_{S\to U}[u\left(w_{S,1} + w_{U,1}Gl\right) - u\left(w_{U,1}\left(1+Gl\right)\right)] \\ - \Pi^{0,1}_{S\to U}[u\left(w_{S,1} - pP\right) - u\left(w_{U,1}\left(1+Gl\right)\right)]. \quad (12) \end{aligned}$$

For our candidate steady state equilibrium to be sustained, both (11) and (12) must hold simultaneously.

The next case is that some skilled and no unskilled workers educate their children, $\tilde{\eta} \in (0,1)$. The necessary and sufficient condition for this steady state is:

$$u\left(w_{S,\tilde{\eta}} + w_{U,\tilde{\eta}} Gl\right) - u(w_{S,\tilde{\eta}} - pP) = \Pi^{0,0}_{S\to U}[u\left(w_{S,\tilde{\eta}} + w_{U,\tilde{\eta}} Gl\right) - u\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right)] \\ - \Pi^{0,1}_{S\to U}[u\left(w_{S,\tilde{\eta}} - pP\right) - u\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right)]. \quad (13)$$

Recall that, by Lemma 1, $V_{GS,\tilde{\eta}} = V_{PS,\tilde{\eta}}$ implies that $V_{GU,\tilde{\eta}} > V_{PU,\tilde{\eta}}$. Hence, unskilled adults strictly prefer large families with working children.

Finally, we turn to the steady state in which none of the children receive education, $\tilde{\eta} = 0$. The necessary and sufficient condition for this steady state to be an equilibrium is that, given wages, the skilled adults find it optimal not to educate their children. By Lemma 1, this implies, a fortiori, that the unskilled adults also choose not to educate their children. The condition is given by:

$$u\left(w_{S,1} + w_{U,1} Gl\right) - u(w_{S,1} - pP) \geq \Pi^{0,0}_{S\to U}[u\left(w_{S,1} + w_{U,1} Gl\right) - u\left(w_{U,1}\left(1+Gl\right)\right)]. \quad (14)$$

A.2 Statement and Proofs of Lemmas

Lemma 1 *In steady state, $V_{GS} - V_{PS} < V_{GU} - V_{PU}$. Hence:*

1. *$V_{GS} \geq V_{PS}$ ($\eta_S > 0$) implies that $V_{GU} > V_{PU}$ ($\eta_U = 0$), and*
2. *$V_{GU} \leq V_{PU}$ ($\eta_U > 0$) implies that $V_{GS} < V_{PS}$ ($\eta_S = 1$).*

Proof of Lemma 1: Proving that $V_{GS}(\Omega) - V_{PS}(\Omega) < V_{GU}(\Omega) - V_{PU}(\Omega)$ is equivalent to proving that:

$$\left(1-\beta\left(1-\lambda\right)\right)\cdot\left(V_{GS}\left(\Omega\right) - V_{GU}\left(\Omega\right)\right) < \left(1-\beta\left(1-\lambda\right)\right)\cdot\left(V_{PS}\left(\Omega\right) - V_{PU}\left(\Omega\right)\right).$$

From (1), plus being in a steady state ($\Omega = \Omega'$), it follows that:

$$\left(1-\beta\left(1-\lambda\right)\right)\cdot\left(V_{GS}\left(\Omega\right) - V_{GU}\left(\Omega\right)\right) = u\left(w_S + w_U lG\right) - u\left(w_U + w_U lG\right) <$$

$$u\left(w_S - pP\right) - u\left(w_U - pP\right) = \left(1-\beta\left(1-\lambda\right)\right)\cdot\left(V_{PS}\left(\Omega\right) - V_{PU}\left(\Omega\right)\right)$$

The last inequality follows from the concavity of the utility function. Q.E.D.

Lemma 2 *The steady state population growth rate g has the following properties.*

1. *If* $\eta_S = 1$, *then*

$$1 + g/\lambda = \frac{P}{2}\left(\psi\left(\eta_U\right) + \sqrt{\psi\left(\eta_U\right)^2 - 4\frac{G}{P}\left(1-\eta_U\right)\left(\pi_1 - \pi_0\right)}\right) \equiv \gamma\left(\eta_U\right),$$

where $\psi\left(\eta_U\right) \equiv 1 + \left(1-\eta_U\right)\left(\frac{G}{P}\left(1-\pi_0\right) - \left(1-\pi_1\right)\right) \geq 1$, *and* $\gamma\left(1\right) = P$. *The population growth rate* g *is a strictly decreasing function of the fraction* η_U *of unskilled adults with small families.*

2. *If* $\eta_S < 1$, *then*

$$1 + g/\lambda = \frac{G}{2}\left(\psi_S\left(\eta_S\right) + \sqrt{\psi_S\left(\eta_S\right)^2 - 4\frac{P}{G}\eta_S\left(\pi_1 - \pi_0\right)}\right) \equiv \gamma_S\left(\eta_S\right),$$

where $\psi_S\left(\eta_S\right) \equiv 1 + \eta_S\left(\frac{P}{G}\pi_1 - \pi_0\right)$, $\gamma_S\left(0\right) = G$ *and* $\gamma_S\left(1\right) = \gamma\left(0\right)$. *The population growth rate* g *is a strictly decreasing function of the fraction* η_S *of skilled adults with small families.*

Proof of Lemma 2: Define $q \equiv G/P > 1$.

