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The Role of Labor Standards in International Trade: A CGE Approach

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1. Introduction

The debate on whether or not to impose labor standards in the international trading systems has a long history in the literature of social sciences. Some researchers argue for their need in order to ensure fair competition all over the world and better human rights in the developing world (Andrews, 1919; Wilson, 1933; Richardson, 1934; and Jenks, 1960), while others opined that they are unnecessary as domestic mechanisms are good enough to help evolve such standards (Windmuller, 1956). More recently, economists have been arguing for excluding this debate from the trade negotiations (Srinivasan, 1996), owing to lack of global consensus on such potentially trade-restrictive standards (Bhagwati, 1995), constraints in efficient co-ordination of trade and domestic policies (Ederington, 2001) and possible losses for the developing countries in terms of cost-competitiveness and consequently (Brown, 2001a).

Although there has been extensive literature on the impact of labor standards on international trade in partial equilibrium and econometric frameworks (Busse, 2002), there is hardly any study that examines in detail the impact of any of them in an economy-wide framework, which could provide useful insights on welfare implications of trade policies.

Child labor is one of the major concerns among the labor standards and is quite prevalent in the developing countries. The practice of exploiting children to support their families has been condemned by the developed countries (OECD, 1996) and banned in most of the countries by setting minimum age for work (Brown, 2001a). However, it has hardly been implemented in many of them, resulting in the global employment of about 211 million children aged 5-14 in 2000 (ILO, 2002).

Few economists study the causes of child labor (Basu and Van, 1998) and the implications for the poor households of banning child labor (Brown, Deardorff and Stern, 2001). A ban of child labor may not affect the poor households if it accompanies re-distributing income from capital to labor so as to raise the wages (Basu and Van, 1998), reforming the capital markets to facilitate availability of education loan (Baland and Robinson, 2000) and raising the returns of education (Brown, 2001b). However, there has been no attempt to address the child labor issue from the viewpoint of production and cost structure, except for a survey by ILO on child labor wages and productivity (ILO, 2007). Particularly, there are no international economy-wide studies that analyze the trade and economic welfare implications of a global or local child labor ban.

In this paper, we attempt to address this gap in the literature, by extending a widely used Computable General Equilibrium (CGE) model of the Global Trade Analysis Project (GTAP) (Hertel, 1997) and its accompanying database (Narayanan and Walmsley, 2008), in conjunction with numerous country-specific surveys including ILO (2007), to model the issue of child labor and its impact on developing economies. From the ILO's International Programme on the Elimination of Child Labour (IPEC) reports for different countries in Asia, Latin America, Africa and Europe, we use the shares of child labor in total employment, its distribution across sectors and the productivity-adjusted-wage-differences (ILO, 2007) between child-labor and adult-labor to split 'child labor' from unskilled labor in the GTAP 7 Data Base with base year 2004. The aggregation that we use comprises 54 regions and 4 sectors, namely, agriculture, industry, services and margin.

In the standard GTAP model, we define two sets of all commodities – one that uses child labor (say, category CL) and another that does not (say, category NCL). We construct these sectors starting from the corresponding GTAP sectors by allocating all of the child labor to the CL sectors, while preserving the unskilled labor shares in total labor. This treatment helps retain the empirically established facts of child labor because the actual splits between child labor and adult-labor use the reliable shares estimated from the ILO's primary surveys. We use CES functions to nest each pair of such commodities within the aggregated set of commodities, in a way similar to Narayanan, Hertel and Horridge (2010).

All the variables corresponding to domestic consumption, production, imports and exports are defined both at aggregated and disaggregated commodity levels. This nesting is done for all these modules in the GTAP model, with a common elasticity for substitution/transformation between commodities that use child labor and those that do not use it. Consumption of intermediate inputs and value added are also defined at the disaggregate level. Therefore, we effectively assume that the commodities are produced, consumed and traded with a differentiation between CL and NCL categories, with a possibility of substitution between CL and NCL, via the elasticity. This is plausible since there are already many labeling systems available to certify the conditions of production of some goods (Freeman, 1994).

