

# Dual Poverty Trap: Intra- and Intergenerational Linkages\*

RYO Horii<sup>†</sup>      MASARU Sasaki<sup>‡</sup>

This Version: March 7, 2008

## Abstract

This paper constructs an overlapping generations model of search equilibrium that analyzes intergenerational and coordination traps simultaneously. When parents are uneducated, their children often face difficulty in finishing school and therefore are likely to remain uneducated. In addition, if children expect that other children of the same generation will not receive an education, they expect that firms will not create enough jobs for educated people and thus are discouraged from schooling. These two mechanisms of poverty trap reinforce each other, creating a dual poverty trap. Escaping from the trap requires a combined, not separate, implementation of financial assistance for schooling, and policies for changing agents' expectations.

**JEL Classification Numbers:** O11, J62, J23.

**Keywords:** overlapping generations model, education, intergenerational externality, job search, coordination failure.

---

\*The authors are grateful to Ryoichi Imai, Noritaka Kudoh, Kazuo Mino, Yasuhiro Sato, Takashi Shimizu and seminar participants at Osaka University, Kansai University, and the JEA 2006 Spring Meeting for their valuable comments and suggestions. This research is partially supported by the Japan Society for the Promotion of Science, Grant-in-Aid for Young Scientists (B), 2004–2006. Any remaining errors are naturally ours.

<sup>†</sup>Correspondence: Graduate School of Economics and Management, Tohoku University, 27-1 Kawauchi, Aoba-ku, Sendai 980-8576, Japan. E-mail: horii@econ.jpn.org

<sup>‡</sup>Graduate School of Economics, Osaka University, 1-7 Machikaneyama, Toyonaka 560-0043, JAPAN. E-mail: sasaki@econ.osaka-u.ac.jp Tel: +81-6-6850-5222. Fax: +81-6-6850-5274.

# 1 Introduction

It has been argued that many low-income countries cannot escape from poverty because people in youth do not acquire sufficient education and therefore work only in less productive sectors when they are adults. A survey by the World Bank's World Development Indicators 2006 (WDI) reports that the gross school enrollment rate for secondary education among low-income countries (with a GNI per capita of \$580 or less with Atlas methodology) was only 45% in 2004. The literature on economic development provides several potential reasons why many children do not receive education in poor countries, and various aid programs are implemented aiming at resolving each of those problems.<sup>1</sup> However, difficulties faced by, and unsuccessful outcomes of, those programs suggest that the reality is more entangled than the scenarios considered by previous theories.

This paper develops a simple model of the poverty trap in which two seemingly unrelated problems reinforce each other, so that the solution of even one of the problems is more difficult than when each problem exists separately. In an overlapping generations model of search equilibrium, we analyze intergenerational linkage in each family or lineage, and coordination issues among the individuals of the same generation. If parents in a family are not educated, children are less likely to obtain education than otherwise. If the majority of other individuals of the same generation within the economy do not receive education, one might (correctly) expect the return from schooling to be low, which lessens the incentive to receive education.

While each of these two mechanisms can separately create the possibility of a poverty trap, this paper shows that, when they are simultaneously present, they reinforce each other so that the likelihood that the economy falls into a poverty trap is considerably higher; that is, a coordination failure triggers the intergenerational trap, whereas the limited intergenerational mobility makes the coordination trap more persistent. In addition, we show that in economies trapped in poverty for both reasons—i.e.,

---

<sup>1</sup>For example, many theoretical studies of the poverty trap rely on the assumption that the financial market is imperfect and therefore children cannot borrow enough against their future income. In such a setting, children cannot afford education and therefore must remain poor, simply because they are poor now. If this were the only problem, it would be solved by provision of education loans for poor families.

in *dually* trapped economies—the problem can be solved only when both intergenerational and coordination issues are tackled simultaneously and in a well-organized way.

Regarding the intergenerational linkage, there are empirical views supporting the hypothesis that the education level of parents has a significantly positive effect on children’s school attendance, even after controlling for income (e.g., Strauss and Thomas 1995; Grootaert 1999; Ray 1998; Patrinos and Psacharopoulos 1997; Altonji and Dunn 1996).<sup>2</sup> In particular, Bratti (2002) shows that children’s school level depends more on family characteristics (parents’ education level and social class) than on parents’ current income, using the British data. To explain those observations in a simple setting, our model assumes that the cost of acquiring education is higher when one’s parent is unskilled, i.e., when the parent neither is educated nor obtained some skill on the job. As studied in the literature (e.g., Azariadis and Drazen 1990; De la Croix and Michel 2002, sec.5.2; Moav 2005), such intergenerational positive spillovers of education generate increasing returns in obtaining education and therefore may create multiple steady states. If the initial generation obtains low education, then the subsequent generation faces a higher cost of schooling and therefore again does not obtain education. Such a link creates an intergenerational poverty trap.

The other key component of our model is coordination failure. We focus on the tendency in low-income countries for children to have little prospect of finding a good job even when they acquire education. Wakabayasi (1993, 1998) reported that throughout the interviews, poor employment opportunities discouraged parents from sending their children to the secondary school in poor communities of Roi-Et Province, Thailand.<sup>3</sup> According to the survey conducted before the policy implementation, 20 % of the households answered that their children were not permitted to go on to the secondary school, and 15 % of them responded that their children did not want to attend the

---

<sup>2</sup>Behrman (1997, 2002) focuses on the effect of mother’s education level on children’s school attainment.

<sup>3</sup>The Thai government initiated its seventh National Educational Development Plan (NEDPlan) in 1992 to raise up to 9 years of mandatory education by 1996. Wakabayashi (1993, 1998) surveyed the process of implementing the national educational policy at the local level in Roi-Et Province.

secondary school.<sup>4</sup> Many people including parents and children view the secondary education as a waste of time. If they hold such a pessimistic expectation, it discourages them from attending school even when it is financially affordable. In fact, the pessimistic expectation is shown to be self-fulfilling when we explicitly consider the frictional nature of the labor market: if there are few educated workers, firms are not willing to create jobs that require educated workers as they think it difficult to find appropriate workers successfully.

In the literature, previous studies have shown that multiple equilibria may emerge if acquiring education on the part of workers and creating jobs on the part of firms are strategic complements (see Laing, Parivos, and Wang 1995; Acemoglu 1997; Takii 1997; Burdett and Smith 2002). Rather, given that acquisition of education takes much longer than creation of jobs, this paper stresses the importance of expectations of young people. If one thinks other agents have a pessimistic expectation, one can rationally expect that other agents will not receive education and that, when they are grown up, firms observing this will not create enough jobs. Therefore, this bad outcome cannot be avoided unless all young agents somehow coordinate their expectations; that is to say, a coordination trap emerges.

