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A Theoretical and Empirical Analysis of the Linkages

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# TRADE AND LABOR STANDARDS: A THEORETICAL AND EMPIRICAL ANALYSIS OF THE LINKAGES

A thesis

submitted to the School of Graduate Studies and Research of the University of Ottawa

in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Economics

by

Yiagadeesen Samy

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## Dedication

*To my mother and to the memory of my father, for their great support and love.*

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## Abstract

This thesis contains three essays and a short introductory chapter. The main theme of the thesis is the interaction of international trade and labor standards, which has been at the forefront of recent trade negotiations, both at the regional and multilateral level. Even though the essays in this thesis share a common theme, they can be read independently without impeding the reader's understanding of the issues discussed in each.

The first essay theoretically considers the impact of labor standards on comparative advantage through their effects on the terms of trade. I use a standard Heckscher-Ohlin trade model and analyze the effects of incorporating a standard that takes resources away from the tradeable sectors. I find that movement in the terms of trade due to the imposition of a standard depends on whether the standard withdraws resources from the import or the export sector, and also on the capital-labor ratios of the tradeable goods. These results imply that there exist grounds for countries to set higher than optimal levels of standards in order to obtain terms of trade gains. The second essay makes use of cross sectional data for a sample of more than seventy (developed and developing) countries to analyze the issue of trade and labor standards. It seeks to answer two questions, first, whether the imposition of labor standards affects the export performance of countries, and second, whether labor standards affect foreign direct investment (FDI) flows.

The third essay, unlike the general approach in the literature which is based on cross-sectional analysis, uses a time series approach based on the structural change literature to analyze and compare the effects of different measures of labor standards on the behavior of exports for Canada and the United States. It also provides an analysis of the issue of convergence of labor standards between the two countries within the context of the North-American Free Trade Agreement. Overall, the empirical results from the second and third essays suggest that caution should be exercised before drawing broad conclusions regarding the magnitude and direction of the effects of labor standards on both export performance and FDI flows, which can have very different policy implications.



**Keywords**: Trade, Labor Standards, Exports, Stationarity, Structural Change
**JEL Classification**: F1, J8, C1, C4

# Chapter 1

# Introduction

# Introduction

## 1.1 Motivation and Contribution

The purpose of this introductory chapter is to provide the motivation for this thesis, its contribution to the existing literature, as well as a summary of its main findings and implications. The thesis contains three essays dealing with the interaction of international trade and labor standards, and it investigates this interaction from both a theoretical and empirical perspective.

The issue of trade and labor standards has been at the forefront of both regional and multilateral trade negotiations over the past two decades, and will likely remain high on the agenda of future trade talks, as North-South trade flows continue to increase. When the North American Free Trade Agreement (NAFTA) was being negotiated in the 1990s, concerns were raised that low labor standards in Mexico could pose a competitive threat to firms in the United States (henceforth US), leaving the latter at a comparative disadvantage and forcing them to close down (or curtail production), or relocate production. Both the US and France have also attempted (without much success) to introduce the issue of labor standards during the Uruguay Round; the US has gone a step further by including a workers' rights clause into many of its trade agreements, thus denying special trading benefits to countries who fail to comply with the U.S. definition of workers' rights. In both the U.S. and Europe, many have been pushing for the inclusion of labor (and environmental) standards in the WTO in the form of a social clause.

Labor standards can be defined loosely as a set of worker rights provided and enforced by national governments of different countries. The levels of these rights are

both a reflection of these countries' preferences, and the extent to which they comply with international conventions (from the International Labor Organization, henceforth ILO) which they have signed. The level of labor standards chosen by a particular country is ultimately a function of that country's level of economic development, and is therefore a domestic policy choice (Alam, 1992), which means that one should expect diversity in labor standards as the norm. The argument from trade theorists, who believe that gains from trade stem from diversity instead of uniformity, is that improvements in labor standards can be brought about with free and unrestricted trade, which tends to lead to higher rates of growth, or by creating a greater consensus on a set of international labor standards by which all countries should abide.[1]

The reason why the issue of trade and labor standards is so hotly debated in trade negotiations and policy discussions is essentially as follows. Labor interests in high-standards countries argue that low labor standards are an unfair source of comparative advantage, and that increasing imports from low-standards countries will have an adverse impact on wages and working conditions in high-standards countries, thus leading to a "race to the bottom" of standards ("bad" standards driving out the "good"). For low-standards countries, there is the fear that the imposition of high labor standards upon them is just a form of disguised protectionism and is equally unfair since it will erode their competitiveness, which is largely based on labor costs.

At a theoretical level at least, one can argue against the possibility of a "race to the bottom" of standards from occurring by pointing out that even though labor standards can act as a distortion, they can also enhance efficiency. Hence, there exist incentives to

[1] In the second essay (Chapter 3) of this thesis, I examine this set of "core" international labor standards in greater detail.

prompt countries to increase rather than reduce the level of their standards. For instance, unionization, a broad form of a labor standard, has both positive and negative effects on the labor market. Because of this, and for political economy reasons[2] (Krueger, 2000), one should not expect countries to be dragged into a "race to the bottom" of standards. I examine the "race to the bottom" issue briefly, since it is not the main focus of this thesis, for Canada and the United States in the third essay by testing for convergence of standards within the context of the NAFTA.

The thesis contributes to the existing literature on trade and labor standards in the following ways. Theoretically, it builds on the work by Brown, Deardoff and Stern (1996) to formally establish certain conditions under which and the reasons why countries might opt for a given level of labor standards that go beyond just the concern for human rights. In terms of future work, an important challenge in this area will be to analyze further the welfare implications of labor standards by outlining the conditions under which optimal levels of labor standards will be provided so as to maximize welfare. More specifically, it will be extremely useful to examine the welfare implications when labor standards are distortionary or when they are supposed to correct or reduce existing distortions.

Empirically, the thesis first shows that the choice of proper indicators for labor standards is extremely important in order to carry out any meaningful empirical exercise. In fact, I show that the choice of different and more realistic indicators for labor standards yields different conclusions regarding the effects of labor standards on export

[2] Indeed, in well functioning democracies, labor standards legislation just like any other legislation, should represent what the majority of the public desires. It could also be determined by narrowly based lobbies, but by and large the majority of the public favors fairly tight standards so that there exists some political pressure for them.

performance. Second, even though the issue of trade and labor standards is usually considered within a North-South framework, the empirical work conducted in this thesis also considers developed countries that are characterized by similar political systems and that are part of regional trade agreements. Third, in addition to using cross-sectional data, which is the more general approach in the literature, I also use a new approach, which is time series analysis based on the structural change literature. The thesis employs sophisticated econometric techniques in order to disentangle some of the pertinent issues. An important challenge in this regard was to find and collect data on different indicators for labor standards. Future empirical work on this issue will be greatly enhanced if one can come up with other indicators for labor standards that are more micro or sector-specific.

## 1.2 Summary of Findings and Policy Implications

In the first essay (Chapter 2), I develop a theoretical model to explore the impact of labor standards on comparative advantage through their effects on the terms of trade. The objective of this paper is to try to understand why some countries would choose a certain level of labor standards, motivated by terms of trade gains, and whether it is in their interest to do so. I also provide a discussion of the welfare implications of the labor standards. Following the seminal contribution of Brown, Deardoff and Stern (1996), I use a standard Heckscher-Ohlin trade model and incorporate the labor standard as a third non-traded good, which takes away some capital and labor (from overall factor endowments) from one of the tradeable sectors.

