C.I.R.P.É.E

Centre Interuniversitaire sur le Risque, les Politiques Économiques et l'Emploi

Cahier de recherche/Working Paper **10-37**

Is Temporary Emigration of Unskilled Workers a Solution to the Child Labor Problem ?

Sylvain Dessy

Tiana Rambeloma

Septembre/September 2010

Dessy: Corresponding author. Département d'économique et CIRPÉE, Université Laval, Québec, Canada
sdes@ecn.ulaval.ca
Rambeloma : Département d'économique et CIRPÉE, Université Laval, Québec, Canada
Trambeloma@ecn.ulaval.ca

We thank participants at the 2009 Canadian Economic Association annual meeting in Toronto, Canada. We are also very grateful for comments from two anonymous referees. The usual disclaimer applies.

Abstract:
This paper reassesses the case for temporary emigration of unskilled workers as a solution to the child labor problem, based upon a general equilibrium model of migrant remittances, parental investment in child schooling, and intersectoral allocation of capital. Counterfactual simulations uncover a U-shape effect of temporary emigration on the incidence of child labor, suggesting that the case for temporary emigration as a solution to the child labor problem may be weak.

Keywords: Migration, remittances, general equilibrium

JEL Classification: O11

1. Introduction

Epstein and Kahana (2008) (hereafter E-K) advance the idea that encouraging temporary emigration of unskilled workers can solve the child labor problem in developing countries. Central to this intuitively compelling idea is the well-documented link between migration and remittances (Docquier and Rapoport 2003). Arguably, as child labor is linked to poverty (Basu and Van 1998), encouraging temporary emigration of the poorest section of the working population indeed can, through remittances, combat child labor among migrant households (Hanson and Woodruff 2003). But does it necessarily reduce the incidence of child labor at the economy-wide level? E-K (2008) give an unequivocally affirmative answer to this question, arguing that such emigration has a non-negative effect on the earnings of non-migrant families. In this paper, we reassess this affirmation by emphasizing the implications of temporary emigration of adult workers for the intersectoral allocation of capital in an environment where the law tolerates child labor.

Imagine an economy with two sectors that produce an identical good. One employs (unskilled) adults only and the other, children only. To the extent that the aggregate production function in each sector is Cobb-Douglas in capital and labor, and there is perfect intersectoral mobility of capital, temporary emigration of adult workers may have two opposite effects on the adult workers' wage. (Footnote: The same idea will go through by substituting land for capital, as in an agrarian economy.) One is a positive effect working through the law of supply and demand. The other is a negative effect caused by the induced decline in the return to capital in the adult sector, and the subsequent reallocation of capital from the adult labor sector to the child labor sector. We argue that the sum of these two opposite effects is key to understanding the nature of the relation between temporary emigration of adult workers and the incidence of child labor in the source country of migrants. Our general equilibrium model (outlined in section 2 below) links these two phenomena in a context where households maximize utility through parental remittances and child schooling decisions, and capitalists maximize the return to capital by balancing between adult labor and child labor as the complementary input to capital. Counterfactual simulations uncover a U-shape effect of temporary emigration on the incidence of child labor.

2. The Setup

Consider a world with two economies. A poor economy (denoted as A) and a richer economy (denoted as B). Economy A is initially populated by a continuum one of households composed each of an unskilled adult (hereafter parent) and his child. In the beginning, all parents from economy A enter a lottery pool whereby $M \in (0,1)$ parents are randomly drawn from the pool and rewarded with the right to emigrate to economy B, where they will work and earn a wage $\bar{\omega}$. A parent who loses the lottery stays and works in economy A where he will earn a wage $\omega_a < \bar{\omega}$. Encouraging temporary emigration of economy A's adult workers thus amounts to increasing the level of M. Given our normalization of the population size of economy A, M is also the exogenous probability that a parent will win the emigration lottery.

2.1. Production

Production of the numeraire requires capital and land. Therefore in addition to households, there is also a number $\bar{k}$ of (for simplicity) childless capitalists, each endowed with one unit of capital. Thus $\bar{k}$ is both the number of capitalists and the total stock of capital available in the economy. Capital hires labor in this environment, and it takes one unit of capital to start a firm. A capitalist may start a firm that combines one unit of capital and adult labor as production inputs (adult labor sector), or he may start a firm that combines capital and child labor (child labor sector). There is perfect capital mobility across the two sectors. Denote as k_a the number of firms operating in the adult labor sector and as k_c the number of those operating in the child labor sector. By normalization, k_h is also the total stock of capital used in sector $h \in \{a, c\}$. Output of the representative firm is $y_a = l_a^{\mu}$ in the adult sector, and $y_c = \phi l_c^{\mu}$ in the child labor sector, where $\phi \in (0,1)$ is a productivity parameter, and $\mu \in (0,1)$, the labor share.