Part 1: The law of motion (5), together with the restriction that $\eta_S = 1$ and $x_{GS,t+1} = 0$, defines a system of four equations in four unknowns. The unique solution with non-negative fractions of each type yields a solution for the growth rate of the population such that $1 + g/\lambda \equiv \gamma\left(\eta_U\right)$, where $\gamma\left(\eta_U\right)$ is as defined above. It is useful to note that:

$$\psi\left(\eta_U\right) \geq \left(1 + \left(1-\eta_U\right)q\left(\left(1-\pi_0\right) - \left(1-\pi_1\right)\right)\right) \equiv \tilde{\psi}\left(\eta_U\right),$$

with strict inequality for any $\eta_U < 1$ (whereas $\psi\left(1\right) = \tilde{\psi}\left(1\right) = 1$), and that $\psi'\left(\eta_U\right) < \tilde{\psi}'\left(\eta_U\right) < 0$. Next, define:

$$\tilde{\gamma}\left(\eta_U\right) \equiv \frac{P}{2}\left(\tilde{\psi}\left(\eta_U\right) + \sqrt{\tilde{\psi}\left(\eta_U\right)^2 - 4q\left(1-\eta_U\right)\left(\pi_1 - \pi_0\right)}\right) \leq \gamma\left(\eta_U\right),$$

and observe that, using the definition of $\tilde{\psi}\left(\eta_U\right)$:

$$\tilde{\gamma}\left(\eta_U\right) = \frac{P}{2}\left(\left(1 + \left(1-\eta_U\right)q\left(\pi_1 - \pi_0\right)\right) + \sqrt{\left(1 - \left(1-\eta_U\right)q\left(\pi_1 - \pi_0\right)\right)^2}\right) = P \leq \gamma\left(\eta_U\right).$$

Thus, $\lambda\left(P-1\right)$ is a lower bound to the growth rate of the population. Note also that $\tilde{\psi}\left(\eta_U\right)^2 - 4q\left(1-\eta_U\right)\left(\pi_1 - \pi_0\right) = \left(1 - \left(1-\eta_U\right)q\left(\pi_1 - \pi_0\right)\right)^2 > 0$, hence, $\psi\left(\eta_U\right)^2 - 4q\left(1-\eta_U\right)\left(\pi_1 - \pi_0\right) > 0$, i.e., $\gamma\left(\eta_U\right) \in R^+$. Furthermore, $\gamma'\left(\eta_U\right) < \tilde{\gamma}'\left(\eta_U\right) = 0$, proving that g is uniformly decreasing in η_U.

Part 2: The law of motion (5), together with the restriction that $\eta = 0$ and $x_{PU,t+1} = 0$ defines a system of four equations in four unknowns. The unique solution with non-negative fractions of each type yields a solution for the growth rate of the population such that $1 + g/\lambda \equiv \gamma_S(\eta_S)$, where $\gamma_S(\eta_S)$ is as defined above. First, note that the discriminant in the definition of $\gamma_S(\eta_S)$ is positive, since:

$$\psi_S(\eta)^2 - 4q\eta_S(\pi_1 - \pi_0) \geq (1 + \eta_S q(\pi_1 - \pi_0))^2 - 4\eta_S q(\pi_1 - \pi_0) = (1 - \eta_S q(\pi_1 - \pi_0))^2 \geq 0.$$

Next, observe that:

$$\gamma_S(\eta) \leq \tilde{\gamma}_S(\eta) \equiv \frac{G}{2}\left(\psi_S(\eta) + \sqrt{\psi_S(\eta)^2 - 4\eta_S\left(\frac{P}{G}\pi_1 - \pi_0\right)}\right),$$

and, moreover, $\gamma'_S(\eta_S) < \tilde{\gamma}'_S(\eta_S)$. Finally, note that:

$$\begin{aligned}\tilde{\gamma}_S(\eta) &\equiv \frac{G}{2}\left(\psi_S(\eta) + \sqrt{\psi_S(\eta)^2 - 4\eta_S\left(\frac{P}{G}\pi_1 - \pi_0\right)}\right) = \\ &= \frac{G}{2}\left(1 + \eta_S\left(\frac{P}{G}\pi_1 - \pi_0\right) + \sqrt{\left(1 - \eta_S\left(\frac{P}{G}\pi_1 - \pi_0\right)\right)^2}\right) = G,\end{aligned}$$

implying that $\tilde{\gamma}'_S(\eta_S) = 0$. This establishes that $\gamma'_S(\eta_S) < 0$, i.e., g is uniformly decreasing in η_S. Q.E.D.

Lemma 3 *The fraction ξ_{PS} of skilled adults with small families is strictly increasing in η_U. The fraction ξ_{GU} of unskilled adults with large families is strictly decreasing in η_S. The ratio of skilled to unskilled labor supply increases with both η_U and η_S. Hence, the equilibrium skilled (unskilled) wage decreases (increases) with both η_U and η_S.*