Previous studies have analyzed intergenerational and coordination traps separately. However, when the economy is trapped for one of those reasons, it increases the likelihood of the economy being also trapped for the other reason; i.e., the poor countries may be *dually* trapped. If a certain mass of people in the previous generation is uneducated, then not only children of those uneducated agents but also other agents in the economy have to choose not to receive education; i.e., the bad intergenerational linkage causes a coordination failure. In the other direction, once a coordination failure occurs, then the majority of agents in the generation choose not to receive education, which causes the intergenerational poverty trap in the subsequent period. We show that, consequently, any policy prescription that aims to solve only one of the problems will not work and may fail completely without even partially resolving the targeted problem. This could be one of the reasons why various forms of development assistance have been largely unsuccessful.

---

<sup>4</sup>On the other hand, 39 % of them said that they could not afford to send their children to the secondary school.

International organizations have recently recognized the necessity of a combined approach to the dual nature of the poverty trap. For example, the World Bank (South Asia) the International Development Association (IDA) budgeted for the female education awareness program as well as for a stipend in the Female Secondary School Assistance Project of Bangladesh, 1993-2001.<sup>5</sup> Similarly, the Africa division of the World Bank put special emphasis on awareness campaigns to enhance girls' education in Mauritania and Guinea (the World Bank 2000). The gross school enrollment rates of girls increased to 83.2 % in 1997-98 from 39.3 % in 1989-90 in Mauritania and to 36.9 % in 1997-98 from 21.7 % in 1989-90 in Guinea.

This paper is organized as follows. The next section sets up a simple overlapping generations model in which a parent's human capital eases the acquisition of education by her child. We derive young peoples' schooling choices given their expectations regarding the prospect of successfully obtaining a job in the modern sector. Firms' job creation decisions are analyzed in section 3. Section 4 investigates the equilibrium of the economy and shows that, under a particular parameter range, the equilibrium exhibits a dual poverty trap. In section 5, after explaining why the one-by-one prescription fails, we consider two types of effective policies: subsidy for education and provision of free education, each combined with public awareness campaigns. Concluding Remarks appear in the last section.

## 2 Households

In the model, there are overlapping two-period-living agents with a unit population for each generation. Agents seeks to maximize the utility that is obtained from their consumption flow. For simplicity, we assume either that the economy is a small open country or that agents are risk neutral. In either case, the discount factor is constant and denoted by  $\beta \in (0, 1)$ .

---

<sup>5</sup>see the World Bank's web site: [web.worldbank.org/html/extdr/hnp/health/inv\\_ppl/p2outcom.htm](http://web.worldbank.org/html/extdr/hnp/health/inv_ppl/p2outcom.htm)  
# bangladesh

## 2.1 Childhood

Let us consider the life of agents born in period  $t$ . In the first period of their life, which we call childhood, agents are endowed with one unit of time and choose whether or not to attend school. Education is assumed to be indivisible: agents can become educated in their adulthood if and only if they finish schooling in their childhood.

If agents decide not to go to school, they spend all available time in working. Children can work only in the traditional sector, where the productivity is low but neither education nor skill is necessary. Let  $z > 0$  denote the marginal productivity of labor per unit time in the traditional sector. Then income in childhood is  $z$ .

If agents want to become educated in adulthood, they must spend a certain amount of time in schooling. Although their parents do not leave financial wealth as bequests, parents' acquired skill has a favorable influence on their ability to learn.<sup>6</sup> If one's parent is skilled (educated or has obtained a skill through work, as discussed later), a time of  $\underline{e} \in (0, 1)$  is required to finish school. For the remaining time in childhood, the agent works in the traditional sector and earns  $(1 - \underline{e})z$ . If the agent's parent is not skilled, a time of  $\bar{e} > \underline{e}$  is required to finish school. Note that this agent needs a longer time to finish school as he or she cannot rely on his or her parents' knowledge. For the remaining time, the agent works and earns  $(1 - \bar{e})z$ .

## 2.2 Adulthood

In what follows, we consider an agent's behavior in adulthood. Adult agents can work either in the modern sector or in the traditional sector.

In the modern sector, production takes place when a firm and a worker meet and agree to a division of output. However, the labor market in the modern sector is frictional and a worker must search for a vacant job. For simplicity, we do not consider separate labor markets for educated and uneducated workers—they search for a job in the same pooled market and find one with the same probability.<sup>7</sup> Let  $q_{t+1} \in [0, 1]$

---

<sup>6</sup>This can be interpreted as a particular form of intergenerational transfer of human capital, as is often assumed in the literature; e.g., De la Croix and Michel (2002).

<sup>7</sup>This assumption can be justified if firms cannot distinguish between educated and uneducated workers until they match with a worker. In other words, this search process is 'undirected.'

denote the probability of a worker successfully matching with a job. Although the value of  $q_{t+1}$  is endogenous, each worker takes it as given.

Both educated and uneducated adult workers seek to find jobs in the modern sector, as the expected income there is higher than elsewhere (which will be confirmed shortly). If a worker fails to match with any vacancy in the modern sector, which occurs with probability  $1 - q_{t+1}$ , she works in the traditional sector where a job is easy to find at no friction (e.g., workers can be self-employed). In that case, she earns  $z$ , regardless of her education level.

If an adult agent successfully matches with a vacant job in the modern sector, which occurs with probability  $q_{t+1}$ , her income depends on whether she is educated or not (i.e., whether she has finished schooling in her childhood). When an educated worker matches with a vacancy in a firm, this pair can produce an output of  $\hat{y} > z$ . Before the production process starts, the worker and the firm negotiate the division of the output. If the worker and the firm fail to agree on the division of output, they cannot match with other agents within the period. After the breakdown, the worker can work in the traditional sector, where she can earn  $z$ , whereas the firm cannot produce output and its income is zero. Let  $y \equiv (\hat{y} - z)/2 > 0$  denote half of the surplus from the match. Through negotiations, we assume that the pair reaches the Nash bargaining solution with equal bargaining powers. Then, the income of the worker is  $y + z$ , whereas that of the firm is  $y$ .

When an uneducated worker matches with a vacancy, she tries to acquire the required skill through self-training, or learning by doing in the modern sector. She successfully obtains the skill with a small probability  $p \in (0, 1)$ , and for this case, the match produces  $z + 2y$ . The division of the surplus is  $y + z$  and  $y$  as above. However, with probability  $(1 - p)$ , she fails, and the match produces only  $z$ —i.e., the surplus is zero. Then, the worker earns  $z$  and the vacancy gets nothing. Figure 1 summarizes the possible courses of life of an individual.