In this framework, we conduct different simulations while assuming unemployment of unskilled adult and child labor and managed float exchange rate regimes in the developing countries and perfect competition in all markets and full employment in the developed countries. Firstly, we model the complete removal of child labor from all countries in both domestic consumption and

exports. This is an extreme possibility because in most of the countries, implementation of a complete ban on child-labor in the domestic production is very unlikely to happen, though policies have already been in place to do this. Secondly, we examine the elimination of child labor for imports and domestic production by developed countries, still retaining the use of child labor for domestic consumption in developing countries. Given the intense debate on including labor standards in WTO, one cannot deny this possibility as the importers can easily impose such a market access restriction without impacting the plight of child labor in the domestic production of the developing countries.

Thirdly, with no market access restrictions, we attempt to examine the effects of willingness to pay higher prices by the ethically conscious customers in the developed countries, using some reliable survey estimates from the literature (Commission of the European Communities, 1997 and Marymount University, 1999). As they have little impact on child labor, we finally examine the price premium required to remove child labor completely. This paper is organized as follows: Section 2 explains the methodologies to develop the data used in the study and its sources. Section 3 describes the modeling framework employed for the study as well as the scenarios postulated herein. Section 4 shows the results of the different scenarios. Section 5 lays out the conclusions and policy recommendations.

2. Data Sources and Methodology

The main data source for this study is GTAP 7.1 Data Base (Narayanan and Walmsley, 2008), which has 112 regions and 57 sectors, with a base year for this version is 2004. This dataset contains international information on trade, protection, input-output data, production, consumption and domestic assistance.

We supplement the GTAP Data Base with the estimates of child labor (aged 5-14 years) proportions in total employment, child labor use proportions in different sectors, wage-differentials between child and adult labor as well as within child labor across the different sectors, from numerous country-specific surveys most of which were supported by ILO. In order to maximize the coverage of countries in this data, we restrict our focus to three aggregate sectors that employ child labor: agriculture, manufacturing and services. We exclude the child labor used for non-economic activities such as household chores, as these do not correspond to GTAP commodities/activities.

Proportions of child labor in the total employment in the countries were estimated in different ways. For most of the countries, the data on total number of children employed and total employment was available. For a few of them, the proportion of children employed in the total number of children was available. From this, we calculated the number of children employed, using the population data on children in the national census reports. Using the labor-force participation rates and employment rates in tandem with population data, we arrived at the total employment and finally calculated the child labor proportions in the total employment.

Sector-specific wage differentials between child and adult labor were available for many countries in our study. For the countries that did not have this data, we used proxies such as the ratio of child labor wages to minimum wages in different sectors. Few countries had the distribution of child labor across different wage ranges, using which we could estimate the average child labor wages. We also collected the estimates of ratios of children employed in different sectors and their wage-differentials across the sectors, using country-specific surveys. For the countries that did not have this information, we use regional averages to compute these ratios.

Table 1: Child Labor (CL): Shares in Total Labor (TL) and distribution across sectors