Proof of Lemma 3: Once more, the two cases of $\eta_U \in (0,1)$ and $\eta_S \in (0,1)$ are parallel. We therefore concentrate on the case $\eta_U \in (0,1)$ (which implies $\eta_S = 1$). Using the solution for g and the definition of $\gamma(\eta_U)$ defined in the proof of Lemma 2, we can solve for the steady state proportion of each type, as a function of η_U:

$$\begin{aligned}\xi_{PU}(\eta_U) &= \frac{G\eta_U((1-\pi_0) - P(\pi_1 - \pi_0)/\gamma(\eta_U))}{\gamma(\eta_U) + (G-P)\eta_U + (G\pi_0 - P\pi_1)(1-\eta_U)},\\ \xi_{GU}(\eta_U) &= \frac{\gamma(\eta_U) - P(\eta_U + \pi_1(1-\eta_U))}{\gamma(\eta_U) + (G-P)\eta_U + (G\pi_0 - P\pi_1)(1-\eta_U)},\\ \xi_{PS}(\eta_U) &= \frac{G\pi_0 + GP\eta_U(\pi_1 - \pi_0)/\gamma(\eta_U)}{\gamma(\eta_U) + (G-P)\eta_U + (G\pi_0 - P\pi_1)(1-\eta_U)}.\end{aligned}$$

We now calculate the total derivative of $\xi_{PS}(\eta_U)$:

$$\xi'_{PS}(\eta_U) = 2P^2(\pi_1 - \pi_0)\lambda^3 \\ \left[F(\eta_U)P + (G(1-\pi_0) - P(\pi_1 - \pi_0))\sqrt{\psi(\eta_U)^2 - 4q(1-\eta_U)(\pi_1 - \pi_0)}\right],$$

where:

$$F(\eta_U) = q^2(1-\eta_U)(1-\pi_0)^2 \\ + q\left(\eta_U(1-\pi_0)^2 + \pi_0(3-\pi_0) - 2\pi_1\right) + (\pi_1 - \pi_0)(\eta_U + \pi_1(1-\eta_U)).$$

We want to prove that $\xi'_{PS}(\eta_U) \geq 0$ for all $\eta_U \in [0,1]$. To this aim, we define the function:

$$\begin{aligned}\tilde{\xi}(\eta_U) =& 2P^3(\pi_1 - \pi_0)\lambda^3 \\ & \left[F(\eta_U) + (q(1-\pi_0) - (\pi_1 - \pi_0))\sqrt{\tilde{\psi}(\eta_U)^2 - 4q(1-\eta_U)(\pi_1 - \pi_0)}\right] \\ =& 2P^3(\pi_1 - \pi_0)\lambda^3(1-\pi_1)\left[(1-\eta_U)\left(q^2(1-\pi_0) - (\pi_1 - \pi_0)\right) + \right. \\ & \left. q(2(\pi_0(1-\eta_U) + \eta_U) + (1-\pi_1)(1-\eta_U))\right],\end{aligned}$$

where we have that $\bar{\xi}(\eta_U) \geq \tilde{\xi}(\eta_U)$. It is immediate to verify that $\tilde{\xi}(\eta_U) \geq 0$, with strict inequality holding whenever $\pi_0 < \pi_1 < 1$. Hence, $\xi'_{PS}(\eta_U) \geq 0$. In fact, $\xi'_{PS}(\eta_U) > 0$ whenever $\pi_0 < \pi_1 < 1$. A parallel argument applies to the case $\eta_S \in (0,1)$. It therefore follows that ratio of skilled to unskilled labor supply increases with both η_U and η_S. Q.E.D.

A.3 Proofs of Propositions

Proof of Proposition 1: We begin by defining the utility differential for unskilled and skilled adults between having large and small families in steady state:

$$\Delta_U(\tilde{\eta}) = V_{GU,\tilde{\eta}} - V_{PU,\tilde{\eta}},$$
$$\Delta_S(\tilde{\eta}) = V_{GS,\tilde{\eta}} - V_{PS,\tilde{\eta}}.$$

According to conditions (9), (10), (11), (12), (13), and (14), a steady state of type $\tilde{\eta} = 2$ exists if $\Delta_U(2) \leq 0$, type $\tilde{\eta} \in (1,2)$ exists if $\Delta_U(\tilde{\eta}) = 0$ for some $\tilde{\eta} \in (1,2)$, type $\tilde{\eta} = 1$ exists if $\Delta_U(\tilde{\eta}) \geq 0$ and $\Delta_S(\tilde{\eta}) \leq 0$, type $\tilde{\eta} \in (0,1)$ exists if $\Delta_S(\tilde{\eta}) = 0$ for some $\tilde{\eta} \in (0,1)$, and, finally, type $\tilde{\eta} = 0$ exists if $\Delta_S(0) \geq 0$. A unique steady state therefore exists if $\Delta_U(\tilde{\eta})$ and $\Delta_S(\tilde{\eta})$ are strictly monotonically increasing in $\tilde{\eta}$.

Given that Lemma 3 establishes that the wage premium is strictly decreasing in $\tilde{\eta}$, for the skilled adults this monotonicity is immediate. The situation is more complicated for the unskilled adults, since there are two opposing effects: as the skill premium rises, education becomes more attractive, but also less affordable. Writing steady state utilities for unskilled adults as a function of $\tilde{\eta}$ we get:

$$V_{GU,\tilde{\eta}} = \frac{u\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right) - \Pi^{0,1}_{U\to S}\left(u\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right) - u\left(w_{S,\tilde{\eta}} - pP\right)\right)}{1-\beta\left(1-\lambda\left(1-z\right)\right)},$$

$$V_{PU,\tilde{\eta}} = \frac{u(w_{U,\tilde{\eta}} - pP) - \Pi^{1,1}_{U\to S}[u\left(w_{U,\tilde{\eta}} - pP\right) - u\left(w_{S,\tilde{\eta}} - pP\right)]}{1-\beta(1-\lambda(1-z))}.$$

