The impact of economic measures on child labor in an open dual economy

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This paper is very preliminary. Do not refer.

Abstract

This paper investigates the impact of various economic measures on child labor in an open dual economy. We construct a small open economy model with heterogeneity of households in terms of location of residency and income. A part of households with low income supplies child labor when they reside in the rural area. The measures we will mainly consider are trade policies (e.g. import tariff and subsidy) and consumer boycott on child-labor-used products with various scopes of boycotts. These measures affect child labor supply through changes in 1) the proportion of rural population due to migration between rural and urban areas, 2) the overall income of household due to increase in the return to labor and endogenous supply of child labor, and 3) the cost of living. Depending on economic conditions, these three effects can explain different experiences of fighting efforts against child labor in developing countries.

Keywords Child labor; Household heterogeneity; Dual Economy; Migration; Trade policy; Consumer boycott

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1 Introduction

Child labor is prevailing; 18 percent of all children of five to fourteen years old are economically active worldwide. In less developed countries, the number goes high as income per capita of the country decreases. Many international organization propagates that sending children to the labor market instead of school suppresses economic development and some substantiative actions against child labor are needed. In fact, several actions have already started: labeling on the child-free product by Rugmark foundation; the imposition of international labor

Unlike the image of child labor most of people have, child labor is not always hazardous. Edmonds and Pavcnik (2005a, Journal of Economic Perspective) shows that child labor happens at home. Most of working children works for their parents in the form of domestic work (washing, dishing etc) and helping family business. Children play an important role to manage the household.

Also importantly, child labor happens in agriculture and rural area. In Nepal, 85 percent of child labor occurs in agriculture while 1 percent in manufacturing. This trend is confirmed in Vietnam (92 percent), Ehiopia (89 percent), Cambodia (73 percent) and other countries according to Edmonds and Pavcnik (2005a,b). Of course this trend partly attributes to the industry structure of the country

Since child labor is a symptom of poverty, people consider that only the cure of reducing child labor is economic development or subsiding households with children in a school (e.g. Food for school program). However, from the facts above, we must consider that child labor is also determined by non-economic factors such that family business inevitably employs its children as a work horse or that parents cannot find a job in a labor market with less opportunities. Taking account into these factors gives finer assessment of actions against child labor

Our paper is aimed to provide a theoretical assessment of economic measures on child labor. We construct a small open economy model with heterogeneity of households in terms of location of residency and income. There are two regions, rural and urban, and households can choose their location of residency by comparing the overall income which can be earned in respective region. The possible rural income differs since rural households are assumed to produce differentiated agricultural products different price by employing only available resource within a family. On the other hand, households earn the same amount of income from the homogeneous manufacturing sector with child labor prohibited due to surveillance of the government. Thus income differs across regions and across farmers within the rural region. As a result, variation in supply of child labor occurs; rural households with high-priced agricultural goods do not make their children work; those with intermediate-priced employ their children part time; those with low-priced force their children work full time; urban immigrant households make their children stay at home.

The measures we will mainly consider are trade policies (e.g. import tariff
and subsidy) and consumer boycott on child-labor-used products with various scopes of boycotts. Most of developing countries takes trade restriction by imposing tariffs on their imports or subsidizing the main sector of the economy. These measure must have an unintended impact on child labor.

Secondly we analyze the impact of consumer boycotts on child labor. The literature shows its limited impact on reduction of child labor. Among others, however, Di Maio and Fabbri (2013) finds the condition where consumer boycotts reduces child labor. In their model, consumer boycott on child-labor products reduces the return to child labor, which is separately determined in the child labor market. With household heterogeneity, which we introduce in our model, households response to this decrease differently; households with income below the subsistent level increase their supply of child labor to meet the subsistent level while those with income above the subsistent level will decrease child labor since the opportunity cost of sending children to work decreases. Depending on the density of population in the income layer of each types of households, consumer boycotts can reduce child labor. In our model, however, different mechanism leads to possible success of consumer boycotts. In the dual economy, consumer boycott decreases the return to labor in the agricultural sector and then encourages migration from the rural area to the city. This is a possible pass that consumer boycotts reduces child labor.