Country	CL/TL	CL/TL	CL wages as % of AL wages			CL number as % of AL number		
	% Number	% Wages	Agriculture	Manufacture	Services	Agriculture	Manufacture	Services
Tanzania	28.0	83.8	89.5	55.1	106.8	79.9	0.4	19.7
Ethiopia	25.5	83.8	89.5	55.1	106.8	91.0	1.9	7.1
Zimbabwe	22.8	6.9	7.4	4.6	8.8	90.7	2.4	6.8
Peru	20.7	62.1	74.1	44.7	67.1	47.4	13.9	38.8
Nepal	17.8	57.9	86.9	38.6	48.3	94.7	1.6	3.7
Madagascar	16.4	83.8	89.5	55.1	106.8	59.0	5.0	36.0
South Africa	16.0	16.1	17.2	10.6	20.5	66.5	1.6	31.9
Cambodia	13.7	63.5	69.3	50.0	71.2	76.5	5.8	17.7
Uganda	13.4	98.3	105.0	64.6	125.3	52.7	2.2	45.1
Nigeria	12.0	60.1	81.1	20.3	78.8	42.2	0.9	56.9
Ghana	11.2	60.1	81.1	20.3	78.8	71.0	6.4	22.6
Mongolia	10.1	48.8	53.3	38.5	54.8	91.0	2.0	7.0
Ecuador	10.1	71.0	78.3	54.1	80.5	62.5	13.0	24.5
Malawi	9.7	83.8	89.5	55.1	106.8	89.0	10.0	1.0
Pakistan	8.9	65.5	89.4	30.6	76.5	67.0	11.0	22.0
Sierra Lione	8.1	65.1	73.9	37.3	84.2	73.8	3.0	23.2
Turkey	7.6	84.4	78.6	75.4	99.3	57.6	21.8	20.6
Philippines	7.3	85.1	93.1	67.5	94.7	65.4	5.3	29.4
Sri Lanka	7.2	57.9	86.9	38.6	48.3	1.0	14.2	14.8
Dominican	6.6	61.7	68.1	47.0	69.9	20.0	13.8	66.2
Guatemala	6.4	63.4	68.1	47.0	69.9	62.6	14.0	23.4
Kenya	6.4	83.8	89.5	55.1	106.8	82.3	2.3	15.4
Bangladesh	6.3	57.9	86.9	38.6	48.3	62.0	14.7	23.3
Nicaragua	5.9	58.5	83.6	32.1	59.7	58.7	10.4	30.9
Zambia	5.8	93.3	105.0	49.8	125.3	90.1	0.8	9.1
Lebanon	5.4	81.1	89.5	61.8	91.9	11.1	64.4	24.4
Honduras	5.1	58.8	64.9	44.9	66.7	59.1	12.4	28.5
Colombia	5.1	24.6	27.2	18.8	27.9	35.6	14.5	49.9
El-Salvador	3.2	120.7	182.9	74.3	104.9	53.2	16.1	30.7
Azerbaijan	3.2	84.4	78.6	75.4	99.3	82.7	2.6	14.7
Panama	3.1	40.6	44.8	30.9	46.0	53.5	4.0	42.5
Sierra Lione	3.1	69.6	76.9	44.0	88.0	66.0	9.9	24.1
India	3.0	68.5	93.6	32.0	80.0	75.0	13.0	12.0
Brazil	2.9	65.2	71.9	49.7	73.9	58.7	7.9	33.5
Viet Nam	2.9	52.4	57.2	41.3	58.8	50.6	30.5	18.9
Chile	2.8	59.7	65.9	45.5	67.7	32.1	44.0	23.8
Argentina	2.7	59.7	65.9	45.5	67.7	15.3	3.9	80.8
Mexico	2.0	62.1	74.1	44.7	67.1	47.4	13.9	38.8
Costarica	1.7	61.7	68.1	47.0	69.9	57.0	12.1	30.9
Indonesia	1.5	41.9	45.7	33.0	46.9	37.7	37.4	24.9
Italy	1.4	65.2	71.9	49.7	73.9	48.6	28.9	22.6
China	1.2	65.9	72.0	51.9	73.9	10.0	70.0	20.0
Thailand	1.2	41.9	45.7	33.0	46.9	37.7	37.4	24.9
Israel	1.1	81.1	89.5	61.8	91.9	11.1	64.4	24.4
Portugal	0.9	12.3	13.6	9.4	14.0	47.2	12.7	40.1
Ukraine	0.8	51.4	56.8	39.2	58.3	49.5	5.9	44.7
UK	0.7	65.2	71.9	49.7	73.9	3.1	8.5	88.5
USA*	0.2	65.2	71.9	49.7	73.9	1.8	16.6	81.7

Source: Authors' calculations from country-specific child labor survey reports, census reports and ILO (2002, 2007)
Note: All these countries except those marked '*', which are for post-1995, are post-2000 data

Table 1 gives an overview of the child labor data compiled from different reports. Tanzania has the highest ratio of child labor to total labor (ILO-IPEC and Government of Tanzania, 2001), followed by Ethiopia (Government of Ethiopia and ILO, 2001), Zimbabwe and Peru. Even developed countries such as Italy (Trentini, 2000), Portugal (Government of Portugal and ILO, 2001), UK (UNICEF, 2005) and USA (Kruse and Mahony, 1998) have a small presence of illegal child labor.

To arrive at the productivity-adjusted wage differences shown in Table 1, we use the data available from ILO (2007) on adult-child productivity differences, so that this split takes into account the fact that some of the wage disparities could arise from the productivity differences. The country-specific detailed survey results from ILO (2007) are used to Even the cost shares of child labor are derived by splitting the total labor costs, based on these country-specific reports. Thus, we make a serious attempt in making the best use of the most reliable primary survey data from ILO, in our CGE modeling exercise. For the countries which do not have adult-child wage differences, we use the country-specific estimates for the whole geographical region and global averages for the regions not covered in this survey.