This modeling strategy yields some interesting conclusions regarding the level of standards that countries will choose to adopt and the conditions of their adoption. In particular, I find that movements in the terms of trade due to the imposition of the standard are dependent on the capital-labor ratios of the traded goods sector, and also on whether the standard takes resources away from the export or the import sector. My model implies that diversity of standards should not come as a surprise since there are incentives (in the form of terms of trade gains) for countries to push for higher labor standards. Hence, at least on theoretical grounds, the case for the international harmonization of standards does not seem to be a strong one.

Using cross-sectional data and considering both developed and developing countries, the second essay (Chapter 3) answers two questions related to the issue of trade and labor standards. First, whether the existence of labor standards affects the export performance of countries; second, whether labor standards affect foreign direct investment (FDI) flows. After providing a discussion of what constitutes "core labor standards" and presenting some arguments in favor of a set of international labor standards, the paper makes use of several indicators for labor standards to answer these two important questions. Regarding the first question, I use the perfect and imperfect substitutes models, which have been used by others to model the behavior of exports and imports. Both of these models assume that a country's export performance is determined by its price competitiveness, and the imposition of a labor standard in such a setting leads to a deterioration of the price competitiveness, since it implies an increase in labor cost.

My motivation came from a paper by Mah (1997), who used these models to test for the effects of labor standards on export performance. Mah (1997) uses core ILO

conventions ratified (a dummy variable) as an indicator for labor standards and concludes that countries that ratify conventions (and hence presumably improve their labor standards) experience a deterioration in their export performance because of increases in their labor costs. I find that the effects on export performance are sensitive to the choice of indicators and the type of specification used. In particular, the empirical results of Chapter 3 imply that low labor standards may both improve or worsen export performance depending on whether the ratification of ILO conventions is used as an indicator, or whether more realistic indicators such as the length of working time and the degree of unionization are used. Consequently, it is not clear whether countries that are characterized by low labor standards do in fact have a competitive advantage in trade. Regarding the second question, the evidence is again mixed. As expected, the higher the GNP, the more FDI is attracted, but growth is not a significant factor to account for FDI flows. More importantly, the empirical results indicate that high labor standards can in fact attract, rather than discourage FDI, despite not being statistically significant. Overall, the empirical evidence assembled in this essay also indicates that the issue of trade and labor standards is relatively more important for developing countries.

In the third essay (Chapter 4), I analyze the empirical effects of different measures of labor standards on the behavior of exports for Canada and the US using annual data for the period 1950 to 1998. I thus investigate the issue within a North-North framework by considering two developed countries with fairly similar political systems, which are part of a regional trade arrangement (NAFTA), and are each other's largest trading partner. Unlike the general approach in the literature, which is based on cross-sectional analysis, I use a time series approach based on the structural change literature.

This is appropriate since I consider long-term time series data and that there is always the possibility that a structural change (an exogenous shock) could have occurred. The approach is also useful since it enables one to see how the relationship between export performance and labor standards changes over time, especially if one allows for the possibility that the effects on export performance may go in different directions at different periods in time.

Indeed, one of the conclusions of Mah's (1997) analysis is that "when" a country adopts labor standards may be important and that time series analysis might provide useful insights. Different models are estimated depending on the stationarity properties of the series which are considered. There is evidence of stationarity with break trends in many series, particularly in the case of the US. A model with endogenous breaks is estimated for the US. In the case of Canada, I estimate a vector autoregressive model and I also provide estimates for the error correction model. Overall, the results show that the different labor standards represented by the number of hours worked, the rate of occupational injures and the unionization rate are important in explaining the behavior of exports in both countries.

The essay also provides a brief analysis of the issue of convergence of standards between the two countries, within the context of the NAFTA, which entered into effect in 1994. The NAFTA agreement is accompanied by a side-agreement dealing with labor laws and cooperation, and the latter is unique in that it allows each country (Canada, the US and Mexico) to set its own standards and to modify the laws and regulations when necessary. One would expect that regional trade agreements such as NAFTA, because they result in increased trade and create more competition among firms from different

countries, would lead to a convergence of standards (maybe even downwards) across countries. I do not find any strong evidence in favor of convergence of standards, and this suggests that it is likely that the US and Canada will continue to maintain different labor practices.

The empirical results obtained in Chapters 3 and 4 imply that caution should be exercised before drawing broad conclusions on the magnitude and direction of the effects of labor standards on export performance and FDI flows. In fact, it is not at all clear whether low labor standards do in fact yield a competitive advantage in trade, as often heard in policy discussions. A question, however, remains. Since my empirical results show that low labor standards can lead to a reduction in export performance, more time should be spent trying to understand why governments continue to refuse to adopt better working conditions for their workers.

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# Chapter 2

# Labor Standards and Terms of Trade Changes

# Labor Standards and Terms of Trade Changes

## 2.1 Introduction

Discussions regarding the interaction of labor standards with international trade are not new, and in fact go as far back as the mid-nineteenth century. At that time, industrialists were already preoccupied by the fact that domestic laws against child labor or in favor of a minimum working week would put their industries at a competitive disadvantage (Leary, 1996). Brown, Deardoff and Stern (1996), citing Alam (1992), mention that the early reformers took free trade as a given and desirable objective and sought to use moral suasion and international agreements to deal with cross-country differences in labor standards. In the past two decades, discussions over the issue of trade and labor standards have resurfaced in policy discussions and multilateral trade negotiations. The recurring concerns have been that, firstly, low labor standards in less developed countries (LDCs), and hence low production costs, are an unfair source of comparative advantage and secondly, on purely moral and humanitarian grounds, that it is the responsibility of countries to ensure a minimum acceptable level of labor standards for their workers.

Fears of low labor standards as a source of unfair trade, particularly from the LDCs, have also led many in developed countries, and especially in the United States, to evoke the possibility of trade sanctions being included in future trade agreements to ensure that such standards are enforced. As economies become increasingly integrated and North-South trade flows more important, it is likely that this issue will continue to be part of the agenda of future trade talks. In the next chapter of the thesis, I discuss the 'what' and the 'why' of labor standards in greater detail. Even though I acknowledge the

'human rights' argument for a set of basic standards, the focus here and in the remainder of this thesis is mostly on competitiveness (in a broad sense, economic) issues and the resulting implications for comparative advantage, if any. In this first essay, labor standards are defined loosely as a set of enforceable rules and regulations governing workers' rights.

The structure of the essay is as follows. In section 2.2, I review the existing theoretical literature on trade and labor standards and summarize the main results thereof. Then, in order to motivate the issue of trade and labor standards, I develop a theoretical framework in section 2.3 to examine the effects of labor standards on trade through their effects on the terms of trade, which is an extension of the work of Brown *et al.* (1996). The model that I use to analyze the effects of labor standards follows a general equilibrium approach. A partial equilibrium analysis would be restrictive since it would not allow one to identify the trade effects of labor standards in both factor and product markets. On the other hand, the model used here allows one to determine the impacts on both product and factor prices.