### 2.3 Schooling Decisions

Agents determine whether or not to attend school in order to maximize the present value of their lifetime income. If an agent born in period  $t$  decides not to attend school, the present value of expected lifetime income is  $z + \beta[pq_{t+1}^e(y + z) + (1 - pq_{t+1}^e)z]$ , where

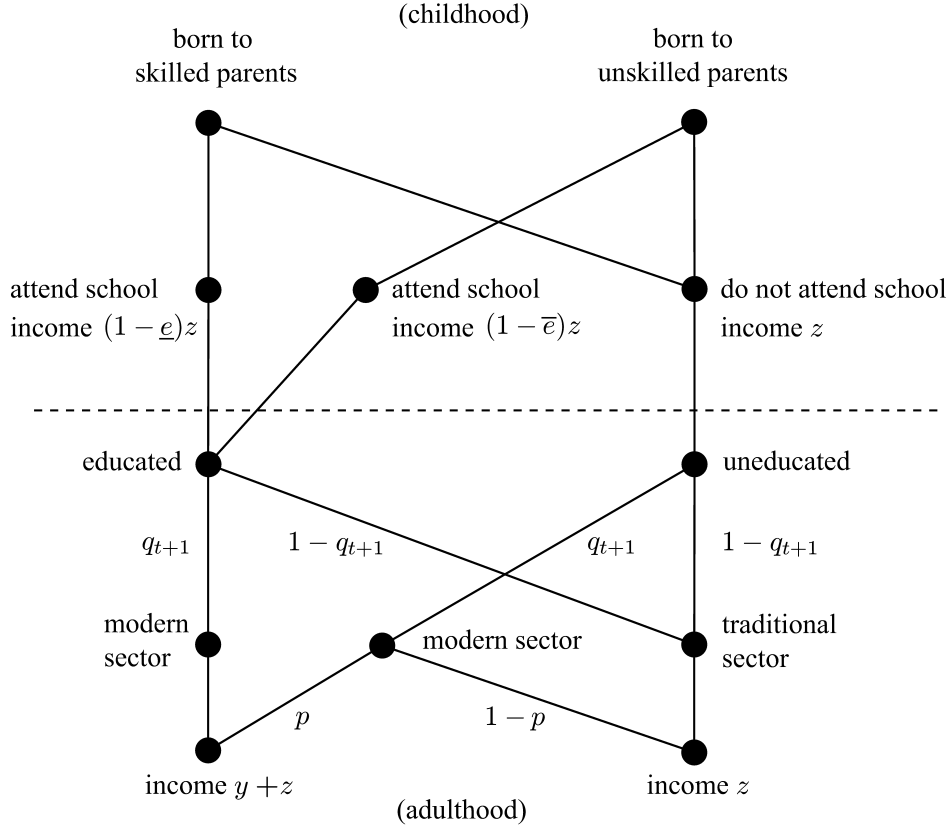


Figure 1: Life of an individual

$q_{t+1}^e$  is the expected value of  $q_{t+1}$  as of period  $t$ . Likewise, if an agent born in period  $t$  decides to finish school, her present value of lifetime income is  $(1 - e)z + \beta[q_{t+1}^e(y + z) + (1 - q_{t+1}^e)z]$ , where  $e = \underline{e}$  if one's parent is skilled whereas  $e = \bar{e}$  if not so. Therefore, the net benefit of schooling is:

$$-ez + \beta q_{t+1}^e (1 - p)y, \quad \text{where } e = \underline{e} \text{ or } \bar{e}. \quad (1)$$

Note that, as  $\underline{e} < \bar{e}$ , the net benefit of education is higher for agents with skilled parents (i.e., parents who have finished schooling or obtained skill through working in the modern sector).

A young agent receives education if and only if expression (1) is positive or zero.<sup>8</sup> More specifically, a young agent whose parent is skilled receives education if and only

---

<sup>8</sup>It is assumed that agents receive education when they are indifferent to doing so.



if the expected probability of finding a job is reasonably high:

$$q_{t+1}^e \geq \underline{e}z/(\beta(1-p)y) \equiv q^*. \quad (2)$$

A young agent whose parent is not skilled receives education if and only if the expected probability of finding a job is even higher:

$$q_{t+1}^e \geq \bar{e}z/(\beta(1-p)y) \equiv \bar{q} > q^*. \quad (3)$$

We focus on the case in which the time cost of education for children of unskilled parents,  $\bar{e}$ , is fairly high so that the threshold level  $\bar{q}$  exceeds one.<sup>9</sup> This means that children of unskilled parents never receive education—the only way for them to acquire skill is learning by doing. In later sections, we show that this limitation in intergenerational mobility constitutes one factor in generating a poverty trap. Before that, however, we describe how jobs are created.

### 3 Matching Technology and Job Creation

In the modern sector, a worker must meet a vacant job in order to produce output. Vacant jobs are created by firms through free entry. Let the cost of creating a vacant job be denoted by  $k > 0$ , and let  $v_{t+1}$  represent the number of vacancies created by firms in period  $t + 1$ . Any job, filled or not, deteriorates in one period.

There exists a search-matching friction as mentioned before. Specifically, we assume that the number of matches in a period is determined by a standard symmetric Cobb–Douglas matching function,  $M(\ell_{t+1}, v_{t+1}) = A\ell_{t+1}^{1/2}v_{t+1}^{1/2}$ , where  $A > 0$  is a parameter of matching technology and  $\ell_{t+1}$  denotes the number of workers who search for a job. Recall that all adult workers (with population one) search for a job in the modern sector, which means  $\ell_{t+1} = 1$ . Therefore, the number of matches in period  $t + 1$  is  $M(1, v_{t+1}) = A\sqrt{v_{t+1}}$ . The probability of a worker matching with a vacant job is:

$$q_{t+1} = M(1, v_{t+1})/1 = A\sqrt{v_{t+1}}. \quad (4)$$

In a similar way, the probability of a vacant job matching with a worker can be expressed as  $M(1, v_{t+1})/v_{t+1} = A/\sqrt{v_{t+1}}$ .

<sup>9</sup>Specifically, it is assumed that  $\bar{e} > \beta(1-p)y/z$ .