Table 2: Ratios of Marginal Products of Adult labor to Child labor for different regions

Country	**Region**	**Agriculture**	**Manufacturing**	**Services**
India	South Asia	1.427	1.6	2
Ghana	West Africa	1.187	1.175	1.314
Philippines	South-East Asia	1.427	0.75	1.747
Uganda	East Africa	1.667	1.175	1.927

Source: Authors' calculations from ILO (2007)

3. Modeling Framework and Scenarios

We begin with the standard GTAP model (Hertel, 1997) and introduce new produced commodities set (disaggregated) that includes two sets of goods – those produced using and not using child labor. Traded commodities remain the same as in the GTAP model. Effectively, the treatment of production follows the standard GTAP model, while the consumption choices by all the agents in the model, across these two different sub-sets of commodities, take place after they make their choice between domestic and imported commodities from the aggregated set.

With this underlying treatment, CES nesting is used for all the agents consumption choices, with an assumed elasticity of ESUBLS between goods produced using and not using child labor. We assume this to be the highest of the sectoral ESUBD (Elasticity of substitution between domestic products and imports) parameters in the standard GTAP model, which is 3.4355. The results are quite likely to be driven by this assumed elasticity, so we test for the sensitivity of the results by varying this parameter 50% above and below this value. Using the mean and standard deviations obtained for the key result variables, we construct 95% Confidence Intervals using Chebyshev's Inequality.

Many policy interventions may be designed to reduce the child labor. Countries have already been banning the use of child labor to different degrees, but implementing the ban has been almost impracticable. However, one could envision better targeting of child labor if the importers, governments and/or customers have a way of knowing which goods are made using child labor and which were not. Accordingly, they could just ban or disincentivize the production of commodities involving child labor. Labeling systems that are already in

practice all over the world can help the agents decide on this. Given this context, we consider the following three scenarios in this paper:

1. Scenario 1: Global and Complete Ban of Commodities involving Child Labor. This is done by bringing the entire consumption of such commodities by all agents to zero.

2. Scenario 2: Ban of import of commodities involving Child Labor, by the developed countries. This is implemented by forcing imports by all agents in the developed countries to be zero.

3. Scenario 3: A higher Willingness to Pay by the customers in the developed countries, for the goods produced without using child labor. This is modeled by shocking the import-augmented technical change variable in the GTAP model, which has both demand-reducing and price-reducing effects. The willingness to pay estimates calculated based on surveys conducted by Commission of the European Communities (1997) for the EU (7.2%), and Marymount University (1999) for USA (4.4%) and Italy (4%).

4. Results

Welfare Effects

Within the GTAP modeling framework, we can anticipate huge welfare losses in terms of allocative efficiency and endowment effects in scenario 1, where we force all output in certain sectors to be zero, causing a massive negative intervention in endowments and other resource allocation in the presence of unchanged distortions in all countries. Similar effects may be seen in scenario 2, insofar as it reduces the child labor and child-labor goods output significantly by nullifying imports. Scenario 3 may show up positive results

mainly because of the positive technological change augmented by imports, causing positive allocative efficiency effects in the presence of unchanged distortions.

5. Conclusions

By supplementing GTAP 7 Data Base with numerous ILO surveys, we develop a 54-region 3-sector dataset accompanied with a GTAP-based model that treats sectors that use child labor and those that do not use child labor as distinct ones, nested within the aggregate sectors using CES nests. In this framework, we conduct three policy experiments to analyze the impacts of child labor related policies on global trade and welfare. In the first experiment, all commodities that use child labor are completely wiped out. Results for this scenario show huge welfare losses and almost complete eradication of child labor that happens universally. In the second experiment, all imported commodities that use child labor are removed by the developed countries. This does not lead to profound welfare losses and most of the other effects, including reduction of child labor are all modest. In the final experiment, we simulate the willingness to pay for child-labor-free goods by the customers in the developed countries. This shows considerable gains in overall imports by developed countries and services exports by developing countries.

References:

Andrews, J.B. 1919. “International Labor Standards and Legislation”. *Proceedings of the Academy of Political Science in the City of New York*, 8(3): 86-9.