Total labor supply is given by $1-M$ in the adult sector, and $\bar{L}_c$ in the child labor sector. We interpret $\bar{L}_c$ as the economy-wide incidence of child labor. Labor use and intersectoral capital allocation constraints respectively are:

$$(i) \;\; k_c l_c \leq \bar{L}_c; \qquad (ii) \;\; k_a l_a \leq 1-M; \qquad (iii) \;\; k_a + k_c = \bar{k}.$$

Under perfect competition, market-clearing wages for adult labor (ω_a) and child labor (ω_c) are respectively

$$\omega_a = \mu\left(\frac{k_a}{1-M}\right)^{1-\mu} \quad (2.1)$$

$$\omega_c = \mu\phi\left(\frac{k_c}{\bar{L}_c}\right)^{1-\mu}. \quad (2.2)$$

As firms are owned by capitalists, a typical capitalist claims a residual $\pi_a = y_a - \omega_a l_a$ after production if operating in sector a, and $\pi_c = y_c - \omega_c l_c$ if operating in sector c. Hence using (2.1)-(2.2) yields the sector-dependent return to capital as follows:

$$\pi_c = (1-\mu)\,\phi\left(\frac{\bar{L}_c}{k_c}\right)^{\mu} \quad (2.3)$$

$$\pi_a = (1-\mu)\left(\frac{1-M}{\bar{k}-k_c}\right)^{\mu}, \quad (2.4)$$

where $\bar{k} - k_c = k_a$.

As long as $\pi_a > \pi_c$, there is no child labor in this economy. Thus a necessary and sufficient condition for child labor to emerge in this environment is that $\pi_a \leq \pi_c$. Perfect mobility of capital across sector implies that in equilibrium, returns are equalized across sectors: $\pi_a = \pi_c$. Substituting (2.3) and (2.4) into this equation, and re-arranging terms thus yields the following equilibrium intersectoral allocation of capital:

$$k_c = \frac{\phi^{1/\mu}\bar{L}_c}{1-M+\phi^{1/\mu}\bar{L}_c}\bar{k} \qquad k_a = \frac{1-M}{1-M+\phi^{1/\mu}\bar{L}_c}\bar{k} \quad (2.5)$$

Clearly, temporary emigration of parents causes a reallocation of capital from the adult sector to the child labor sector: $\partial k_c/\partial M > 0$ and $\partial k_a/\partial M < 0$. Furthermore, from (2.1)-(2.2), substituting in (2.5), yields wages as follows:

$$\omega_a = \mu\left(\frac{\bar{k}}{1-M+\phi^{1/\mu}\bar{L}_c}\right)^{1-\mu} \qquad \omega_c = \phi^{1/\mu}\mu\left(\frac{\bar{k}}{1-M+\phi^{1/\mu}\bar{L}_c}\right)^{1-\mu}. \quad (2.6)$$

To ensure that it is in the best interest of all economy A's parents to enter the temporary emigration lottery pool, we assume that

$$\bar{\omega} \geq \mu \left(\frac{\bar{k}}{1-M} \right)^{1-\mu} \tag{2.7}$$

which in turn implies that the inequality $\bar{\omega} > \omega_a$ always holds.

2.2. Households

A typical parent has preferences defined over own consumption of the numeraire good c_a, child consumption c_k, and child's skill status $j \in \{s, u\}$ when adult. Denote as $m \in \{0, 1\}$ an index operator that takes the value $m = 1$ if a parent wins the emigration lottery and $m = 0$ if not. A child born in a household whose emigration lottery outcome is m and who receives a level of education e becomes skilled ($j = s$) with conditional probability $\Pr(s/e) = \lambda_m e$; but with probability $\Pr(u/e) = 1 - \lambda_m e$ he will remain unskilled as his parent ($j = u$), where $\lambda_m \in (0, 1)$. Given that parents in this environment are homogenous in terms of parenting skills, we will assume that $\lambda_1 = \lambda_0 = \lambda$. The expected utility function representing parental preferences is given by:

$$U = \ln c_a + \gamma \left[\ln c_k + \beta \sum_{j \in \{s,u\}} \Pr(j/e)\, \nu(j) \right] \tag{2.8}$$

where $\nu(j)$ denotes parental valuation of the skill status j of his child when adult, $\gamma > 0$ is the usual parental altruism parameter, and $\beta \in (0, 1)$ the time discounting factor. For simplicity we set $\nu(s) = 1$ and $\nu(u) = 0$, implying that each parent longs to raise a child that will become skilled when adult. Since children do not emigrate in this environment, they each receive a transfer θ from their parent to help finance their consumption expenses. This transfer is called *remittance* when it is made from an emigrant parent to his child left behind.