The remainder of the paper is organized as follows. The next section explains the setting of our model. The third section describes economic equilibrium. The fourth section analyses the impact on child labor supply of trade measures (import tariffs, production subsidy and export subsidy) and the fifth section does consumer boycotts of child-labor-used products with various scope of targeted products. The last section concludes the paper.

2 Model

We construct a small open economy model with rural and urban areas. The rural area produces differentiated agricultural goods $j \in [0, N]$. In production, farmers can employ child labor in the rural area. On the other hand, the urban area produces manufacturing goods $M$ without child labor since child labor is prohibited in the reach of government’s control. The trade pattern is fixed; the country imports manufacturing goods while it exports some of differentiated agricultural products (with higher prices in equilibrium). There is a $N$ continuous measure of households residing in this country. Each household $i \in [0, N]$ consists of one adult and one child. Adult makes decision on residence, consumption, and labor supply of her household. Each adult has one unit of labor and always work. Child has $\gamma < 1$ unit of labor. Adult decides how much her child works, $e_i \in [0, 1]$.

The utility function is given as, regardless of its income level and residence,

\footnote{Most of countries have laws to regulate or prohibit child labor in the real world}

\footnote{This country imports some of agricultural products with lower prices.....}
\[ U(C_i, e_i) = \begin{cases} (C_i - s)(1 - e_i) & \text{if } C_i \geq s \\ (C_i - s) & \text{if } C_i < s. \end{cases} \]  

(1)

where \( s \) is the subsistent consumption level. \( C_i \) is the consumption level of a composite good as

\[ C_i = A_i^\mu M_i^{1-\mu} \]

\[ A_i = \left[ \int_{j=0}^{N} a_{ij} \sigma_i^1 di \right]^{-\sigma} \]

(2)

where \( A_i, M_i, \) and \( a_{ij} \) are the consumption level for household \( i \) of aggregate agricultural goods, manufacturing goods, and a differentiated agricultural product \( j \) respectively. The parameters \( \mu \in (0, 1) \) and \( \sigma \in (1, \infty) \) denote the share of expenditure to a composite agricultural good and the substitution elasticity across differentiated agricultural goods. Expenditure is described in terms of \( C_i \) such as

\[ p_A A_i + p_M M_i = PC_i \]  

(3)

where \( p_A \) and \( p_M \) are the domestic consumer price of the composite agricultural goods and the manufacturing goods, and \( P \) is the price index for all the goods, or cost of living. The price indices are given as

\[ P = \left[ \left( \frac{\mu}{1-\mu} \right)^{1-\mu} + \left( \frac{\mu}{1-\mu} \right)^{-\mu} \right]^{\mu} p_A^{1-\mu} p_M^{\mu} \]

\[ p_A = \left[ \int_{j=0}^{N} p_j^{1-\sigma} di \right]^{1/\sigma} \]

(4)

where \( p_j \) is the domestic consumer price of a differentiated agricultural good \( j \).

In the small country setting, we assume that

\[ p_M = \tau p_M^* \]

\[ p_j = \alpha p_j^* \]

\[ q_j = \alpha p_j^* + z \]

(5)

where \( q_j \) is the producer price of a differentiated good \( j \) (for latter use) and \( \tau, \alpha \) and \( s \) are policy variables for the domestic prices. The superscript * means the international prices. We interpret \( \tau \geq 1 \) as the ad valorem import tariffs on the manufacturing goods, \( \alpha \in (0, 1) \) as the degree of consumer boycotts or the ad valorem export tax on the agricultural goods, and \( z \) as the specific production subsidy on the agricultural goods. Note that the specific production subsidy affects only the domestic producer price.

Although households shares the same utility function, they differ in terms of their residence and their income. The first heterogeneity arises from the following assumption.
Assumption

1. Each household $i$ is assigned to produce one differentiated agricultural product with international price $p_i^*$. 
2. The function of $p_i^*$ is continuous, linear, and increasing in $i$ over $i \in [0, N]$. 
3. No household is assigned to produce the same type of product a priori. 
4. The degree of differentiation is low enough that households can learn to produce high-priced product once they engage in production of high-priced product. 