Following Alam (1992) and *Brown et al.* (1996), I use the Heckscher-Ohlin trade model (two goods and two factors) and I consider two different ways in which the labor standard will affect the terms of trade. In both cases, the labor standard (directly or indirectly) takes away some capital and labor from overall factor endowments, and is treated as a non-traded good. I show that for countries that are large enough to influence their terms of trade, movements in the latter due to the proportion of capital and labor withdrawn to finance the standard are dependent on the capital-labor ratios of the tradeable goods. Hence, whether countries will opt for international labor standards and

the level of the standards that they choose will be dependent on whether they are net importers or net exporters of the tradeables used to finance the labor standard. An implication of this result is that countries might choose high or low labor standards strictly for terms of trade gains if they are large enough. I provide a discussion of the welfare effects of labor standards in section 2.4. Section 2.5 concludes with some possible avenues for further research.

## 2.2 Literature Review

In this section, I review the theoretical literature on trade and labor standards and outline the main results thereof. Theoretical work linking international trade with labor standards is relatively scarce. Early studies, for instance by Johnson (1969) and Brecher (1974a and 1974b), considered minimum wages and their welfare implications but did not consider other internationally accepted labor standards such as the number of hours worked, the freedom from forced labor or unionization. Alam (1992), on the other hand, was one of the first to provide a more general framework for the economic analysis of the impact of labor standards, at constant goods prices, on a country's comparative advantage. In his thesis, he first argues that concerns regarding foreign competition and human rights have led to the idea that there should be a linkage between labor standards and international trade, both in Europe and the United States, starting as early as the beginning of the 19$^{th}$ century.

After providing a brief historical overview of United States trade policy legislation linking labor standards to international trade, he then conducts most of his analysis using a two-country, two-commodity, two-factor model, and discusses the

effects of different labor standards such as unionization, the prohibition of forced labor, enforcement of a minimum age for employment of children, occupational health and safety standards, limit on working hours, and minimum wages. Much of Alam's discussion revolves around impacts on labor productivity, the size of the labor force, and on the cost of capital and/or labor. In particular, his work focuses on minimum wages and occupational safety and health (OSH). He considers two types of minimum wages namely a sector-specific minimum wage and a generalized minimum wage. In the case of a sector-specific wage, which is imposed in the export sector, comparative advantage will be worsened regardless of the capital intensity of the sector. However, a generalized minimum wage will worsen comparative advantage only if the latter lies in the labor-intensive industry.

Alam also considers two different ways of modeling OSH standards, namely as diverting resources to produce a non-traded good, or as an implicit tax of factor usage. As in the case of a sector-specific minimum wage, a sector-specific OSH standard will worsen a country's comparative advantage if it is imposed in the export industry. A generalized OSH standard can have both a neutral and non-neutral effect on comparative advantage. In fact, in the non-neutral case, comparative advantage is improved under certain specific conditions[1]. Alam concludes that the impact of labor standards on comparative advantage is non-neutral in most cases even though some of his results are counterintuitive in the sense that the impact of labor standards is sometimes neutral or non-neutral in the wrong direction. Overall, Alam's results suggest that one should be

[1] In the second and third chapters of this thesis, I empirically investigate these impacts to check for neutrality or non-neutrality *vis à vis* export performance and foreign direct investment flows.

careful when making generalizations regarding the impact of labor standards on comparative advantage.

Brown *et al.* (1996) focus on the welfare and other effects of standards and whether it is in a country's interest to implement common international standards. Most of their analysis is graphical and relies on the Heckscher-Ohlin model. They model the imposition of a labor standard as a policy that takes resources away from production and first use a partial equilibrium model to examine how standards will affect countries when the latter act individually or coordinate on a common standard. The interaction of world demand and supply (which are the sums of individual-country demands and supplies) determine the world price in this perfectly competitive model, and because there are many small countries, the world price is taken as given by all. In the absence of any policy, suppose that suppliers behave in such a way as to impose a cost on society that is not shown by the supply curve.

A labor standard in this model does two things: it adds a social cost to the private costs of individual firms, while at the same time eliminating the cost to society that suppliers would otherwise not take into account. As a result, the effect of the standard is to shift the supply curve to the left, leading to more imports since the world price does not change. Even though suppliers lose in this case, society or the country as a whole gains, since the cost of the standard was also the optimal way of solving the social problem. The conclusion of this exercise is that, if one ignores terms-of-trade effects, then a country will choose a certain level of labor standards independently of the level that exists abroad, based on its general economic interest. In case countries agreed internationally on a common standard, they will choose a high or low labor standard

depending on their net trade position, namely whether they are net importers or exporters of goods which are affected the most by labor standards. This result is due to a terms-of-trade effect and hence, Brown *et al* use general equilibrium analysis by considering different variants of the standard two-good two-factor Heckscher-Ohlin-Samuelson model in order to analyze the effects of standards on the terms of trade.

They first consider a specialized economy where a labor standard is modeled as a non-traded good and diverts resources from the production of the tradable good. When a labor standard is imposed, less of the tradable is produced (and hence exported), and the country loses welfare because overall consumption is lower. If the country were large, then its terms of trade would also improve since the world price of the tradable good would rise relative to the imported good. In this type of setting, the standard is in effect reducing the supply of exports to the world market. The country that imposes the standard benefits but also imposes a cost on its trading partner. Since each country can impose a labor standard at home to improve its terms of trade, they would prefer to act alone rather than coordinate their actions. As a result, there exists an incentive for each country to set a higher level of the standard than is necessary to correct any existing market failure.

In the case where countries produce both traded goods using two factors of production (the Heckscher-Ohlin model), the way a standard will affect output and trade will depend on the factor intensity of the standard, namely the capital/labor ratio diverted from production when the standard is imposed, compared to the capital/labor ratios of the tradable goods. In this case, however, the terms-of-trade effect can be positive or negative for the country that imposes the standard. For example, if the standard has a

capital/labor ratio equal to the country's overall capital/labor ratio, this will cause a fall in the country's trade and lead to an improvement in its terms of trade. If the standard has a higher capital/labor ratio than the world capital/labor ratio, the price of the capital-intensive good will rise on the world market and the capital-abundant country will gain.

What is more important in the Heckscher-Ohlin case is the capital/labor ratio of the standard compared to the capital/labor ratio of world production, and not which country imposes the labor standard. If countries tried to coordinate their actions, a labor abundant country would get an extra terms-of-trade benefit from a labor-intensive standard and will thus tend to overprovide it. A capital abundant country will lose and tend to underprovide the standard. Brown *et al.* also analyze a standard that affects only one sector of the economy. For example, suppose a labor standard is imposed in the labor-intensive (export) sector. In this case, the standard raises the cost of production in the industry where it is imposed, the output of the industry falls, the country trades less and this leads to an improvement in its terms of trade. The partner country, on the other hand, trades more, and this also improves the home country's terms of trade. Once again, the gains from the standard are dependent on which country exports the good that is affected by the standard, and not the country that imposes it.

The authors also consider the case where the labor standard is endogenous and where the market provides a socially optimal level of the standard. Suppose the government intervenes because of a market failure and imposes a standard that exceeds the equilibrium level. The terms-of-trade effect will in this case depend on the net trade position of the country but compared to the case of an exogenous labor standard, working conditions might not necessarily improve. For instance, if a standard is imposed in the

labor-intensive sector, real wages will fall for the whole economy and the labor standard will in fact fall in the capital-intensive sector. Only if the labor standard is imposed in the capital-intensive sector will working conditions improve for all workers.

The different models in Brown *et al.* show that the effects of labor standards are dependent on the technology of production of goods and standards, and also on whether the standards are endogenous (in which case the existence of a market failure will not lead to a socially optimal level of the standard). If the market fails to yield the socially optimal level of the standard, intervention on the part of the government may not necessarily correct the failure. All these results, according to Brown *et al.* suggest that the international harmonization of labor cannot be supported since market failures are not similar across countries and cannot, therefore, be overcome by similar measures. Including labor standards into multilateral trade negotiations, the so-called social clause, should therefore be dealt with extreme caution.