Baland, Jean-Marie and James Robinson. 2000. "A Model of Child Labor." Journal of Polit-ical Economy. 108:4, pp. 663-79.

Basu, Kaushik. 1999. "Child Labor: Cause, Consequence, and Cure, with Remarks on Inter-national Labor Standards." Journal of Economic Literature. September, 37, pp. 1083-1119.

Basu, Kaushik and Pham Hoang Van. 1998. "The Economics of Child Labor." American Eco-nomic Review. 88:3, pp. 412-27. B

Bhagwati,Jagdish. 1995. "Trade Liberalisation and 'Fair Trade' Demands: Addressing the En-vironmental and Labour Standards Issues." World Economy. 18:6, pp. 745-59.

Brown, Drusilla K., Alan V. Deardorff and Robert M. Stern. 2001. "U.S. Trade and Other Policy Options and Programs to Deter Foreign Exploitation of Child Labor," in Topics in Empir-ical International Economics. Bagnus Blomstrom and Linda S. Goldberg, eds. Chicago and Lon-don: The University of Chicago Press.

Brown, D.K. 2001a. “Labor Standards: Where Do They Belong on the International Trade Agenda?”, *The Journal of Economic Perspectives*, 15(3): 89-112.

Brown, Drusilla K. 2001b. "Child Labor in Latin America: Policy and Evidence." World Economy,……...

Freeman, Richard. 1994. "A Hard-Headed Look at Labour Standards," in International Labour Standards and Economic Interdependence. Werner Sengenberger and Duncan Campbell, eds. Geneva: International Institute for Labour Studies, pp. 79-92.

Government of Ethiopia and International Labour Organization, 2001. *Ethiopia Child Labour Survey Report 2001*. Ministry of Labour and Social Affairs and Central Statistical Authority, Government of Ethiopia, Addis Abbaba and International Labour Organization, Geneva.

Hohman, E.P. 1956. “Minimum Labor Standards in Factory Employment in Underdeveloped Areas”. *Journal of Farm Economics,* 38(2):513-20.

International Labour Organization, 2002. *Every Child Counts: New Global Estimates of Child Labour*, International Labour Office, Geneva.

International Labour Organization, 2007. *Child Labour Wages and Productivity: Results from Demand-side Surveys,* International Labour Office- International Program on the Eradication of Child Labour (IPEC), Geneva.

International Labour Organization and Government of Tanzania, 2001. *Child Labour in Tanzania: 2000-01 Integrated Labour Force and Child Labour Survey*. ILO-International Program on the Eradication of Child Labour (IPEC), Ministry of Labour, Youth Development & Sports and National Bureau of Statistics, Government of Tanzania, Dar es Salaam.

Jenks, C.W. 1960. *Human Rights and International Labour Standards.* Frederick A. Praeger, Inc., New York.

Organization for Economic Cooperation and Development. 1996. Trade, Employment and La-bourS tandards:A Study of CoreW orkers' Rights and International Trade. Paris: OECD.

Richardson, H.J. 1934. “International Competition and Labor Standards”. *Annals of the American Academy of Political and Social Science*, July 174:76-80.

Srinivasan, T.N. 1996. “Post Uruguay Round Issues for Asian Developing Countries”. *Asian Development Review,* 14(1): 1-28.

Wilson, F.G. 1933. “The Enforcement of International Labor Standards”. *Annals of the American Academy of Political and Social Science,* March 166:95-101.

Windmuller, J.P. 1956. “Minimum Wages and Other Labor Standards Considered in Relation to Economic Growth in Underdeveloped Countries”. *Journal of Farm Economics*, 38(2):543-5.

Anderson, J. E. and J.P. Neary. 1996. “A New Approach to Evaluating Trade Policy”. *Review of Economic Studies*, 63(1): 107-25.

Anderson, J. E. and E. van Wincoop. 2004. “Trade Costs”. *Journal of Economic Literature*, 42(3): 691-751.

Anderson, J. E. 1998. “Trade Restrictiveness Benchmarks”. *The Economic Journal*, 108(449): 1111-25.

Arndt, C. and K.R. Pearson (1998) “How to Carry Out Systematic Sensitivity Analysis via Gaussian Quadrature and GEMPACK”. GTAP Technical Paper No. 3, Center for Global Trade Analysis, Purdue University, West Lafayette.