The first three assumptions induce that the number of differentiated agricultural goods produced in the country is the same as the number of households; $i \in [0, N]$; that households with higher identification number are ordered to have higher price. For simplicity, we assume that $p_i^* = i$ without loss of generality. The last two assumption assures that production of good $i$ employs resources available within a household. Thus rural households act as family-employed farms. 

The second heterogeneity is that industry where adults (and children) work is determined by the choice of residency. Following a classical paper on dual economy by Harris and Todaro (1970), migration between rural and urban areas occurs since adult seeks for more income (hence consumption). Since there is heterogeneity of income when households stay in the rural area, households with lower rural income will move to the city and start to work in the manufacturing industry while some with higher rural income stay in the rural area. 

We end this section to summarize the timing of events in this model:

1. Nature assigns each household to differentiated agricultural products. 
2. Adult decides location of residency of her family. 
3. Rural households decide $C_i$ and $e_i$ while urban households decide $C_i$. 
4. Markets are cleared and households realize the level of utility. 

3 Equilibrium

Solving the problems backwardly.

3.1 Urban households

The production function in the manufacturing sector is assumed to be $M = \beta L_M$, where $\beta$ is the technology coefficient and $L_M$ is labor demand of the manufacturing sector. We also assume that the sector is competitive and then the return to one unit of efficient labor in the manufacturing sector is $\beta p_M$. 

Households in the urban area works in the manufacturing sector. When they decide to move to the city, the constraint equations are now defined as

\[ PC_i = \beta p_M (1 + \gamma e_i) + t \]  
(6)

\[ e_i = 0 \]  
(7)

where \( t \) is a lump-sum transfer or taxation to an individual household from the government and negligible since there are an infinite number of households with a measure \( N \). We assume that the government budget constraint is balanced. Equation (7) describes the situation where child labor is prohibited in the city so that households cannot send their children to work.

Maximizing (6) subject to (7) and (10) gives the optimal level of consumption of urban households

\[ C_i^U (p_M) = \frac{\beta p_M}{\beta p_M + \gamma} \]  
(8)

The income of urban households is homogeneous, which is given as

\[ I_i^U = \beta p_M. \]  
(9)

3.2 Rural households

Rural self-employed households solve the two problems facing \( p_i \); the profit (income) maximization and the utility maximization. Since the first problem is constrained by the available amount of labor supply within a household, the constraints equations for rural household are

\[ PC_i = q_i (1 + \gamma e_i) + t \]  
(10)

\[ e_i \in [0, 1]. \]  
(11)

Maximizing (10) subject to (11) and (12) with respect to \( C_i \) and \( e_i \), we have the optimal household consumption as \( C_i^R (q_i) = \frac{p_i}{\beta p_i + \gamma} \), the optimal level of child labor in rural area as

\[ e_i (q_i) = \begin{cases} 
1 & \text{if } i \in [0, N_L] \\
\frac{p_i - q_i (1 - \gamma)}{2 \gamma q_i} & \text{if } i \in [N_L, N_H] \\
0 & \text{if } i \in (N_H, N]. \end{cases} \]  
(12)

the total income of household \( i \) in rural area as

\[ I_i^R = q_i (1 + \gamma e_i) = \begin{cases} 
q_i (1 + \gamma) & \text{if } i \in [0, N_L] \\
\frac{p_i + q_i (1 + \gamma)}{2} & \text{if } i \in [N_L, N_H] \\
q_i & \text{if } i \in (N_H, N]. \end{cases} \]  
(13)
where the threshold households between low and intermediate income and between intermediate and high income are given as, using $p_i^* = i$,

\[
N_L = \frac{P_s}{a(1 + \gamma)} - \frac{z}{a},
\]
\[
N_H = \frac{P_s}{a(1 - \gamma)} - \frac{z}{a}.
\] (14)

Heterogeneity of households leads to different pattern of consumption, supply of child labor, and then income; households assigned to higher-priced commodity earn enough to meet the subsistent consumption level and then do not send their children to work, while households assigned to lower-priced commodity force their children to work full time.