Noor (2000) uses a standard two-country trade model with two countries, Industrial and Developing, which have similar production and consumption structures, and produce two goods, to investigate the impact that labor standards have on the international trade regime. In particular, he considers whether the adoption of a domestic labor standard can lead to an improvement in welfare for an industrial country by its effect on the international market, and once the policy comes into effect, whether there are also gains in promoting the adoption of standards abroad. The paper shows that the industrial country can improve welfare when it implements a labor standard since the standard will increase the country's optimal tariff on its labor-intensive imports and force the country's trading partner to decrease its own tariffs. An important result of this paper

is that a minimum wage can improve the industrial country's welfare when there is a tariff-war.

Noor (2000) also explains why industrial countries would have an incentive to encourage developing countries to implement labor standards. The reason, it turns out, has to do with the fact that due to multilateral trade agreements, for instance, some industrial countries cannot gain an advantage in trade through tariffs. As a result, industrial countries will opt for "second-best policy" options and ask for labor standards to be implemented by their trading partners, which in effect will act as a substitute for higher tariffs in the industrial countries themselves. Hence, even though global labor standards have been advocated for on moral grounds, they could just be a form of disguised protectionism.

In the next section, I develop a theoretical model based on the work of Brown *et al.* (1996) to formally derive the terms of trade effects that will result from the imposition of a labor standard. I first derive the terms of trade for a country in the absence of any standard and then consider two ways in which the imposition of a labor standard might affect the terms of trade.

## 2.3 The Model

### 2.3.1 Deriving the Terms of Trade with No Labor Standard

A standard Heckscher-Ohlin trade model is used to examine the effects of imposing labor standards in a country. Two countries (*I* and *II*) produce two traded goods (*X* and *Y*) and each good uses two factors of production, labor (*L*) and capital (*K*). Perfect competition is assumed to prevail in commodity markets and in factor markets.

Technology and preferences are identical in both countries and are assumed to be Cobb-Douglas in this model. Labor and capital are available in fixed amounts in each country; each factor of production is perfectly mobile within the country but cannot be sent abroad. The two countries engage in trade and goods can be exported or imported at zero transport costs. As a result, differences in relative overall endowments drive comparative advantage in such a model.

For instance, suppose $(K/L)^I > (K/L)^{II}$, that is, country *I* is capital abundant relative to country *II*. Suppose also that good *X* is capital intensive while good *Y* is labor intensive. Let the price of good *X* be denoted by $p_x$ and the price of good *Y* by $p_y$. In autarky, country *I* will then produce good *X* at a relatively lower price. Autarky price ratios will be such that $(p_y/p_x)^{II} < (p_y/p_x)^I$ and international equilibrium will then imply that $(p_y/p_x)^I = (p_y/p_x)^{II}$. By the Heckscher-Ohlin theorem, good *X* will be exported by the capital-abundant country (country *I*) and good *Y* will be exported by the labor-abundant country (country *II*). In equilibrium, the terms of trade $p$ $(= p_y/p_x)$ for country *II* (the terms of trade for country *I* will thus be equal to $1/p$) must be such as to clear the market for each good. In other words, world production must be equal to world consumption or the value of exports of a country must be equal to the value of its imports. By Walras's law, clearance of the market for good *X* implies clearance of the other and we are thus able to write down the following equation for the terms of trade for country *II*:

$$p = \frac{Q_x^I - C_x^I}{Q_y^{II} - C_y^{II}} \qquad (1)$$

where $C$'s denote the consumption of goods $X$ and $Y$, $Q$'s refer to production levels and the superscripts refer to countries $I$ and $II$. As mentioned above, technology is taken to be Cobb-Douglas, so that production of goods $X$ and $Y$ in countries $I$ and $II$ respectively can be represented as follows:

$$Q_x = K_x^{\theta} L_x^{1-\theta} \tag{2}$$

$$Q_y = K_y^{\mu} L_y^{1-\mu} \tag{3}$$

Consumption levels for goods $X$ and $Y$ are obtained by maximizing a Cobb-Douglas community utility function subject to a budget constraint. This results in the following expressions for consumption of goods $X$ and $Y$ in countries $I$ and $II$ respectively:

$$C_x^I = \frac{\alpha I^I}{p_x} = \frac{\alpha(wL^I + rK^I)}{p_x} \tag{4}$$

$$C_y^{II} = \frac{\beta I^{II}}{p_y} = \frac{\beta(wL^{II} + rK^{II})}{p_y} \tag{5}$$

where $w$ and $r$ are the wage rate and rental rate respectively and where superscripts refer to countries. $\alpha$ and $\beta$ are the preference parameters associated with the community utility function and $\alpha + \beta = 1$ and $0 < \alpha, \beta < 1$. Substituting equations (2)-(5) in equation (1) yields the following expression for the terms of trade for country $II$[2]:

[2] In order to derive the terms of trade, I have to go through a number of steps as shown in appendix A.

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-C)K^{I}+(1-D)K^{II}}{CL^{I}+DL^{II}}\right]^{\theta-\mu} \tag{6}$$

, and where $C = \mu + \alpha\theta - \alpha\mu$ and $D = \theta + \beta\mu - \beta\theta$. Since $\alpha + \beta = 1$, then $C = D$, which means that equation (6) can be further simplified to

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-C)(K^{I}+K^{II})}{C(L^{I}+L^{II})}\right]^{\theta-\mu} \tag{6a}$$

Equation (6a) implies that one can express the terms of trade in terms of overall endowments, and technological and preference parameters. As shown in the appendix, the wage/rental ratio and the factor intensities for goods $X$ and $Y$ are all dependent on the terms of trade. In fact,

$$\varpi = \frac{w}{r} = \phi \tag{7}$$

$$k_x = \varpi\frac{\theta}{1-\theta} = \phi\frac{\theta}{1-\theta} \tag{8}$$

$$k_y = \varpi\frac{\mu}{1-\mu} = \phi\frac{\mu}{1-\mu} \tag{9}$$

where $\phi = \left[\frac{(1-C)(K^I + K^{II})}{C(L^I + L^{II})}\right]^{\theta-\mu}$ which is part of the expression from (6a) above.

### 2.3.2 Deriving the Terms of Trade with a Labor Standard

I now want to consider the impact on the terms of trade of imposing a labor standard in one of the two countries. In a small country case, the change in trade due to the imposition of a labor standard would likely have no effect on world prices. Two small countries that traded with one another would therefore not be able to influence world prices and would care about each other's policy purely on moral grounds. As Brown *et al.* (1996) note, in a world which consists of many small countries:

> Each country's interest is then its own policy choice, plus the collective choices of the other countries. In this context, no country on economic grounds would care about the policy choices of other individual countries. They would, however, care about international agreements that might alter the policy choices of all countries collectively. (p. 237)

In the present case, I assume that countries *I* and *II* are sufficiently large to influence their terms of trade and I consider two different ways in which the labor standard might alter the terms of trade.

Case 1:

Suppose the labor standard is imposed in country *I* only, and withdraws resources (both capital and labor) from one of the tradeable sectors (for instance sector *X*). I do not explicitly model how the labor standard will be produced but only assume that its effect is to lead to a reduction in output in one of the tradeable sectors by using some amount of capital and labor. Even though one would expect that most labor standards are purely labor using, it is also possible to think of a labor standard as using both capital and labor.