Let us calculate the profitability of creating a job. Let  $E_{t+1}$  denote the number of educated among the adult agents in period  $t + 1$ . When a vacant job is created, it meets with a worker with probability  $A/\sqrt{v_{t+1}}$ . Conditional upon this, the matched worker turns out to be educated with probability  $E_{t+1}/\ell_{t+1} = E_{t+1}$ , and in that case, the firm earns  $y$ . With probability  $(1 - E_{t+1})$ , the matched worker is uneducated. The uneducated worker successfully trains himself with probability  $p$ , for which case the firm earns  $y$ , but if he fails to acquire the skill, the firm earns 0. Therefore, the expected profit of creating a vacancy is written as:

$$(A/\sqrt{v_{t+1}}) [E_{t+1} + (1 - E_{t+1})p] y - k. \quad (5)$$

In equilibrium, the number of vacant jobs,  $v_{t+1}$ , is determined so that expression (5) becomes zero; i.e.,  $v_{t+1} = A^2 [E_{t+1} + (1 - E_{t+1})p]^2 / k^2$ . Substituting it into (4) shows that the equilibrium probability for a worker of finding a job is:<sup>10</sup>

$$q_{t+1} = m_0 + m_1 E_{t+1}, \quad (6)$$

where  $m_0 \equiv pA^2y/k$  and  $m_1 \equiv (1 - p)A^2y/k$  are positive constants. Equation (6) implies that if firms observe that there are greater numbers of educated workers among adults, they create more jobs in the modern sector, leading to an increase in  $q_{t+1}$ . We also have shown in the previous section that, if young agents expect  $q_{t+1}$  to be higher, they are more willing to obtain education, leading to an increase in  $E_{t+1}$ . In the next section, we show that the mutual dependence between  $q_{t+1}$  and  $E_{t+1}$  gives rise to multiple equilibria.

## 4 Equilibrium

In the model presented above, the current state of the economy is sufficiently described by the number of educated among the adult agents,  $E_t$ . Given  $E_t$ , the first subsection investigates the equilibrium of the economy in a particular period. Then, the second

---

<sup>10</sup> As  $q_{t+1}$  is a probability, it must be between 0 and 1. Therefore, it may be more appropriate to write (6) as  $q_{t+1} = \min[m_0 + m_1 E_{t+1}, 1]$ , or to write the matching function as  $M(\ell_{t+1}, v_{t+1}) = \max[A\ell_{t+1}^{1/2}v_{t+1}^{1/2}, \ell_{t+1}, v_{t+1}]$ . If  $k > A^2y$ , the right-hand side of (6) does not exceed 1 for any  $E_{t+1} \in [0, 1]$ , and therefore such a consideration is unnecessary. In what follows, we assume  $k > A^2y$ .

subsection considers the evolution of the economy over generations and explains why a poverty trap emerges.

## 4.1 Stage Equilibria

Let us consider the behavior of generation  $t$  agents (those born in period  $t$ ), given the number of educated among the previous generation's adults,  $E_t$ . To this end, we first need to know how many generation  $t$  agents have skilled parents. Similarly to (6), firms in period  $t$  create vacant jobs so that the probability of a generation  $t - 1$  adult finding job is  $q_t = m_0 + m_1 E_t$ . Therefore,  $q_t(1 - E_t)$  uneducated workers find jobs in the modern sector, and  $p q_t(1 - E_t)$  of them successfully obtain the required skills by themselves. The number of skilled workers among generation  $t - 1$  is the sum of educated and self-trained workers, which can be written as a function of  $E_t$ :

$$S(E_t) \equiv E_t + p q_t(1 - E_t) = E_t + p(m_0 + m_1 E_t)(1 - E_t). \quad (7)$$

Observe that function  $S(E_t)$  is increasing and concave for all  $E_t \in [0, 1]$ .<sup>11</sup>

Among the young agents in period  $t$ ,  $S(E_t)$  of them are with skilled parents and  $1 - S(E_t)$  of them are with unskilled parents. Recall that children of skilled parents receive education if and only if they expect that they will find a job in the modern sector in the next period with probability higher than or equal to  $q^*$  (see equation 2). Recall also that children of unskilled parents never receive education. Therefore, the number of young agents who obtain education is:

$$E_{t+1} = \begin{cases} 0 & \text{if } q_{t+1}^e < q^*, \\ S(E_t) & \text{if } q_{t+1}^e \geq q^*. \end{cases} \quad (8)$$

Equation (8) determines the number of educated in period  $t + 1$ ,  $E_{t+1}$ , as a function of the expected matching probability,  $q_{t+1}^e$ . Then, as a function of  $E_{t+1}$ , the actual matching probability  $q_{t+1}$  is determined according to (6). As long as agents are rational,

---

<sup>11</sup>By straightforward calculations,  $S'(E_t) = 1 + p(m_1 - m_0) - 2pm_1 E_t$  and  $S''(E_t) = -2pm_1 < 0$ . In addition, as it is assumed that  $k > A^2 y$  (see footnote 10),  $S'(1) = 1 - p(m_0 + m_1) = 1 - pA^2 y/k > 0$ . Therefore  $S'(E_t) > 0$  for all  $E_t \in [0, 1]$  follows.

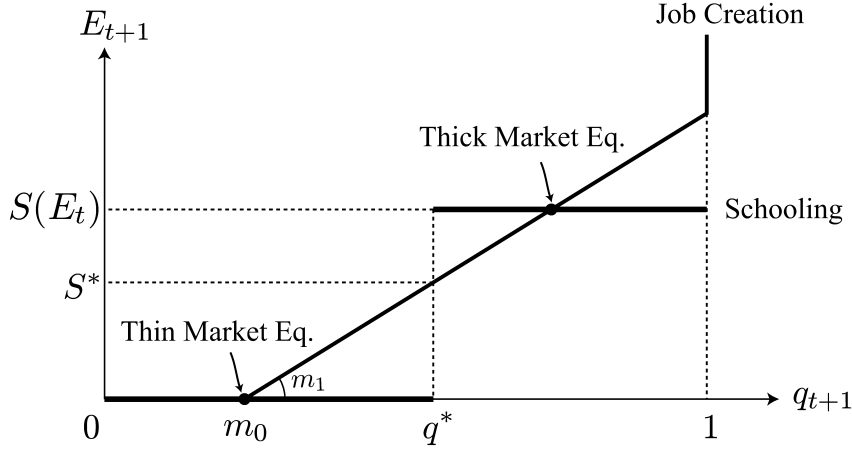


Figure 2: Reaction functions and stage equilibria

the expected matching probability  $q_{t+1}^e$  must coincide with the actual probability  $q_{t+1}$ .<sup>12</sup> Therefore, the rational expectations equilibrium for this period is given by a pair of  $q_{t+1}$  and  $E_{t+1}$  that simultaneously satisfy (6) and (8).