### 3.3 Migration

Adult makes decision on her residence by comparing total income (can be) earned in respective region. Since total income in rural is different across households, some will stay in rural and some will move to the city. There will be a threshold household with $p_{NU}$ which satisfy $I_R = I_U$. Thus $N_U$ measure of households reside in urban while $N_R = N - N_U$ reside in rural. There will be three cases arising according to the level of $I_U = \beta p_M$, described in Figure (?).

#### 3.3.1 Case 1: $\beta p_M > \frac{P_s}{1 - \gamma}$

The first case arises when the return to labor in the manufacturing sector is relatively high. In this case, most of population reside in the urban area and only farmer with high-priced products produce agricultural goods without employing child labor. The population residing in the city is given as

\[
N_U = \frac{\beta \tau p_M^*}{a} - \frac{z}{a}.
\] (15)

This case is trivial since there is no child labor in this economy and then we ignore this case in the rest of paper.

#### 3.3.2 Case 2: $\frac{P_s}{1 - \gamma} > \beta p_M > P_s$

The second case arises when the return in the manufacturing sector is intermediately large. The proportion of population living in the city is given as

\[
N_U = \frac{2\beta \tau p_M^* - P_s}{a(1 + \gamma)} - \frac{z}{a}.
\] (16)
In this case, some rural households make their children work part time, according to (??). Thus total supply of child labor is given as\(^3\)

\[
S^R_C = \int_{i=N_L}^{N_H} \frac{P_s - q_i(1 - \gamma)}{2\gamma q_i} \, di. \tag{17}
\]

**3.3.3 Case 3: \( P_s > \beta p_M \)**

The last case arises when the return in the manufacturing sector is low so that most of population reside in the rural area. The proportion of population living in the city is given as

\[
N^U = \frac{\beta \tau p^*_M}{a(1 + \gamma)} - \frac{z}{a}. \tag{18}
\]

In this case, some poor households force their children to work full time and some do so part time. Thus total supply of child labor is given as

\[
S^R_C = \int_{i=N_L}^{N_H} 1 \, di + \int_{i=N_L}^{N_H} \frac{P_s - q_i(1 - \gamma)}{2\gamma q_i} \, di. \tag{19}
\]

\(^3\)See Appendix for \( S^R_C \) in terms of parameters.
4 The Impact of Trade Measures on Child Labor

We analyze the impact on child labor of trade measures (import tariffs on manufacturing goods, production and export subsidies on agricultural goods). These measures are likely to occur when the developing countries intend to protect their infant manufacturing industries by restricting imports from other countries and improve living standards of the economy by providing subsidy to farmers. Even though they are not aimed to achieve reduction in child labor, they must have a substantive impacts on supply of child labor at the household level.

It is turned out that these measure (and anti-child-labor measures which we will talk about in the latter sections) will affect total supply of child labor through changes in 1) the proportion of rural population due to migration between rural and urban areas, 2) the overall income of household due to increase in the return to labor and endogenous supply of child labor, and 3) the cost of living. The first effect is a new feature of our model, which have not been discussed in the literature. These three effects work sometimes in an opposite way and thus can explain different experiences of fighting efforts against child labor in developing countries.

We show the results of analysis separately for Case 2 and 3. Note that in the following analysis, we will limit our analysis to the case where marginal change in policy variables does not change the case we analyze. (e.g. increase in \( p_M \) does not shift Case 2 to Case1.) A technical sufficient condition is provided in Appendix.

4.1 Import Tariffs on the Manufacturing Sector

We model imposing import tariffs as increase in \( \tau \) for \( \tau \geq 1 \). As we know, increase in tariff on manufacturing goods increases the return to labor in the city \( I^U \) and price index \( P \) in a small-country setting.

4.1.1 Case 2

Increase in \( \tau \) reduces rural population since\(^4\)

\[
\frac{\partial N^U}{\partial \tau} = \left( \frac{2\beta}{a(1 + \gamma)} - \frac{s}{a(1 + \gamma)} \frac{\partial P}{\partial p_M} \right) p_M^* > 0. \tag{20}
\]

The rise in \( \tau \) increases the return to labor in the manufacturing sector, which attracts more people to the city. On the other hand, it increases cost of living and then induces households to send their children to work more. In our model, the former effects always dominates the latter effect.