For example, if a law is passed that prohibits children from working, the effect will be a reduction in the labor force and in that sense a minimum age for employment is purely labor-using. A similar effect will be obtained if a limit is placed on the number of hours of work. However, as Brown *et al.* point out, this may not necessarily be so and there are certain labor standards that may not be entirely labor using. For instance, OSH regulations may require investments in capital in the form of safer machines. As a result of the labor standard, a smaller amount of good *X* will be produced such that

$$Q_x = (1-A)K_x^{\theta}L_x^{1-\theta} \text{ and } 0 < A < 1. \tag{10}$$

The terms of trade for country *II* will then be equal to

$$p = \frac{(1-A)Q_x^I - C_x^I}{Q_y^{II} - C_y^{II}} \tag{11}$$

Inserting equation (10) and equations (3)-(5) in equation (11), and simplifying, yields the following expression for the terms of trade[3]:

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-C)K^I + (1-D)K^{II}}{CL^I + DL^{II}}\right]^{\theta-\mu}(1-A) \tag{12}$$

[3] Please refer to Appendix 2A for the relevant steps of this derivation.

Equation (12) is in fact equation (6) multiplied by *(1-A)*, and it implies that the terms of trade for country *II* fall (and the terms of trade for country *I* improve) when the labor standard takes resources away from sector *X* (*since dp/dA < 0*), which is the export industry for country *I*. One should note, however, that the preference parameters associated with the community utility function will likely be of different magnitudes in the presence of the labor standard since the consumer will also derive utility from the labor standard in addition to the traded goods (as argued in section 2.4 and illustrated by equation (18)). In order to obtain equation (12), I modify the profit maximization problem in Appendix 2A, shown by equation (2A), by replacing the production function for good *X* with equation (10), and I then derive the terms of trade.

On the other hand, if the labor standard withdrew resources from sector *Y*, and because world production is always equal to world consumption for each good, I can re-write equation (1) in terms of good *Y* for country *I* and good *X* for country *II*. In this case, the terms of trade for country *II* will be equal to

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-C)K^{I}+(1-D)K^{II}}{CL^{I}+DL^{II}}\right]^{\theta-\mu}\frac{1}{(1-A)} \qquad (13)$$

Equation (13) is equation (6) divided by *(1-A)* and it implies that country II will now experience an improvement in its terms of trade (country *I* will experience a deterioration in its terms of trade) when the labor standard is imposed in the import sector of country *I*. Once again, the preference parameters associated with the

community utility function will be of different magnitudes in the presence of the labor standard. Hence it is possible to establish the following:

**Proposition 1**: *A labor standard that withdraws resources from a country's export (import) sector will improve (worsen) that country's terms of trade and, of course, worsen (improve) the trading partner's terms of trade.*

Furthermore, once the terms of trade is determined, one can also determine the wage/rental ratio and the factor intensities for goods $X$ and $Y$ based on equations (7) to (9) above.

Case 2:

Suppose now that the same amount of tradeable goods ($X$ and $Y$) is produced as in the case where there was no standard but that a fraction ($A$) of output $X$ is then used to finance the labor standard. In other words, only ($1$-$A$) of output $X$ is available for trade[4]. The fact that the labor standard is using some of the output of $X$ implicitly implies that it is once again using some amount of capital and some amount of labor. I derive the terms of trade by going through the different steps outlined in Appendix A and using equations (10) and (11). The difference between Case 1 and Case 2 is that in the latter case I do not modify the profit maximization problem shown by equation (2A) since the same amount

[4] This is equivalent to saying that the labor standard uses the same technology as sector $X$. Even though this assumption is restrictive, it allows one to focus on the terms of trade effect. Introducing a different capital/labor ratio for the standard would add one more dimension to the model and bring us closer to a Komiya-type model where the tradeables and non-traded good have different capital intensities. Dehejia and Garbo consider such a case and the resulting implications for the terms of trade in a different kind of setting.

of good $X$ is being produced initially. This gives rise to the following expression for the terms of trade for country *II*:

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\phi^{\theta-\mu} \tag{14}$$

where

$$\phi = \frac{(1-C)(K^{I}) + (1-D)(K^{II}) + (\mu-1)AK^{I}}{C(L^{I}) + D(L^{II}) - \mu AL^{I}}$$

and where $C = \mu + a\theta - a\mu$ and $D = \theta + \beta\mu - \beta\theta$. Once again, the wage/rental ratio and the factor intensities for goods $X$ and $Y$ are all dependent on the terms of trade, which is now dependent on $A$. Hence, once the value of $A$ is determined, and given overall endowments in both countries as well as technological and preference parameters, the terms of trade, the wage-rental ratio and the capital-labor ratios of goods $X$ and $Y$ are all determined in this model. In fact,

$$\varpi = \frac{w}{r} = \phi \tag{7a}$$

$$k_x = \varpi\frac{\theta}{1-\theta} = \phi\frac{\theta}{1-\theta} \tag{8a}$$

$$k_y = \varpi\frac{\mu}{1-\mu} = \phi\frac{\mu}{1-\mu} \tag{9a}$$

, where, this time, $\phi = \dfrac{(1-C)(K^I)+(1-D)(K^{II})+(\mu-1)AK^I}{C(L^I)+D(L^{II})-\mu AL^I}$

It is easy to see from equations (11) and (7a) - (9a) that a change in $A$ will have an impact on the terms of trade, factor prices and factor intensities. Differentiating equation (14) with respect to $A$, the following expression is obtained:

$$\frac{dp}{dA} = \frac{\theta^\theta(1-\theta)^{1-\theta}}{\mu^\mu(1-\mu)^{1-\mu}}(\theta-\mu)\phi^{\theta-\mu-1}\left[\frac{(\mu-1)K^I+\mu L^I\phi}{CL^I+DL^{II}-\mu AL^I}\right] \tag{15}$$

If we assume that incomplete specialization obtains, then $k_y > k^I$, that is, the capital-labor ratio of good $Y$ is greater than that of the economy, making the element in square brackets positive. The sign of equation (15) will thus depend on $(\theta-\mu)$, which is the difference between the capital-labor ratios of goods $X$ and $Y$. Hence movement of the terms of trade due to a change in $A$ depends on the capital-labor intensity of the tradeables. For example, if good $X$ was the capital-intensive good and country $I$ was capital abundant such that good $X$ was being exported, then $\theta > \mu$ which means that $dp/dA > 0$, and there would thus be a terms of trade gain for country $II$ when the labor standard is imposed in the export sector. Hence, it is possible to write down the following result:

**Proposition 2:** *The effect of the labor standard on the terms of trade, when modeled as above, will depend on the capital-labor ratios of the tradeable goods.*

Suppose that we repeated this analysis by assuming instead that the labor standard withdrew a fraction ($A$) of the output of good $Y$ produced in country $I$, keeping everything else the same. Again, because world production is always equal to world consumption for each good, we can re-write equation (1) in terms of good $Y$ for country $I$ and good $X$ for country $II$ The terms of trade in that case will be equal to

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-D)K^{I}+(1-C)K^{II}+(\theta-1)AK^{I}}{DL^{I}+CL^{II}-\theta AL^{I}}\right]^{\theta-\mu} \tag{16}$$

where $C = \mu + a\theta - a\mu$ and $D = \theta + \beta\mu - \beta\theta$. Differentiating equation (16) with respect to $A$ gives

$$\frac{dp}{dA} = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}(\theta-\mu)\phi^{\theta-\mu-1}\left[\frac{(\theta-1)K^{I}+\theta L^{I}\phi}{DL^{I}+CL^{II}-\theta AL^{I}}\right] \tag{17}$$

Once again, one can see from equation (17) that movements in the terms of trade due to a change in $A$ will depend on the capital-labor ratios of the tradeables.