Figure 1 displays job creation (6) and schooling decisions (8) in  $(q_{t+1}, E_{t+1})$  space. Throughout the analysis, we assume that the probability of obtaining skill without education is low so that  $m_0 \equiv pA^2y/k < q^*$  holds. Observe that if  $S(E_t) \geq (q^* - m_0)/m_1 \equiv S^*$ , there are two rational expectations (stage) equilibria:

$$(q_{t+1}^e, E_{t+1}) = \begin{cases} (m_0, 0) & \dots \text{thin market eq.} \\ (m_0 + m_1 S(E_t), S(E_t)) & \dots \text{thick market eq.} \end{cases} \quad (9)$$

If young agents in period  $t$  expect the matching probability in period  $t+1$  to be low, they do not receive education. Then, in period  $t+1$ , firms observing few educated workers are not willing to create many jobs in the modern sector. Thus, the low matching probability is realized, which we call the *thin market* equilibrium. Conversely, young agents with skilled parents receive education in period  $t$  if they expect the matching probability in period  $t+1$  to be high. Then, in period  $t+1$ , firms observing many educated workers create sufficiently many jobs that the matching probability is actually high, which we call the *thick market* equilibrium.

<sup>12</sup>Note that, for simplicity, we rule out mixed strategies. If agents are allowed to make schooling decisions probabilistically,  $(q^*, S^*)$  can be another equilibrium. However, equilibria such as  $(q^*, S^*)$  are often ruled out in the literature as they seem ‘unstable.’

If  $S(E_t) < S^*$ , only the thin market equilibrium exists:

$$(q_{t+1}^e, E_{t+1}) = (m_0, 0). \quad (10)$$

In this case, the young agents who have skilled parents correctly know that, even when all of them choose to receive education, firms will not create enough jobs such that their devoted time is legitimized.<sup>13</sup>

## 4.2 Poverty Trap

In what follows, we consider the long-term dynamics of the economy in terms of the number of educated,  $E_t$ . From (9) and (10),  $E_t$  evolves over generations according to:

$$E_{t+1} = \begin{cases} 0 & \text{if } S(E_t) < S^*, \\ \text{either 0 or } S(E_t) & \text{if } S(E_t) \geq S^*, \end{cases}$$

as illustrated in Figure 3. We find that there exist two steady-state values of  $E_t$ : one is a good steady state in which all agents receive education ( $E_t = 1$ ), whereas the other is a poverty trap in which no agent receives education ( $E_t = 0$ ).

Figure 3 also shows an example path converging to the good steady state. Observe that, for the economy to converge to the good steady state, two distinct conditions must be satisfied. First, for every generation, young agents must expect the probability of finding a job in the modern sector to be high so that the thick market equilibrium is realized for all periods. Second, the number of skilled agents in the initial adult generation,  $S(E_0)$ , must be larger than the threshold level,  $S^*$ , as otherwise the thick market equilibrium does not exist. If either of the above two conditions is violated, the economy falls into the poverty trap, as we now describe in detail.

Observe that, regardless of the initial state  $E_0$ , the thin market equilibrium is always feasible. Therefore, if the initial young agents happen to have a pessimistic expectation that firms in the modern sector will not create many jobs (which is one of the rational expectations), they do not receive education, and the thin market equilibrium

---

<sup>13</sup>From (1) and (6), the net benefit of education when all of the fortunate young agents who have skilled parents receive education is  $-\underline{e}z + \beta(m_0 + m_1 S(E_t))(1 - p)y$ . This expression is negative if  $S(E_t) < S^*$ .

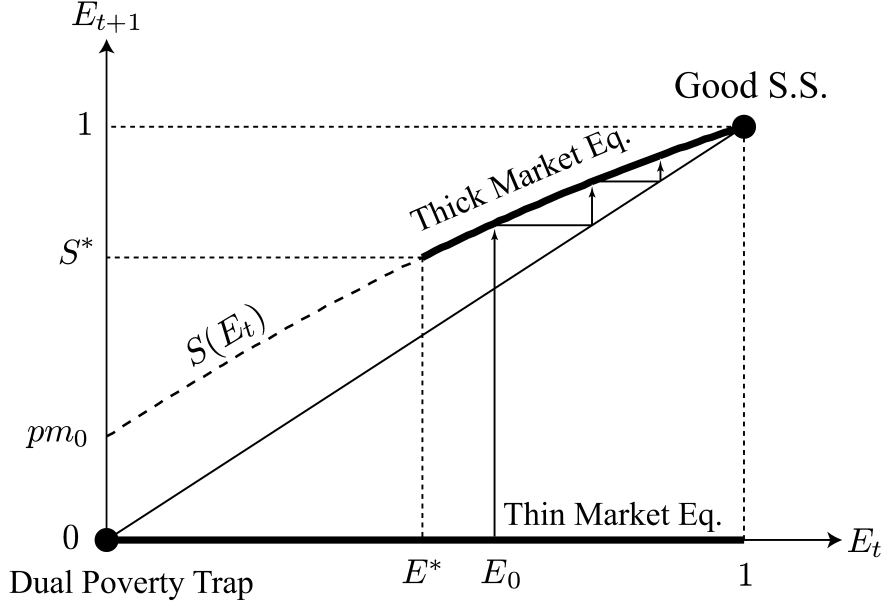


Figure 3: Dynamics and multiple steady states

is realized in the next period (i.e.,  $E_1 = 0$ ). Obviously, this is a worse outcome than the thick market equilibrium in which many of them obtain jobs in the modern sector. Then, why do they not change their minds and have an optimistic expectation? The reason is that each agent cannot rationally change his or her expectation given those of the others: if other agents have a pessimistic expectation, one can rationally expect that other agents will not receive education and that, in the next period, firms observing this will not create enough jobs. Therefore, this bad outcome cannot be escaped unless all young agents somehow coordinate their expectations; i.e., a *coordination trap* emerges.

The selection of equilibrium depends not only on expectations but also on the previous generation's educational attainments. Suppose that the threshold level  $S^*$  is larger than  $pm_0$ , or equivalently that the time cost of education,  $\underline{e}$ , is higher than  $\beta(1-p)(1+pm_1)m_0y/z \equiv \hat{e}$ . Then, young agents cannot hold an optimistic expectation about the probability of finding a job in the modern sector, unless sufficiently many ( $E^* \equiv S^{-1}(S^*)$ ) agents in the previous generation have obtained education. If the economy starts from  $E^0 < E^*$ , then the initial young agents necessarily hold a pessimistic expectation as the thin market equilibrium is the only possible equilibrium in the next period, and therefore they choose not to receive education. This means

$E_1 = 0 < E^*$ , which induces the young agents in period 1 to choose again not to receive education. Such a bad linkage continues over generations, which we call an *intergenerational* trap.