\(^4\)\(2\beta > s \frac{P}{\partial p_M} > s \frac{\partial P}{\partial p_M} = s (1 - \mu) \frac{P}{\partial p_M} \) since \(2\beta p_M > \beta p_M > Ps \) and \( \mu \in (0,1) \).
The impact of import tariff on child labor is described in

\[ \frac{\partial S_0^R}{\partial \tau} = \frac{s}{2\alpha \gamma} \frac{\partial P}{\partial \tau} \ln \frac{aN_H + z}{aN_U + z} - \frac{Ps - (aN_U + z)(1 - \gamma)}{2\gamma(aN_U + z)} \frac{\partial N_U}{\partial \tau}. \]  

The first term describes increase in supply of child labor from the intermediate income households due to rise in cost of living. The second term accounts for decreases in supply of child labor due to movement of rural households to the city. The overall impact of import tariffs depends on the two effects.

4.1.2 Case 3

Increase in \( t \) reduces rural population since

\[ \frac{\partial N_U}{\partial \tau} \beta p^*_M > 0. \]  

In this case, change in cost of living does not affect endogenous supply of child labor since households are inelastic to change in \( P \). Thus imposing tariff inevitably reduces rural population.

The impact of import tariff on child labor is described in

\[ \frac{\partial S_0^R}{\partial \tau} = \frac{s}{2\alpha \gamma} \frac{\partial P}{\partial \tau} \ln \frac{aN_H + z}{aN_U + z} - \frac{\partial N_U}{\partial \tau}. \]

**Proposition 1** Imposing import tariffs on the manufacturing goods reduces rural population since it attracts household to the city with higher return to labor. It affects child labor through the two compelling effects: the migration effect and the cost of living effect. The overall effect is ambiguous and depends on economic conditions.

4.2 Production Subsidy on the Agriculture Sector

We model production subsidy as increase in \( s \). As the traditional trade theory tells, this measure affect only the domestic producer price and then income of farmers. Production subsidy affects the decision of location of residence and supply of child labor at the household level. Indeed it chains households to the rural area and increases child labor. On the other hand, increase in income of the rural sector reduces supply of child labor at the household level.

4.2.1 Case 2

Increase in \( z \) increases rural population since

\[ \frac{\partial N_U}{\partial z} = -\frac{1}{\alpha} < 0. \]
4.2.2 Case 3

Increase in $z$ increases rural population since

$$\frac{\partial N^\mathrm{IL}}{\partial z} = -\frac{1}{\alpha} < 0. \hspace{1cm} (25)$$

$$\frac{\partial S^\mathrm{R}}{\partial z} = \int_{z=N^\mathrm{IL}}^{N_H} \left[ \frac{1}{\alpha N_H + z} - \frac{1}{\alpha N^\mathrm{IL} + z} \right] + \frac{Ps - (\alpha N^\mathrm{IL} + z)}{2\gamma(\alpha N^\mathrm{IL} + z)} = 0 \hspace{1cm} (26)$$

since $\alpha N_H + z = \frac{Ps}{1-\gamma}$.

**Proposition 2** Providing production subsidy on the agricultural goods increases rural population since it chain household to the rural area with higher return to labor. It affects child labor through the two compelling effects: the migration effect and the income effect. In our setting, these two effects offset each other and then production subsidy does not affect child labor at all.

5 **The Impact of Consumer Boycotts on Child labor**

Secondly, we analyzes the impact of consumer boycotts on child labor. We model consumer boycott as $\alpha$, which is equivalent to Di Maio and Fabbri (2013).\footnote{In Appendix, we show formal formation of consumer boycotts. In general, consumer boycott outside the country will reduces international price of differentiated agricultural product, which is affected by consumer boycott, when we assume that the price elasticities of exports are positive.} Now $\alpha \in (0, 1)$ is interpreted as the degree of consumer boycott; consumer boycotts become harsh as $\alpha$ decreases to zero.