## 2.4 Implications and Welfare Considerations

So far in this essay, I have considered models where the labor standard is imposed by one country at a time in order to identify the terms of trade effects. It is quite possible that countries which trade with one another will each set their domestic labor standards at a certain level. For example, one could again use equation (1) to consider the effects of a labor standard in sector *X* of country *I* and sector *Y* of country *II*, and as a result the effects will not only depend on which sector the standard is imposed but also on the relative levels of the standard in each country. Alternatively, one could think of this situation as a game of strategy between two countries who can choose to impose or not impose a labor standard, and where they each know what will happen if they decide to set the standard at a certain level.

Instead, I use the results of the previous section to discuss the possible outcomes. Indeed, an important implication of these results is that countries will tend to impose labor standards in order to sway the terms of trade in their favor. For instance, a country might choose to set a labor standard in the export sector and thus obtain terms of trade gains; or alternatively, it could try to force its trading partner to adopt a labor standard in the latter's import sector, which would lead to a deterioration in its trading partner's terms of trade and hence an improvement in its own. The other implication of the analysis in section 2.3 is that countries will also have an incentive to set labor standards that are too high or too low and just for terms of trade gains, and that the absence of coordination will not allow them to reach the world optimum[5]. In other words, because

[5] Brown *et al* also obtain this result in the case of a specialized economy.

of the potential terms of trade gains, countries acting rationally from an individual point of view will not maximize global welfare.

This also leads to some comments on welfare considerations. The results in the previous section have shown that the imposition of a standard reduces production, the volume of trade and can also lead to an improvement or deterioration in the terms of trade. The effect on national welfare is something I have not discussed so far and I examine this by considering Case 2 from the previous section. Standards are often viewed as creating distortions since they impose additional costs on producers, they alter factor and product prices, and lead to lower employment. From the point of view of national welfare, the overall effect of standards will depend on the benefit that consumers derive from consuming the standard good and the loss in welfare due to reduced consumption of the traded goods, as well as the terms of trade effects of the standard on product and factor prices, which were considered in the previous section. Hence, even though standards may be distortionary, they may improve national welfare by providing benefits that are valued highly by consumers.

Suppose that there are N consumers indexed by $i = 1,\ldots,N$ in country I. In the absence of any labor standard, consumers will derive utility from the consumption of goods $X$ and $Y$. With a labor standard, each representative consumer has identical preferences and derives utility from

$$U_i = x_i^{\alpha} y_i^{\beta} z^{\gamma} \tag{18}$$

where $\alpha + \beta + \gamma = 1$, and where $z$ represents the labor standard. This utility function implies that an individual's utility depends not only on the consumption of the two tradeables but also on the labor standard, which is itself a public good (and this is why $z$ does not have a subscript $i$ attached to it). Each individual possesses some amount of capital and some amount of labor. Hence, individual $i$'s income is given by $I_i = wL_i + rK_i$, where $L_i$ and $K_i$ denote the amounts of labor and capital owned by individual $i$. Also, $\sum_{i=1}^{N} L_i = L^I$ *and* $\sum_{i=1}^{N} K_i = K^I$, which are the overall endowments of labor and capital.

At the economy level, for country $I$, we can think of the labor standard as a non-traded good such that supply equals demand. Preferences of individual $i$ can also be described by an indirect utility function $V_i = V_i(p, I_i)$, where $V_i$ represents the maximum utility obtained by individual $i$, given $p$ ($= p_y / p_x$) and $I_i$, as follows:

$$V_i(p, I_i) = \frac{\alpha^{\alpha+\gamma} \beta^{\beta} (wL_i + rK_i)^{\alpha+\beta} (wL^I + rK^I) A^{\gamma}}{p^{\beta}} \tag{19}$$

As in the previous section, $A$ in equation (19) is the fraction of output $X$ which is used to finance the labor standard, such that $z = AX$. Suppose we assume that $L_i$ and $K_i$ are exogenous to individual $i$. Suppose also that the individual recognizes the effects of the labor standard on producer and factor prices. Based on these assumptions, we can substitute the expressions for $p$, $w$ and $r$ obtained previously when deriving the terms of trade, in $V_i(p, I_i)$ to obtain the following:

$$V_i(p, I_i) = FA^{\gamma}(\phi^{D} L_i + \phi^{D-1} K_i)(\phi^{\theta} L^{I} + \phi^{\theta-1} K^{I})^{\gamma} \tag{20}$$

where,

$$F = \alpha^{\alpha+\gamma} \beta^{\beta} \left[\theta^{\theta}(1-\theta)^{1-\theta}\right]^{2} \left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}}\right]^{\beta}$$

$$D = \theta + \beta\mu - \beta\theta$$

$$\text{and } \phi = \frac{(1-C)(K^{I}) + (1-D)(K^{II}) + (\mu-1)AK^{I}}{C(L^{I}) + D(L^{II}) - \mu A L^{I}}$$

In order to obtain equations (19) and (20), it is assumed that $p_x$ is equal to one, that is, I take good $x$ as the numeraire good. Rewriting $i$'s utility function in terms of the indirect utility function thus enables one to interpret the latter as $i$'s welfare as a function of $A$:

$$W_i(A) = FA^{\gamma}(\phi^{D} L_i + \phi^{D-1} K_i)(\phi^{\theta} L^{I} + \phi^{\theta-1} K^{I})^{\gamma}, \text{ where } \phi = f(A) \tag{21}$$

This welfare function is dependent upon the individual's income, overall income, the terms of trade and by construction the labor standard. Equation (21) tells us that as long as the marginal benefit from consuming the standard (represented by parameter $\gamma$) exceeds the possible welfare losses (either through reduced consumption of the tradeables or because of adverse changes in the terms of trade and their effects on factor prices), then there will be an incentive for the consumer to demand the labor standard.

For the economy as a whole, the indirect utility function and the social welfare function will be respectively

$$V_i(p, I_i) = GA^{\gamma}(\phi^{D} L^{I} + \phi^{D-1} K^{I}) \tag{22}$$

$$W(A) = GA^{\gamma}(\phi^{D} L^{I} + \phi^{D-1} K^{I}) \tag{23}$$

where

$$G = \alpha^{\alpha+\gamma} \beta^{\beta} \left(\theta^{\theta}(1-\theta)^{1-\theta}\right) \left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}}\right]^{\beta}$$

From equation (23), one can see that national welfare will depend on the consumption of tradeable goods and the labor standard. As long as the sum of marginal benefits derived from consuming the standard is high enough, national welfare will be higher.

## 2.5 Conclusion

The purpose of this essay has been to investigate the effects of labor standards on trade through the terms of trade. After reviewing the existing literature on this issue, the general equilibrium analysis has shown that these effects are far-reaching in that they affect product prices, factor prices and intensities, income and welfare. Most importantly, we have seen that once a country adopts a labor standard, the effects can spill over to its trading partners because of changes in the terms of trade. These terms of trade effects were found to be in turn dependent on whether the standard was imposed in

the import or export sector, and also on the factor intensity of the tradeables. These results, thus, formally echo those of Brown *et al* who also focused on the welfare and other effects of labor standards.