The coordination trap and the intergenerational trap emerge for distinct reasons, but they fortify each other. Suppose that, in some period  $t$ , the young agents fail to coordinate on the optimistic expectation, and therefore  $E_{t+1} = 0$  realizes. Then, from period  $t+1$  on, the only possible equilibrium is the thin market equilibrium. That is, a coordination trap in a certain period triggers the intergenerational trap that persists. Conversely, suppose that the economy has been in the intergenerational trap, and then, for some period  $t$ , the thick market equilibrium becomes feasible (e.g., if  $\underline{e}$  suddenly falls below  $\widehat{e}$ ). This means that the economy is no longer in the intergenerational trap. However, as young agents in period  $t$  know that the probability of finding a job in the modern sector has been low for a number of generations before them, they are likely to think that the thin market equilibrium will be realized again in the next period (more precisely, they are likely to think that other young agents will hold a pessimistic expectation). That is, even when the economy can escape from the intergenerational trap, the history of it being in that trap increases the likelihood of the coordination trap in this period, and also in the future.<sup>14</sup>

## 5 Economic Policies

The previous section has shown that if  $E_t = 0 < E^*$ , the economy is dually trapped in the sense that both the intergenerational and coordination issues must be resolved before economic development can be achieved. This section considers policy prescriptions for escaping from this dual poverty trap.

### 5.1 Inefficacy of Separate Implementation

When the economy is in the intergenerational trap, only a few young agents have skilled parents ( $S(E_t) < S^*$ ). Then the majority of the young agents, with unskilled

---

<sup>14</sup>Rostow (1990) calls such a phenomenon “long run fatalism,” whereas Hoff and Pandey (2004) call such behavior “historically created social identities.” Chamley (2002) shows that a similar equilibrium will be chosen again and again if there is small uncertainty about the structure of the economy.

parents, face a high time cost of education and therefore do not receive education. This in turn lowers the number of jobs created by firms in the next period and therefore deters even the fortunate young agents with skilled parents from receiving education. To resolve this trap, one can imagine two types of policy. One is to subsidize education so that the fortunate young agents with skilled parents receive education even when they expect the probability of finding a job to be not very high. Another is to provide free education for some unfortunate young agents; then firms in the next period will create more jobs, which can induce the fortunate young agents to choose to receive education.

Both types of policy will be effective if the only problem is intergenerational issues. However, in a dually trapped economy, such policies cannot help the economy escape from poverty as long as the expectations of the agents,  $q_{t+1}^e$ , do not change; i.e., the pair of  $q_{t+1}^e = m_0$  and  $E_{t+1} = 0$  is always a rational expectation equilibrium. Therefore, subsidy or free provision of education should be combined with appropriate policies that convince young agents that their lives can be different from their parents' (e.g., public awareness campaigns).

Note also that a public awareness campaign never changes the expectations of rational agents unless it is combined with a subsidy or free provision of education—the thin market equilibrium is only the feasible equilibrium in the dual poverty trap, and the only rational expectation is a pessimistic one. Therefore, the remedies for the intergenerational issue and the coordination issue must be implemented simultaneously—if they are implemented separately or sequentially, they are most likely to fail. The following discusses the combined policy package in more detail.

## 5.2 Uniform Subsidy for Schooling

Consider a subsidy program in which any young agent who completes schooling receives  $\sigma_t z$ , where  $\sigma_t > 0$ . For simplicity, we assume that the expenditure for this program is covered by foreign aid (the results do not change if it can be covered by a nondistortionary tax). Adding  $\sigma_t z$  to expression (1) shows that this subsidy in effect lowers the time cost of education,  $\underline{e}$  and  $\bar{e}$ , by  $\sigma_t$ . Unless  $\sigma_t$  is very large, it does not change the



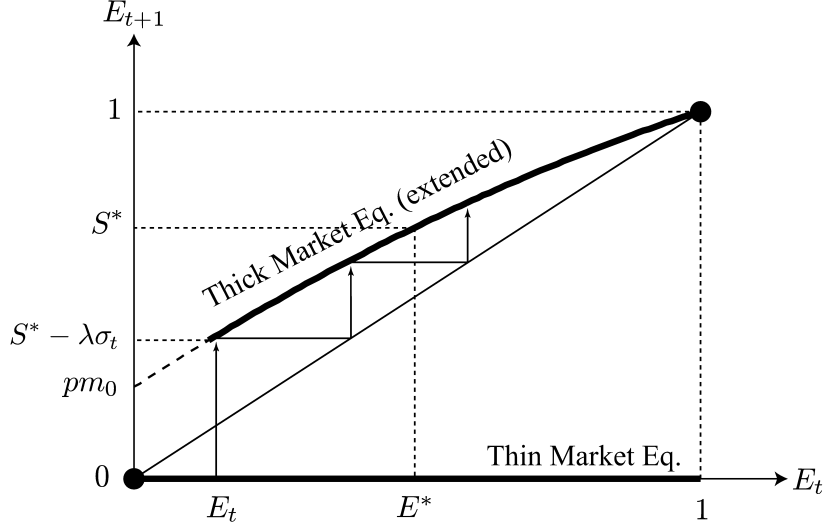


Figure 4: Dynamic effects of subsidy for schooling

behavior of young agents who face the high cost  $\bar{e} - \sigma_t$  of schooling.<sup>15</sup> Therefore, the uniform subsidy is virtually directed to privileged agents who have skilled parents.

How large should the size of subsidy  $\sigma_t$  be? By replacing  $\underline{e}$  by  $\underline{e} - \sigma_t$  in (2), it turns out that subsidy  $\sigma_t$  lowers the threshold number of skilled adults from  $S^* \equiv (q^* - m_0)/m_1$  to  $S^* - \lambda\sigma_t$ , where  $\lambda \equiv z/(\beta(1-p)m_1y)$  is a constant. As shown in Figure 4, the thick market equilibrium becomes possible if:

$$S(E_t) \geq S^* - \lambda\sigma_t \Leftrightarrow \sigma_t \geq (S^* - S(E_t))/\lambda.$$

Suppose that the economy is initially in the dual poverty trap:  $E_t = 0 < E^*$ . As the number of skilled adults is  $S(E_t) = pm_0$ , the subsidy is effective only if  $\sigma_t \geq \underline{e} - \hat{e}$ .<sup>16</sup> With subsidy  $\sigma_t \geq \underline{e} - \hat{e}$ , both the optimistic expectation  $q_{t+1}^e = m_0(1 + pm_1)$  and the pessimistic (or conservative in the sense that it is the same as  $q_t$ ) expectation  $q_{t+1}^e = m_0$  are rational. Therefore, by combining a sufficient amount of subsidy *and* a policy instrument that coordinates expectations, the number of agents receiving education can be increased:  $E_{t+1} = S(E_t) > E_t$ .