Here we assume that skilled adults educate their children, which is the relevant case. We now have

$$\Delta'_U\left(\tilde{\eta}\right) = \frac{1}{1-\beta(1-\lambda(1-z))}\Big[u'\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right)\left(1-\Pi^{0,1}_{U\to S}\right)\left(1+Gl\right)w'_{U,\tilde{\eta}} - u'\left(w_{U,\tilde{\eta}} - pP\right)\left(1-\Pi^{1,1}_{U\to S}\right)w'_{U,\tilde{\eta}} - u'\left(w_{S,\tilde{\eta}} - pP\right)\left(\Pi^{1,1}_{U\to S} - \Pi^{0,1}_{U\to S}\right)w'_{S,\tilde{\eta}}\Big],$$

where $w'_{U,\tilde{\eta}} > 0$, $w'_{S,\tilde{\eta}} < 0$, and $\Pi^{1,1}_{U\to S} - \Pi^{0,1}_{U\to S} > 0$. It therefore suffices to show that:

$$u'\left(w_{U,\tilde{\eta}}\left(1+Gl\right)\right)\left(1-\Pi^{0,1}_{U\to S}\right)\left(1+Gl\right) > u'\left(w_{U,\tilde{\eta}} - pP\right)\left(1-\Pi^{1,1}_{U\to S}\right)$$

or:

$$\left(1+Gl\right)\frac{1-\Pi^{0,1}_{U\to S}}{1-\Pi^{1,1}_{U\to S}} > \frac{u'(w_{U,\tilde{\eta}} - pP)}{u'\left(w_{U,\tilde{\eta}}(1+Gl)\right)}.$$

Under CRRA, the right-hand side is increasing in the wage and, therefore, Assumption 2 is a sufficient condition for a unique steady state to exist. Q.E.D.

Proof of Proposition 2: To begin, set $\beta = 0$ (to be relaxed later), choose an arbitrary $G > 0$, and choose $\lambda > 0$, $\pi_0 > 0$, and $\pi_1 > \pi_0$ such that the old unskilled are always in majority (i.e., $(1-\lambda)(1-\pi_1) > 0.5$), which satisfies the first condition in the proposition. Since given $\beta = 0$ the future is not valued, there is no incentive for education. Therefore without CLR, for any positive values of the remaining parameters p and P the steady state with $\tilde{\eta} = 0$ prevails (all families are large), satisfying the second part of the proposition. Conversely, when CLR are in place (combined with a compulsory education policy) the steady state is $\tilde{\eta} = 2$, as all families are small to economize on the educational cost.

We still need to show that we can choose p and P such that both CLR and no CLR are SSPE, and that the assumption $\beta = 0$ can be relaxed. First, assume that the steady state without CLR prevails. We want to find conditions such that the (old unskilled) majority would oppose CLR if a referendum occurred. In the steady state without

CLR, the ratio of skilled to unskilled labor supply is:

$$x_0 = \frac{\pi_0}{1 - \pi_0 + Gl},$$

and the corresponding unskilled wage is $w_{U,0} = f(x_0) - f'(x_0)x_0$. If CLR are introduced, all children are withdrawn from the labor market. The new skill ratio is:

$$\tilde{x}_0 = \frac{\pi_0}{1 - \pi_0},$$

and the corresponding wage $\tilde{w}_{U,0} = f(\tilde{x}_0) - f'(\tilde{x}_0)\tilde{x}_0$ satisfies $w_{U,0} < \tilde{w}_{U,0}$. However, the unskilled workers also lose child labor income and have to pay the schooling cost. The old unskilled majority oppose CLR if their consumption is lower under CLR, i.e., if:

$$w_{U,0}(1 + Gl) > \tilde{w}_{U,0} - pG$$

is satisfied. Clearly, the education cost p can always be chosen sufficiently high such that the majority of unskilled agents opposes the introduction of CLR. Also notice that the small family size P has not entered any equations yet; we are free to choose P independently to meet the final condition in the proposition.

Now consider the case where currently the steady state with CLR prevails. We want to find conditions under which the (old unskilled) majority would prefer to keep CLR in place. In the steady state with CLR, the ratio of skilled to unskilled labor supply is:

$$x_2 = \frac{\pi_1}{1 - \pi_1},$$

and the corresponding unskilled wage is $w_{U,2} = f(x_2) - f'(x_2)x_2$. If CLR are abandoned, all children will enter the labor market, and young families will choose the large family size G. The ensuing skill ratio is:

$$\tilde{x}_2 = \frac{\pi_1}{1 - \pi_1 + (1 - \lambda)Pl + \lambda Gl},$$

and the corresponding wage $\tilde{w}_{U,2} = f(\tilde{x}_2) - f'(\tilde{x}_2)\tilde{x}_2$ satisfies $\tilde{w}_{U,2} < w_{U,2}$. The old unskilled will prefer to maintain CLR if their consumption falls if CLR are abandoned, i.e.:

$$w_{U,2} - pP > \tilde{w}_{U,2}(1 + Pl).$$

This condition can be satisfied by choosing P sufficiently small. Notice that $\tilde{w}_{U,2}$ does not converge to $w_{U,2}$ as P goes to zero, because the young adults choose the large family size G. By choosing P, we can therefore ensure that the majority prefers to keep CLR in place. We have therefore found a set of parameters for which multiple SSPE exist. Finally, since utility is continuous in β, the same result can be obtained for positive β, sufficiently close to zero, and the same remaining parameters. Q.E.D.