The results in the present essay have important implications because countries might push for higher labor standards domestically or abroad for pure terms of trade gains and not because of genuine moral concerns. Also, the potential terms of trade gains from standards might lead countries to choose too high or too low levels of standards that are not optimal from the point of view of the world. One issue which I have not dealt with in this paper, and which is an important challenge for further research, is to investigate further the welfare implications of labor standards and identify the conditions which will guarantee that an optimal level of the labor standard is demanded and which at the same time maximizes welfare. Particularly, the welfare implications of standards that are distortionary, and those that can reduce or correct an existing distortion, should be more closely examined

Now that possible links between labor standards, comparative advantage and trade have been established, I empirically examine these issues in the next two chapters of the thesis by considering the effects of labor standards on foreign direct investment flows and export performance.

## APPENDIX 2A

**Derivation of the Terms of Trade**

Suppose that an economy is characterized by the following Cobb-Douglas production functions for goods *x* and *y* respectively:

$$Q_x = F(K,L) = K_x^{\theta} L_x^{1-\theta} = L_x K_x^{\theta} = L_x f(K_x)$$

$$Q_y = G(K,L) = K_y^{\mu} L_y^{1-\mu} = L_y K_y^{1-\mu} = L_y g(K_y)$$

Suppose producers behave as price takers, that is, they face competitive markets. Assuming constant returns to scale, each producer minimizes his unit cost of production, that is, he/she chooses capital/labor ratios $k_x$ and $k_y$ such that $\frac{w+k_x r}{f(k_x)}$ and $\frac{w+k_y r}{g(k_y)}$ are minimized, where '*w*' is the price per unit of labor service per unit of time and '*r*' is the rental per unit of capital per unit of time (both prices being defined in terms of the numeraire good, '*x*').

The optimal capital/labor ratios depend only on the factor-price ratio $w/r \equiv \omega$ and assuming the so-called Inada conditions are given by

$$\frac{f - k_x f_x}{f_x} = \omega = \frac{g - k_y g_x}{g_x} \qquad (1A)$$

The ratio of minimal unit cost of production of good *y* in terms of good *x*, denoted by $c(\omega)$, depends only on $\omega$ such that

$$c(\omega) = \frac{\dfrac{\omega + k_y(\omega)}{g(k_y(\omega))}}{\dfrac{\omega + k_y(\omega)}{f(k_x(\omega))}}$$

Using equation (1A), this means that

$$c(\omega) = \frac{f(k_x(\omega))}{g_x(k_y(\omega)} = \frac{f - k_x f_x}{g - k_y g_x}$$

$$\Rightarrow c(\omega) = \frac{(1-\theta)k_x^{\theta}}{(1-\mu)k_y^{\mu}} = \frac{(k_x^{\theta} - k_x \theta k_x^{\theta-1})}{(k_y^{\mu} - k_y \mu k_y^{\mu-1})} = \frac{(1-\theta)k_x^{\theta}}{(1-\mu)k_y^{\mu}}$$

Consider the following profit maximization problems:

$$\Pi_x = p_x K_x^{\theta} L_x^{1-\theta} - wL_x - rK_x \qquad (2A)$$

$$\Pi_y = p_y K_y^{\mu} L_y^{1-\mu} - wL_y - rK_y \qquad (3A)$$

These yield the following FOCs:

$$p_x(1-\theta)k_x^{\theta} = w = p_y(1-\mu)k_y^{\mu} \tag{4A}$$

$$p_x\theta k_x^{\theta-1} = r = p_y\mu k_y^{\mu-1} \tag{5A}$$

From equation (4A),

$$\frac{p_y}{p_x} = p = \frac{(1-\theta)k_x^{\theta}}{(1-\mu)k_y^{\mu}} = c(\omega)$$

I can use equations (4A) and (5A) to obtain the capital/labor ratios for goods $x$ and $y$ as follows:

$$k_x = \omega\left(\frac{\theta}{1-\theta}\right)$$

$$k_y = \omega\left(\frac{\mu}{1-\mu}\right)$$

that is, $k_x = f(\omega)$ and $k_y = f(\omega)$. Hence,

$$\Rightarrow c(\omega) = \frac{(1-\theta)k_x^{\theta}}{(1-\mu)k_y^{\mu}} = \frac{(1-\theta)\omega^{\theta}\left(\frac{\theta}{1-\theta}\right)^{\theta}}{(1-\mu)\omega^{\mu}\left(\frac{\mu}{1-\mu}\right)^{\mu}}$$

$$\Rightarrow \omega = p^{1/(\theta-\mu)}\left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}}\right]^{1/(\theta-\mu)} \tag{6A}$$

that is, $\omega = f(p)$. Therefore,

$$k_x = \omega\left(\frac{\theta}{1-\theta}\right) = p^{1/(\theta-\mu)}\left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}}\right]^{1/(\theta-\mu)}\left(\frac{\theta}{1-\theta}\right) \tag{7A}$$

$$k_y = \omega\left(\frac{\mu}{1-\mu}\right) = p^{1/(\theta-\mu)}\left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}}\right]^{1/(\theta-\mu)}\left(\frac{\mu}{1-\mu}\right) \tag{8A}$$

and, hence, $k_x = f(p)$ and $k_y = f(p)$

*Deriving the terms of trade:*

$Q_y^{II} - C_y^{II} = \frac{Q_x^{I} - C_x^{I}}{p}$, where $p = p_y/p_x$

$$\text{or } p = \frac{Q_x^{I} - C_x^{I}}{Q_y^{II} - C_y^{II}} \tag{9A}$$

where $C$'s denote the consumption of goods, $Q$'s refer to production levels and the superscripts refer to countries. Now,

$$C_x^I = \frac{\alpha I^I}{p_x} = \frac{\alpha(wL^I + rK^I)}{p_x} \tag{10A}$$

$$C_y^{II} = \frac{\beta I^{II}}{p_y} = \frac{\beta(wL^{II} + rK^{II})}{p_y} \tag{11A}$$

$$Q_x^I = K_x^\theta L_x^{1-\theta} = L_x k_x^\theta \tag{12A}$$

$$Q_y^{II} = K_y^\mu L_y^{1-\mu} = L_y k_y^\mu \tag{13A}$$

I also already know that

$$k_x = \omega\left(\frac{\theta}{1-\theta}\right) = p^{1/(\theta-\mu)}\left[\frac{\mu^\mu(1-\mu)^{1-\mu}}{\theta^\theta(1-\theta)^{1-\theta}}\right]^{1/(\theta-\mu)}\left(\frac{\theta}{1-\theta}\right)$$

$$k_y = \omega\left(\frac{\mu}{1-\mu}\right) = p^{1/(\theta-\mu)}\left[\frac{\mu^\mu(1-\mu)^{1-\mu}}{\theta^\theta(1-\theta)^{1-\theta}}\right]^{1/(\theta-\mu)}\left(\frac{\mu}{1-\mu}\right)$$

$$w = p_x(1-\theta)k_x^\theta$$

$$r = p_x\theta k_x^{\theta-1}$$

I can use the following properties for endowments of labor and capital:

$$\left(\frac{L_x}{L}\right)\left(\frac{K_x}{L_x}\right)+\left(\frac{L_y}{L}\right)\left(\frac{K_y}{L_y}\right)=\left(\frac{L_x}{L}\right)k_x+\left(\frac{L_y}{L}\right)k_y=\frac{K}{L}=k \tag{14A}$$

$$\frac{L_x}{L}+\frac{L_y}{L}=1 \tag{15A}$$

Solving equations (14A) and (15A) simultaneously yields the following:

$$\frac{L_x}{L}=\frac{k-k_y}{k_x-k_y} \tag{16A}$$

$$\frac{L_y}{L}=\frac{k_x-k}{k_x-k_y} \tag{17A}$$

Substituting equations (10A) – (13A) into equation (9A), I obtain an expression for the terms of trade (for country *II*) as follows:

$$p=\frac{p_y}{p_x}=\frac{L_x k_x^{\theta}-\dfrac{\alpha(wL^{I}+rK^{I})}{p_x}}{L_y k_y^{\mu}-\dfrac{\beta(wL^{II}+rK^{II})}{p_y}} \tag{18A}$$