<sup>15</sup>If  $\sigma_t$  is that large, all agents go to school and economic development is completed in one period. While this is theoretically possible, the magnitude of expenditure required for such a policy would be implausibly huge.

<sup>16</sup> $\sigma_t \geq (S^* - S(E_t))/\lambda = ((q^* - m_0)/m_1 - pm_0) \cdot (\beta(1-p)m_1y)/z = \underline{e} - \beta(1-p)(1+pm_1)m_0y/z = \underline{e} - \hat{e}$ .

How long should education be subsidized in this case? As  $S(E_t)$  is increasing in  $E_t$ , the required amount of subsidy  $(S^* - S(E_t))/\lambda$  falls period by period.  $S(E_t)$  eventually exceeds  $S^*$ , and thereafter a subsidy is unnecessary. Even after this take-off period is finished, young agents must coordinate upon the thick market equilibrium for all periods. This is typically not difficult given that they observe that firms are creating enough jobs for their parents when they form expectations. Over generations, the economy approaches the good steady state,  $E_t = 1$ .

It should be noted that even though only agents with skilled parents receive the subsidy, those who do not also benefit from an externality. When the agents receiving subsidy acquire education, firms create more jobs in the modern sector, and agents without education can enjoy a greater opportunity for self-training when they are hired in the modern sector. In fact, this is the immediate reason why  $E_t$  increases over generations.

### 5.3 Providing Free Education

The previous subsection has shown that, even though the uniform subsidy for education is virtually directed only to children of skilled parents, if it, and appropriate campaign policy, can change the expectations of those fortunate agents, children of unskilled parents will also benefit from such a policy package through an externality. However, for various reasons, aid organizations often aim to support directly the most unfortunate people. This subsection examines the effectiveness of such programs.

Consider a policy of providing free education to a certain number young agents. The recipients of ‘free education’ are compensated not only for direct expenses regarding education (not explicitly considered in the model) but also for the opportunity cost of learning (i.e.,  $\underline{e}z$  or  $\bar{e}z$ ). Suppose that, in each period, the government or aid organization that implements this program can control the number of recipients,  $n_t$ , as well as the number of the children of unskilled parents among the recipients,  $n_t^u$ . Then, even in the thin market equilibrium,  $n_t$  agents receive free education. In the thick market equilibrium where agents expect  $q_{t+1}$  to be higher than  $q^*$ , education is received by all children of skilled parents,  $S(E_t)$ , and  $n_t^u$  young agents without skilled

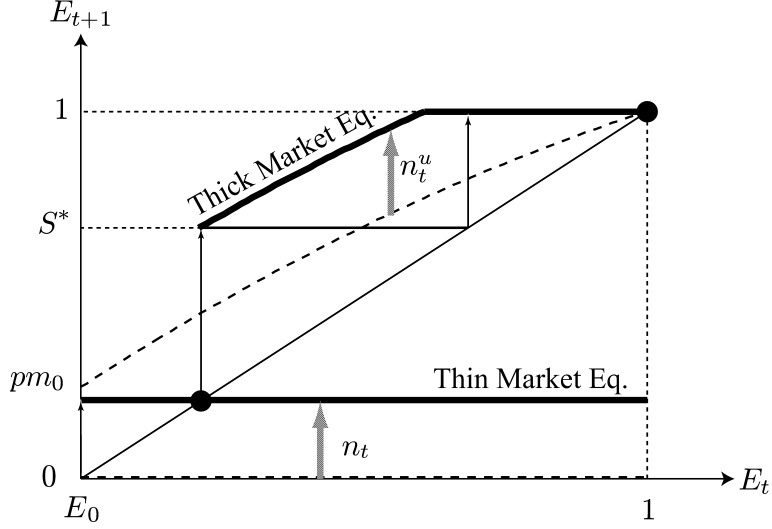


Figure 5: Dynamic effects of free education

parents but with provision of free education. Therefore equation (8) changes to:

$$E_{t+1} = \begin{cases} n_t & \text{if } q_{t+1}^e < q^*, \\ S(E_t) + n_t^u & \text{if } q_{t+1}^e \geq q^*. \end{cases} \quad (11)$$

Firms' decisions to create jobs are the same as (6). From (11) and (6), we can derive the dynamics of  $E_t$  over generations:<sup>17</sup>

$$E_{t+1} = \begin{cases} n_t & \text{if } S(E_t) + n_t^u < S^*, \\ \text{either } n_t \text{ or } S(E_t) + n_t^u & \text{if } S(E_t) + n_t^u \geq S^* > n_t, \\ S(E_t) + n_t^u & \text{if } n_t \geq S^*. \end{cases} \quad (12)$$

Observe that, as shown by the third line of (12), there is only a thick market equilibrium if free education is provided for more than  $S^*$  children (regardless of whether they are children of unskilled parents or not). Obviously, the problems of the dually trapped economy can be solved all at once if the majority of people can receive free education. However, such a policy typically requires an excessively large amount of expenditure in one period and thus often cannot be implemented within limited budgets.

<sup>17</sup>As there are only  $S(E_t)$  children of skilled parents, the number of free education recipients among them,  $n_t - n_t^u$ , cannot exceed  $S(E_t)$ . Therefore,  $S(E_t) + n_t^u \geq (n_t - n_t^u) + n_t^u = n_t$ .

In the following, we propose a two-step method in which the required budget in each period is smaller. When  $n_t < S^*$ , the dynamics of  $E_t$ , determined by (12), can be illustrated as in Figure 5. Suppose that the economy is initially in the dual poverty trap, and denote the initial period by 0:  $E_0 = 0$ . If  $n_1$  young agents receive free education in the initial period, they become educated and therefore  $E_1 = n_1$ . That is, even though  $n_1$  is far smaller than  $S^*$  and therefore the economy stays in the thin market equilibrium, the new steady-state level of  $E_t$  is raised by  $n_1$ .