References

Acemoglu, Daron and Joshua D. Angrist. 2000. "How Large are Human Capital Externalities? Evidence from Compulsory Schooling Laws." *NBER Macroeconomics Annual 2000*, pp. 9–59.

Acemoglu, Daron and James A. Robinson. 2001. "A Theory of Political Transitions." *American Economic Review* 91 (4): 938–963.

Angrist, Joshua D. and Alan B. Krueger. 1991. "Does Compulsory School Attendance Affect Schooling and Earnings?" *The Quarterly Journal of Economics* 106 (4): 979–1014.

Baland, Jean-Marie and James Robinson. 2000. "Is Child Labor Inefficient?" *Journal of Political Economy* 108 (4): 663–679.

Bardhan, Pranab and Christopher Udry. 1999. *Development Microeconomics*. Oxford University Press.

Basu, Kaushik. 1999. "Child Labor: Cause, Consequence, and Cure, with Remarks on International Labor Standards." *Journal of Economic Literature* 37 (3): 1083–1117.

Basu, Kaushik and Pham Hoang Van. 1998. "The Economics of Child Labor." *American Economic Review* 88 (3): 412–427.

Becker, Gary S. and Robert J. Barro. 1988. "A Reformulation of the Economic Theory of Fertility." *Quarterly Journal of Economics* 103 (1): 1–25.

Berdugo, Binyamin and Moshe Hazan. 2002. "Child Labor, Fertility and Economic Growth." *Economic Journal* 112 (482): 810–28.

Boadway, Robin W. and David E. Wildasin. 1989. "A Median Voter Model of Social Security." *International Economic Review* 20 (2): 307–28.

Brenner, Y. Simon, Harmut Kaelble, and Mark Thomas, eds. 1991. *Income Distribution in Historical Perspective*. Cambridge: Cambridge University Press.

Brown, Drusilla, Alan V. Deardorff, and Robert M. Stern. 2003. "Child Labor: Theory, Evidence, and Policy." In *International Labour Standards: History, Theory, and Policy Options*, edited by Kaushik Basu, Henrik Horn, Lisa Roman, and Judith Shapiro. Oxford: Blackwell Publishing.

Chesnais, Jean Claude. 1992. *The Demographic Transition*. Oxford: Oxford University Press.

Coate, Stephen and Stephen Morris. 1999. "Policy Persistence." *American Economic Review* 89 (5): 1327–36.

Cunningham, Hugh. 1996. "Combating Child Labor: The British Experience." In *Child Labor in Historical Perspective: Case Studies from Europe, Japan, and Colombia*, 41–55. UNICEF.

Davidson, Elizabeth H. 1939. *Child Labor Legislation in the Southern Textile States*. Chapel Hill: The University of North Carolina Press.

Dessy, Sylvain and Stephane Pallage. 2001. "Child Labor and Coordination Failures." *Journal of Development Economics* 65 (2): 469–476.

Doepke, Matthias. 2004. "Accounting for Fertility Decline During the Transition to Growth." *Journal of Economic Growth* 9 (3): 347–83.

Feinstein, Charles. 1988. "The Rise and Fall of the Williamson Curve." *Journal of Economic History* 48 (3): 699–729.

Galbi, Douglas A. 1997. "Child Labor and the Division of Labor in the Early English Cotton Mills." *Journal of Population Economics* 10:357–375.

Galor, Oded and Omer Moav. 2002. "Natural Selection and the Origin of Economic Growth." *Quarterly Journal of Economics* 117 (4): 1133–91.

———. 2003. "Das Human Kapital: A Theory of the Demise of the Class Structure." Unpublished Manuscript, Brown University.

Galor, Oded and David N. Weil. 2000. "Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond." *American Economic Review* 90 (4): 806–28.

Hassler, John, Jose V. Rodriguez Mora, Kjetil Storesletten, and Fabrizio Zilibotti. 2003. "The Survival of the Welfare State." *American Economic Review* 93 (1): 87–112.

———. 2005. "A Positive Theory of Geographic Mobility and Social Insurance." *International Economic Review* 46 (1): 263–303.

Horrell, Sara and Jane Humphries. 1995. "The Exploitation of Little Children: Child Labor and the Family Economy in the Industrial Revolution." *Explorations in Economic History* 32:485–516.

Kirby, Peter. 1999. "The Historic Viability of Child Labor and the Mines Act of 1842." Chapter 4 of *A Thing of the Past? Child Labour in Britain in the Nineteenth and Twentieth Centuries*, edited by Michael Lavalette. Liverpool: Liverpool University Press.

———. 2003. *Child Labour in Britain, 1750–1870*. New York: Palgrave Macmillan.

Kremer, Michael and Daniel L. Chen. 2002. "Income Distribution Dynamics with Endogenous Fertility." *Journal of Economic Growth* 7 (3): 227–58.

Krueger, Dirk and Jessica Tjornhom. 2004. "Economic Inequality and the Emergence of Child Labor Laws." Forthcoming, International Economic Review.

Lee, Ronald D. and Roger S. Schofield. 1981. "British Population in the Eighteenth Century." In *The Economic History of Britain since 1700*, edited by Richard Floud and Donald McCloskey. Cambridge: Cambridge University Press.

Levison, Deborah, Richard Anker, Shahid Ashraf, and Sandhya Barge. 1998. "Is Child Labour Really Necessary in India's Carpet Industry?" Chapter 5 of *Economics of Child Labour in Hazardous Industries of India*, edited by R. Anker, S. Barge, S. Rajagopal, and M.P. Joseph. New Delhi: Hindustan Publishing.