A parent's optimal choice of the household's consumption plan, child transfer and investment in child's education is made subject to the following constraints: (i) $c_a + \theta \leq R(m)$, (ii) $c_k \leq \theta + (1 - e)\, \omega_c$, where $R(1) = \bar{\omega}$ and $R(0) = \omega_a$, with $\Pr(m = 1) = M$ and $\Pr(m = 0) = 1 - M$.

The decision problem faced by a typical parent whose emigration lottery outcome is

m can thus be written as follows using budget constraints and (2.8): $\max_{\langle e,\theta\rangle} V(m,e,\theta)$, where

$$V(m,e,\theta) = \ln\left[R(m) - \theta\right] + \gamma\left[\ln\left(\theta + (1-e)\,\omega_c\right) + \lambda\beta e\right]. \tag{2.9}$$

At a cost of straightforward calculus, we obtain the following Lemma:

Lemma 1. *Suppose that ,*

$$1 \quad < \quad \frac{(1+\gamma)\,\phi^{1/\mu}}{\gamma\beta\lambda} < 1 + \phi^{1/\mu}; \tag{2.10}$$

$$\mu\left(\frac{\bar{k}}{1-M}\right)^{1-\mu} \quad \leq \quad \bar{\omega} \leq \frac{(1+\gamma)\,\phi^{1/\mu}}{\gamma\beta\lambda}\left(\frac{\bar{k}}{1-M+\phi^{1/\mu}}\right)^{1-\mu}\mu. \tag{2.11}$$

Then, the optimal choice of (e,θ) *is given as follows:*

$$e_m^* = 1 + \frac{R(m)}{\omega_c} - (1+\gamma)\,(\gamma\beta\lambda)^{-1}; \qquad \theta_m^* = R(m) - (\gamma\beta\lambda)^{-1}\,\omega_c. \tag{2.12}$$

Since $R(1) > R(0)$, children from migrant households always receive more education (Hansen and Woodruff 2003). Conditions (2.10) and (2.11) ensure that $e_m \in (0,1)$, for all $m \in \{0,1\}$. These conditions are useful for comparative statics exercises. Given Lemma 1, the economy-wide incidence of child labor can thus be given as follows, using the law of large numbers: $\bar{L}_c = (1-M)(1-e_0) + (1-e_1)\,M$. Using (2.1), (2.2), (2.5), and (2.12) yields $\bar{L}_c$ as follows

$$\bar{L}_c = \frac{1+\gamma}{\gamma\beta\lambda} - \frac{1-M}{\phi^{1/\mu}} - \frac{\bar{\omega}}{\mu\phi^{1/\mu}}\left(\frac{1-M+\phi^{1/\mu}\bar{L}_c}{\bar{k}}\right)^{1-\mu} M. \tag{2.13}$$

2.3. Equilibrium Analysis

Observe that k_a, k_c, π_a, and π_c are written as functions of the incidence of child labor $\bar{L}_c$. This implies that proving the existence of a general equilibrium for economy A amounts to determining $\bar{L}_c$. Therefore:

Definition 1. *A general equilibrium for economy* A *is an incidence of child labor* $\bar{L}_c$*, such that* $\bar{L}_c$ *solves (2.13).*

Given conditions (2.10) and (2.11), equation (2.13) can be shown to be a well-defined fixed-point problem. Therefore *Brouwer Fixed Point* theorem may be applied to establish the existence of a unique solution to (2.13).

To characterize this solution, define

$$\Gamma\left(\bar{L}_c, M, \bar{\omega}\right) \equiv \bar{L}_c - \frac{1+\gamma}{\gamma\beta\lambda} + \phi^{-1/\mu} + \left[\left(\frac{1 - M + \phi^{1/\mu}\bar{L}_c}{\bar{k}}\right)^{1-\mu}\bar{\omega} - \mu\right]\frac{M}{\mu\phi^{1/\mu}},$$

so that equation (2.13) becomes $\Gamma\left(\bar{L}_c, M, \bar{\omega}\right) = 0$. The unique solution $\bar{L}_c^*$ to this equation can be characterized implicitly as follows by applying the *Implicit Function* theorem: $d\bar{L}_c^*/dM = -\Gamma_M/\Gamma_L$, where Γ_L and Γ_M are partial derivatives of Γ. At the cost of straightforward calculus, it can be shown that $\Gamma_L > 0$. Clearly then, the effect of temporary emigration (i.e., an exogenous increase in M) depends on the sign of Γ_M, which, unfortunately, is ambiguous. We therefore have no choice but to resort to a numerical simulation to assess this effect. Parameters values for this simulation are chosen such that conditions (2.10) and (2.11) underlying Lemma 1 are simultaneously satisfied:

Table: Parameters values

β	λ	γ	$\bar{\omega}$	μ	$\bar{k}$
0.96	0.70	0.75	0.80	0.66	1

Figures 1 and 2 below summarize our simulation exercises. Encouraging temporary emigration of unskilled workers (i.e., a rise in M) has a U-shape effect on the incidence of child labor as both figures show. Fig. 1 controls for the effect of child labor productivity

ϕ, while Fig. 2 shows a U-shape effect for $\phi = .45$.

Fig.1: Incidence of Child Labor by ϕ and M

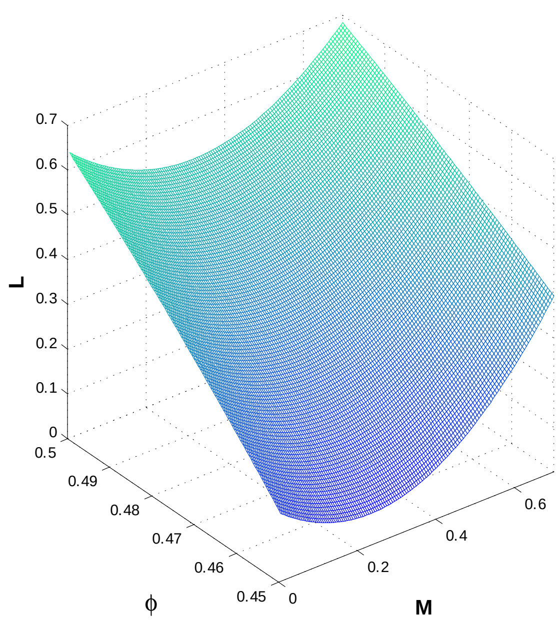
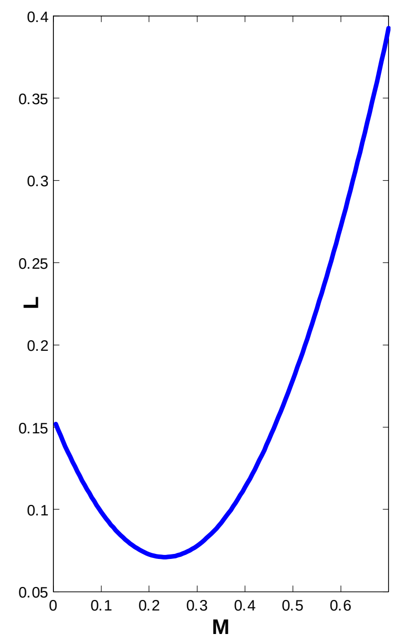


Fig.2: Incidence of Child Labor, ϕ=0.45



3. Concluding Remarks

Using a general equilibrium model of migrant remittances, parental investment in child schooling, and intersectoral allocation of capital, we reassess the case for temporary emigration of unskilled workers as a solution to the child labor problem. A counterfactual simulation of this model reveals a U-shape effect of temporary emigration on the incidence of child labor: encouraging temporary emigration of unskilled workers initially reduces the incidence of child labor as shown in both graphs above. However, as the flow of emigrants becomes increasingly large, such policy becomes counter-productive. The driving force of this U-shape effect is the complementarity between labor and capital (or land), and the intersectoral perfect mobility of capital (or land). Our results suggest that policymakers and development experts should exercise caution in advocating temporary emigration of unskilled workers as the solution to the child labor problem.

References

[1] Basu, Kaushik and Van, Pham Hoang, 1998. The Economics of Child Labor, *American Economic Review*, vol. 88(3), pp. 412-27.

[2] Docquier, F. and Rapoport H., 2003. Remittances and inequality: a dynamic migration model, *CREDPR Working Paper, Stanford University.*

[3] Epstein, G.S., and Kahana, N., 2008. Child labor and temporary emigration. *Economics Letters* 99 (2008) 545–548.

[4] Hanson, G., and Woodruff, C. , 2003. Emigration and education attainment in Mexico. Unpublished paper. University of California at San Diego.