Then, in the following period, let  $n_2^u = S^* - S(n_1)$  children with uneducated parents receive free education.  $S(E_1) + n_2^u$  reaches the threshold level  $S^*$ , and therefore, if combined with appropriate policies that affect young agents' expectations, such a policy can realize the thick market equilibrium, in which  $E_2 = S^*$ . Thereafter the economy can trace the development path without further assistance as  $E_3 = S(E_2) = S(S^*) > S^*$ , and so forth. Not only can this two-step method diversify the required expenditure over two periods but also it can reduce the total number of free education recipients required before the full development has been completed.<sup>18</sup>

Let us return to the initial question of who should receive free education. In the first step, the type of recipient does not matter. In that case, as a rule, provision of free education for able students (in the model, those with skilled parents) may be financially more reasonable.<sup>19</sup> However, it must be noted that in the second step, the provision of free education must be directed toward the unfortunate children born to unskilled parents. The activities of aid organizations in favor of unfortunate children can be legitimized when such activities are parts of a long-running program. Note also that the public awareness program must be implemented in this later stage of the program, whereas it must be implemented at the initial state of the program if the (uniform) subsidy is used instead of provision of free education.

---

<sup>18</sup>Using (7),  $(n_1 + n_2) = S^* - (S(n_1) - n_1) = S^* - p(m_0 + m_1 n_1)(1 - n_1) < S^*$ . In addition, the derivative of  $(n_1 + n_2)$  with respect to  $n_1$  at  $n_1 = 0$  is  $-p(m_1 - m_0) = -(1 - 2p)A^2 y/k$ , where we used (6). As long as  $p$  is small, this expression is negative. It means that the total number of recipients can be reduced by choosing  $n_1 > 0$  rather than using a one-step program in which  $n_1 = 0$ .

<sup>19</sup>To compensate for the opportunity cost of education, provision of free education for a child of skilled parents costs  $\underline{e}z$  and that for a child of unskilled parents costs  $\bar{e}z > \underline{e}z$ .

## 6 Conclusions

Using an overlapping generations model of search equilibrium, this paper has demonstrated that limited intergenerational mobility and a coordination failure mutually reinforce each other, generating a dual poverty trap. Escaping from the dual trap requires combined implementation of financial assistance for schooling and policies for changing agents' expectations. When financial assistance is given as a form of a uniform subsidy on education, it initially benefits able children who are born to skilled parents but subsequently trickles down to children of families in less favorable situations. On the other hand, when assistance is given as a form of free education to a limited number of children, free education should be provided to children in less favorable situations, especially in the later stage of the assistance program.

This study highlights the necessity of designing a well-organized policy package by simultaneously considering the intergenerational and coordination traps. We show that the size and duration of financial assistance should be determined with a view not only to mitigating the intergenerational issues but also to making the coordination feasible (otherwise the assistance will be totally unsuccessful). Moreover, effective timing of the awareness program to be implemented differs depending on the form of financial assistance. We suggest from this research that a combined approach to seemingly separate problems, not a single approach to either one, is necessary to help low-income countries escape from the persistent poverty trap.

## References

- [1] Acemoglu D. Training and Innovation in an Imperfect Labour Market. *Review of Economic Studies* 1997; 64; 445–464.
- [2] Altonji JG, Dunn TA. The Effects of Family Characteristics on the Return to Education. *Review of Economics and Statistics* 1996; 78; 692–704.
- [3] Azariadis C, Drazen A. Threshold Externalities in Economic Development. *Quarterly Journal of Economics* 1980;105; 501–526.

- [4] Behrman JR. Mother's Schooling and Child Education: A Survey. PIER Working Paper 97-025, University of Pennsylvania; 1997.
- [5] Behrman JR, Rosezweig MR. Does Increasing Women's Schooling Raise the Schooling of the Next Generation? *American Economic Review* 2002; 92; 323–334.
- [6] Massimiliano B. Parents' Current Income, Long-term Family Characteristics and Children's Educational Outcomes: Evidence from the 1970s British Cohort Study. Warwick Economic Research Paper No. 658; 2002.
- [7] Burdett K, Smith E. The Low Skill Trap. *European Economic Review* 2002; 46; 1439–1451.
- [8] Chamley CP. *Rational Herds*. Cambridge University Press; Cambridge; 2004.
- [9] De la Croix D, Michel P. *A Theory of Economic Growth: Dynamics and Policy in Overlapping Generations*. Cambridge University Press; Cambridge; 2002.
- [10] Grootaert C. Child Labor in Cote d'Ivoire. In: Grootaert, C. and Patrinos, H. (Eds), *The Policy Analysis of Child Labor: A Comparative Study*. St Martin's Press; New York; 1999.
- [11] Hoff K, Pandey P. Belief Systems and Durable Inequalities: An Experimental Investigation of Indian Caste. World Bank Policy Research Working Paper 3551; 2004.
- [12] Laing D, Palivos T, Wang P. Learning, Matching and Growth. *Review of Economic Studies* 1995; 62; 115–129.
- [13] Moav O. Cheap Children and the Persistence of Poverty. *Economic Journal* 2005; 115; 88–110.
- [14] Patrinos HA, Psacharopoulos G. Family Size, Schooling and Child Labor in Peru – An Empirical Analysis. *Journal of Population Economics* 1997; 10; p.387–405.
- [15] Ray R. Analysis of Child Labor in Peru and Pakistan: A Comparative Study. *Journal of Population Economics* 2000; 13; p.3–19.

- [16] Rostow WW. *The Stages of Economic Growth: A Noncommunist Manifesto*. 3rd edition. Cambridge University Press; New York; 1990.
- [17] Strauss J, Thomas D. *Human Resources: Empirical Modeling of Household and Family Decisions*. In: J Behrman and TN Srinivasan (Eds), *Handbook of Development Economics*. North-Holland; Amesterdam; 1995.
- [18] Takii K. Jobs, Education and the Underdevelopment Trap. *Journal of International Trade and Economic Development* 1997; 6; 29–42.
- [19] Wakabayashi M. Implementation of the National Educational Policy on Expansion of Basic Education in Rural Thai: A Survey in Northeast Thai, Roi-Et Province. *Bulletin of the School of Education, Nagoya University* 1993; 40; 59–76.
- [20] Wakabayashi M. Universal secondary education and diversifying educational and occupational opportunities in Roi-Et Province in Thailand 1992-1996. *Forum of International Development Studies* 1998; 9; 137–160.
- [21] The World Bank. *Girls Education: The Role of Educational Policies in Mauritania and Guinea*. Africa Region Findings No.171. web site: [www.worldbank.org/aft/findings/english/find171.htm](http://www.worldbank.org/aft/findings/english/find171.htm).; 2000.