Lleras-Muney, Adriana. 2002. "Were Compulsory Attendance and Child Labor Laws Effective? An Analysis from 1915 to 1939." *Journal of Law and Economics* 45 (2): 401–435.

Maddison, Angus. 1995. *Monitoring the World Economy, 1820-1992*. Paris: OECD.

Margo, Robert A. and T. Aldrich Finegan. 1996. "Compulsory Schooling Legislation and School Attendance in Turn-of-the-Century America: A 'Natural Experiment' Approach." *Economics Letters* 53 (1): 103–10.

Marimon, Ramon and Fabrizio Zilibotti. 2000. "Employment and Distributional Effects of Restricting Working Time." *European Economic Review* 44 (7): 1291–326.

Moav, Omer. 2005. "Cheap Children and the Persistence of Poverty." *Economic Journal* 115 (500): 88–110.

Moehling, Caroline M. 1999. "State Child Labor Laws and the Decline of Child Labor." *Explorations in Economic History* 36 (1): 72–106.

Nardinelli, Clark. 1980. "Child Labor and the Factory Acts." *Journal of Economic History* 40 (4): 739–755.

———. 1990. *Child Labor and the Industrial Revolution*. Bloomington: Indiana University Press.

Peacock, A.E. 1984. "The Successful Prosecution of the Factory Acts, 1833–55." *Economic History Review* 37 (2): 197–210.

Ranjan, Priya. 2001. "Credit Constraints and the Phenomenon of Child Labor." *Journal of Development Economics* 64 (1): 81–102.

Weiner, Myron. 1991. *The Child and the State in India: Child Labor and Education Policy in Comparative Perspective*. Princeton University Press.

Weissbach, Lee Shai. 1989. *Child Labor Reform in Nineteenth-Century France*. Baton Rouge: Louisiana State University Press.

Williamson, Jeffrey G. 1985. *Did British Capitalism Breed Inequality?* Boston: Allen and Unwin.

Williamson, Jeffrey G. and Peter H. Lindert. 1980. *American Inequality: A Macroeconomic History*. New York: Academic Press.

Parameter	β	z	σ	λ	P	G	π_0	π_1	p	l	κ
Value	0.8	1	0.5	0.15	1	3	0.05	0.4	0.013	0.1	0.5

Table 1: Parameter Values for the Model Simulations

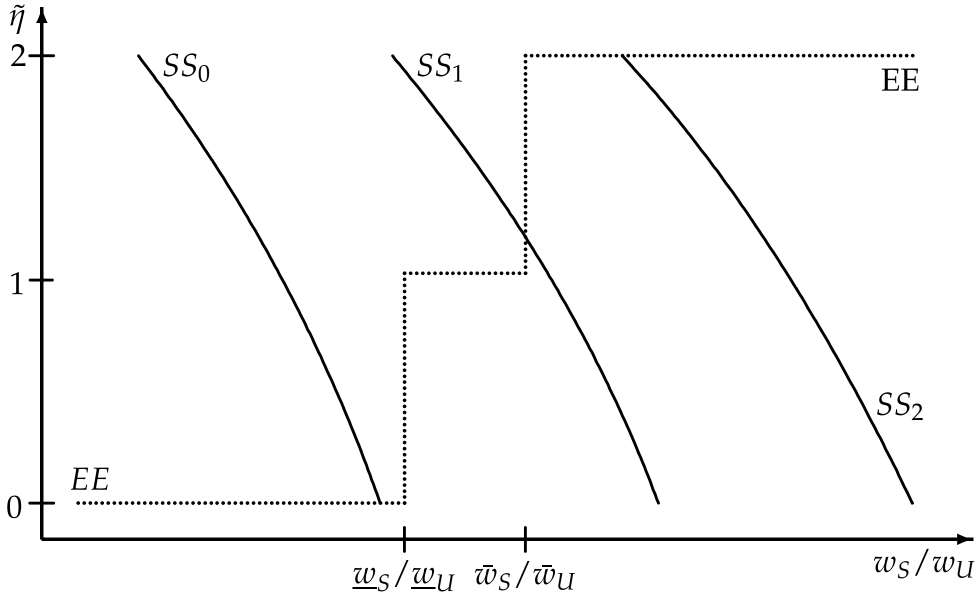
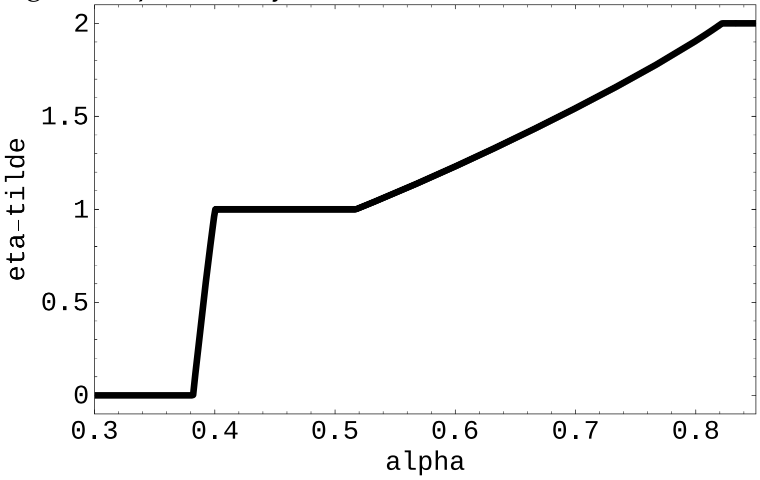