In our setting, the consumer boycotts affect both the producer and the consumer production through decrease in the international price of the differentiated agricultural goods. Consumer boycott increases the price index such as

$$\frac{\partial P}{\partial \alpha} = \frac{\mu}{1-\sigma} P_A \int_{N^\mathrm{IL}}^{N_H} (p^*_j)^{1-\sigma} di > 0. \hspace{1cm} (27)$$
Our model is also capable of analyzing the effect of scope of consumer boycotts. We analyze two cases of scopes; consumer boycott on products produced with child labor and consumer boycotts on products produced with full time child worker.

5.1 Consumer boycotts on child-labor-used products

5.1.1 Case 2

Decrease in $\alpha$ reduces rural population since

$$\frac{\partial N^{U}}{\partial \alpha} = -\frac{2\beta \tau p^{*}_{M} - Ps}{\alpha^{2}(1 + \gamma)} - \frac{z}{\alpha^{2}} < 0. \tag{28}$$

The impact of consumer boycotts on child labor is described in

$$\frac{\partial S_{C}^{R}}{\partial \alpha} = \int_{i=N_{L}}^{N_{H}} \frac{\partial e_{i}}{\partial \alpha} di - \frac{Ps - (aN^{U} + z)(1 - \gamma)}{2\gamma(aN^{U} + z)} \frac{\partial N^{U}}{\partial \alpha} \tag{29}$$

5.1.2 Case 3

Decrease in $\alpha$ reduces rural population since

$$\frac{\partial N^{U}}{\partial \alpha} = -\frac{\beta \tau p^{*}_{M}}{\alpha^{2}(1 + \gamma)} - \frac{z}{\alpha^{2}} < 0. \tag{30}$$

The impact of consumer boycotts on child labor is described in

$$\frac{\partial S_{C}^{R}}{\partial \alpha} = \int_{i=N_{L}}^{N_{H}} \frac{\partial e_{i}}{\partial \alpha} di - \frac{\partial N^{U}}{\partial \alpha} \tag{31}$$

**Proposition 3** Organizing international consumer boycotts reduces rural population since it releases households to the city with higher return to labor. It affects child labor through the three compelling effects: the migration effect, the income effect, and the cost of living effect. The overall effect is ambiguous and depends on economic conditions.

Export subsidy on the agricultural sector can also be modeled in the same way.

5.2 Consumer boycotts on full-time-child-labor products

We also analyze the case where consumers are capable of knowing production situations and boycott specifically products which are produced with full time child workers. The impact of production subsidy on child labor is described in

$$\frac{\partial S_{C}^{R}}{\partial \alpha} = \frac{\partial N^{U}}{\partial \alpha} < 0 \tag{32}$$

**Proposition 4** Under the circumstance where consumer boycotts target only the product tainted with full-time child-workers, consumer boycott effectively reduces child labor since only it attracts more household to the city with children not working.
6 Conclusion

We analyze the impact on child labor of a set of trade policies and consumer boycotts in a small-open-economy framework with rural and urban areas. Taking migration between rural and urban areas into consideration, the ad valorem import tariffs on the manufacturing sector and the ad valorem export subsidy on the agricultural sector result in more ambiguous consequences than those discussed in the literature. Interestingly, however, our model predicts that the specific production subsidy on the agricultural sector does not affect child labor supply since the migration effect, where some households which should have lived in the urban area would turn back to their rural areas and start sending children to work part time, kills the income increase due to subsidy, which results in reducing child labor at the household level. This stems from our assumption that child labor happens only in the rural area. If we assume instead that child labor can occur in the urban area, the production subsidy indeed reduces child labor since the income effect dominates the migration effect (or change in total child labor supply by migration).

The consumer boycotts with two scopes are also scrutinized. In our setting, consumer boycotts have ambiguous consequence as predicted in the literature. However, when we focus on targeting the worst form of child labor, working full time, consumer boycotts succeed in reducing child labor since they send more household to the child-free urban area. This insight is new in this literature since our paper is the first to scrutinize the scope of consumer boycotts. In real life, consumer boycotts do not have any target in terms of the intensity of child labor use and thus leads to the ambiguous consequence. This paper propose to organizers of international consumer boycotts to investigate the situation of child labor more and focus on reduction in the number of full-time child workers.
Reference