Figure 1: Uniqueness of Steady States with Fixed Policies

Figure 2: $\tilde{\eta}$ in Steady State as a Function of Skill Bias α



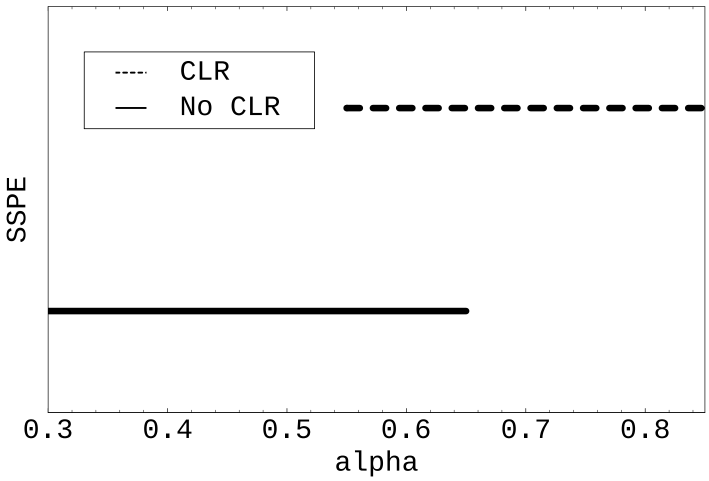


Figure 3: Regions of Existence for each SSPE as a Function of Skill Bias α

Figure 4: Skill Premium (Ratio of Skilled to Unskilled Wages) in the U.K.

Source: Williamson (1985)

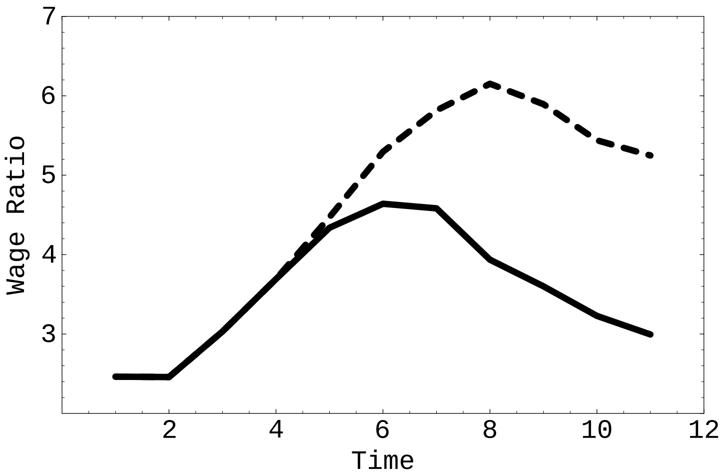
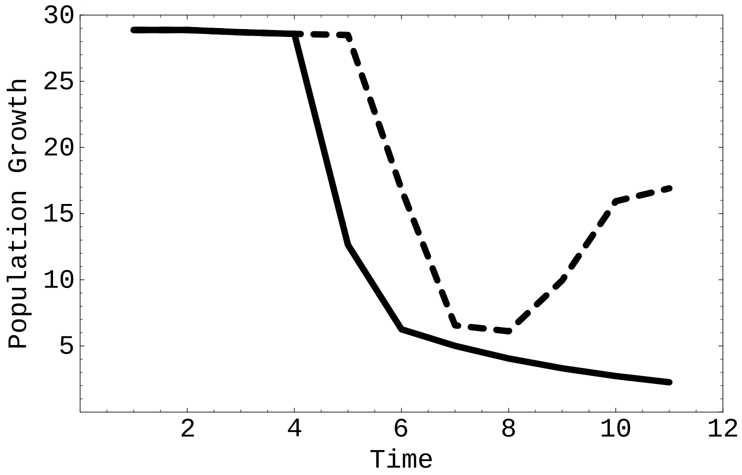


Figure 5: Skill Premium in the Model under Endogenous Policy (Solid) and without CLR (Dashed)

Figure 6: Population Growth in the Model under Endogenous Policy (Solid) and without CLR (Dashed)



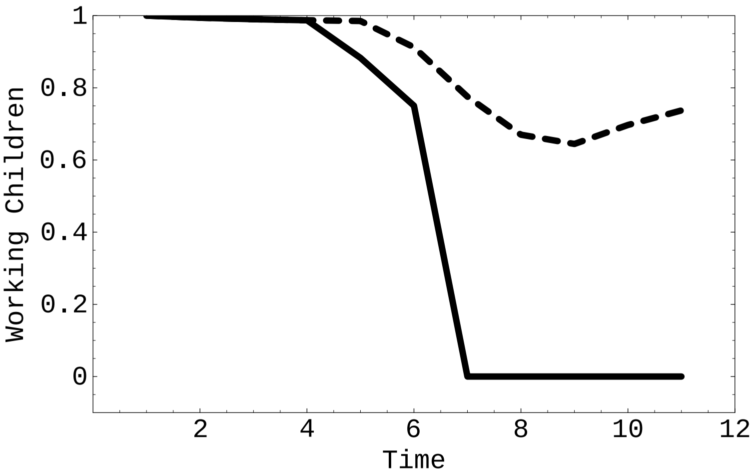
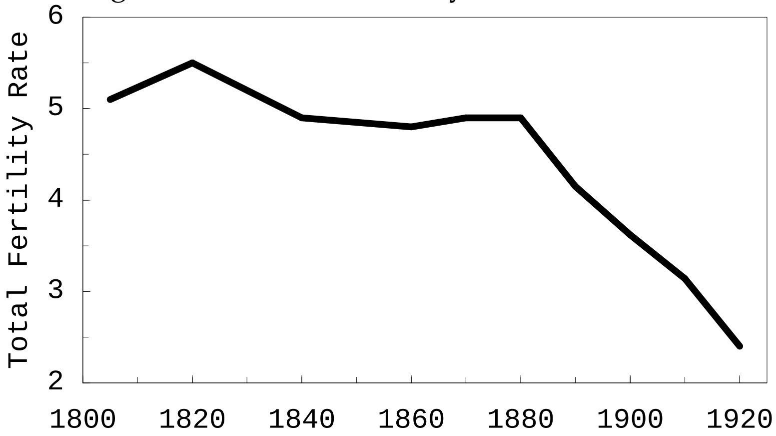
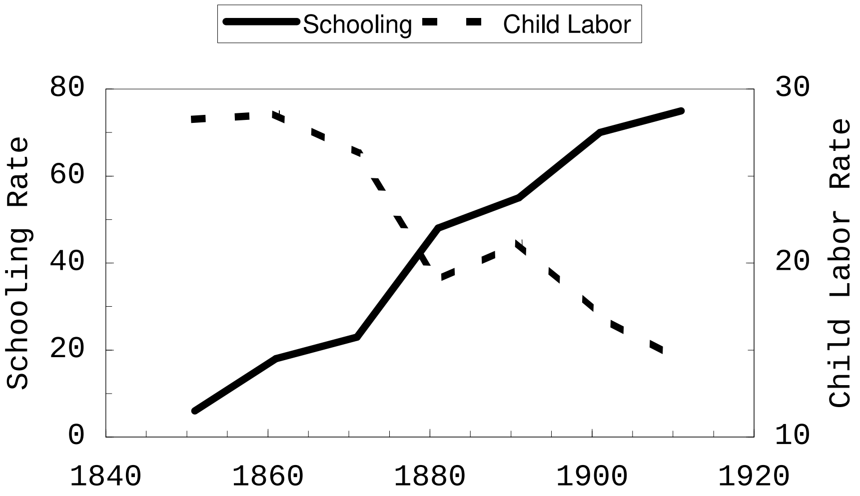


Figure 7: Fraction of Children Working in the Model under Endogenous Policy (Solid) and without CLR (Dashed)

Figure 8: The Total Fertility Rate in the U.K.



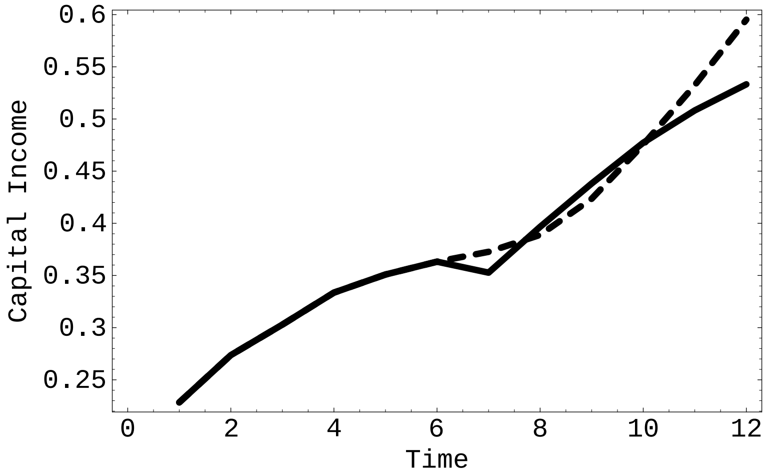
Source: Lee and Schofield (1981), Chesnais (1992)



Source: Cunningham (1996)

Figure 9: Schooling Rates (Percentage of Children Aged 5–14 in School) and Child Labor Rates (Percentage of Children Aged 10–14 Economically Active) in the U.K.

Figure 10: Capitalists' Income in the Baseline Model under Endogenous Policy (Solid) and without CLR (Dashed)



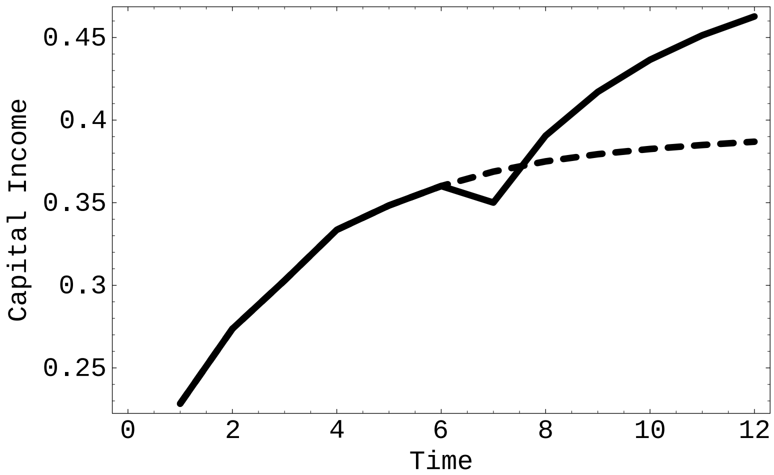


Figure 11: Capitalists' Income in the Model with Larger Increase in Skill Bias under Endogenous Policy (Solid) and without CLR (Dashed)