After further substituting equations (4A) and (5A) for *w* and *r*, and simplifying, I obtain

$$p=\left(\frac{L^{II}}{L_y}\right)\left(\frac{k_x^{\theta}}{k_y^{\mu}}\right)\left(\frac{L^{I}}{L^{II}}\right)\left[\left(\frac{L_x}{L^{I}}\right)-\alpha(1-\theta)-\alpha\theta k_x^{-1}k^{I}+\beta(1-\theta)\left(\frac{L^{II}}{L^{I}}\right)+\beta\theta\left(\frac{L^{II}}{L^{I}}\right)k_x^{-1}k^{II}\right]$$

I then substitute $\frac{L^{II}}{L^{y}}=\frac{k_x-k_y}{k_x-k^{II}}$ and $\frac{L_x}{L^{I}}=\frac{k^{I}-k_y}{k_x-k_y}$ which are themselves derived from equations (16A) and (17A) and simplify further such that:

$$p=\left(\frac{k_x-k_y}{k_x-k^{II}}\right)\left(\frac{k_x^{\theta}}{k_y^{\mu}}\right)\left(\frac{L^{I}}{L^{II}}\right)\left[\left(\frac{k^{I}-k_y}{k_x-k_y}\right)-\alpha(1-\theta)-\alpha\theta k_x^{-1}k^{I}+\beta(1-\theta)\left(\frac{L^{II}}{L^{I}}\right)+\beta\theta\left(\frac{L^{II}}{L^{I}}\right)k_x^{-1}k^{II}\right]$$

Substituting equations (7A) and (8A) in the above expression, and solving for *p* yields the following expression for the terms of trade for country *II*:

$$p=\frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-C)(K^{I})+(1-D)(K^{II})}{C(L^{I})+D(L^{II})}\right]^{\theta-\mu} \qquad (19A)$$

where $C=\mu+\alpha\theta-\alpha\mu$ and $D=\theta+\beta\mu-\beta\theta$. Since $\alpha+\beta=1$, then $C=D$, which means that equation (19A) can be further simplified to

$$p=\frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}}\left[\frac{(1-C)(K^{I}+K^{II})}{C(L^{I}+L^{II})}\right]^{\theta-\mu} \qquad (20A)$$

The terms of trade for country *I* will thus be equal to *1/p*. I can then substitute equation (20A) into equations (6A)-(8A) to obtain expressions for the wage-rental ratio and the capital labor ratios of the tradeables in terms of *p*.

Case 1:

Modify equation (2A) such that:

$$\Pi_x = p_x(1-A)K_x^{\theta}L_x^{1-\theta} - wL_x - rK_x \qquad (21A)$$

and using equation (3A), namely

$\Pi_y = p_y K_y^{\mu} L_y^{1-\mu} - wL_y - rK_y$, I obtain the following FOCs:

$$p_x(1-A)(1-\theta)k_x^{\theta} = w = p_y(1-\mu)k_y^{\mu} \qquad (22A)$$

$$p_x(1-A)\theta k_x^{\theta-1} = r = p_y \mu k_y^{\mu-1} \qquad (23A)$$

From equation (22A),

$$\frac{p_y}{p_x} = p = \frac{(1-A)(1-\theta)k_x^{\theta}}{(1-\mu)k_y^{\mu}} = c(\omega)$$

From equations (22A) and (23A):

$$k_x = \omega\left(\frac{\theta}{1-\theta}\right) \text{ and}$$

$$k_y = \omega\left(\frac{\mu}{1-\mu}\right)$$

,that is, $k_x = f(\omega)$ and $k_y = f(\omega)$. Hence,

$$\Rightarrow c(\omega) = \frac{(1-A)(1-\theta)k_x^{\theta}}{(1-\mu)k_y^{\mu}} = \frac{(1-A)(1-\theta)\omega^{\theta}\left(\frac{\theta}{1-\theta}\right)^{\theta}}{(1-\mu)\omega^{\mu}\left(\frac{\mu}{1-\mu}\right)^{\mu}}$$

$$\Rightarrow \omega = p^{1/(\theta-\mu)}\left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}(1-A)}\right]^{1/(\theta-\mu)} \text{ , that is, } \omega = f(p).$$

Therefore,

$$k_x = \omega\left(\frac{\theta}{1-\theta}\right) = p^{1/(\theta-\mu)}\left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}(1-A)}\right]^{1/(\theta-\mu)}\left(\frac{\theta}{1-\theta}\right)$$

$$k_y = \omega\left(\frac{\mu}{1-\mu}\right) = p^{1/(\theta-\mu)}\left[\frac{\mu^{\mu}(1-\mu)^{1-\mu}}{\theta^{\theta}(1-\theta)^{1-\theta}(1-A)}\right]^{1/(\theta-\mu)}\left(\frac{\mu}{1-\mu}\right)$$

and, hence, $k_x = f(p)$ and $k_y = f(p)$.

The equation for the terms of trade when a labor standard withdraws resources from sector X is as follows:

$$p = \frac{p_y}{p_x} = \frac{(1-A)L_x k_x^{\theta} - \dfrac{\alpha(wL^I + rK^I)}{p_x}}{L_y k_y^{\mu} - \dfrac{\beta(wL^{II} + rK^{II})}{p_y}} \qquad (24A)$$

I then follow the same procedure as in the case when I derived the terms of trade with no labor standard, but taking into account the modified expressions for $w$, $r$, $k_y$ and $k_x$. This yields equation (12).

Case 2:

In order to derive an expression for the terms of trade with a labor standard (taking resources from sector $X$), I use equation (24A). The difference here is that I assume that the same amounts of tradeable goods are produced initially, and then a fraction of X is used to finance the labor standard (that is, is not traded). This yields the following expression for the terms of trade:

$$p = \frac{\theta^{\theta}(1-\theta)^{1-\theta}}{\mu^{\mu}(1-\mu)^{1-\mu}} \left[ \frac{(1-C)(K^I) + (1-D)(K^{II}) + (\mu-1)AK^I}{C(L^I) + D(L^{II}) - \mu AL^I} \right]^{\theta-\mu} \qquad (25A)$$

which is in fact equation (14).

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# Chapter 3

# Trade and Labor Standards: An Empirical Analysis

# Trade and Labor Standards: An Empirical Analysis

## 3.1 Introduction

There have been many concerns in more recent times that the effects of unfair labor conditions have been ignored in regional and multilateral trade negotiations. For instance, the creation of the North American Free Trade Agreement (NAFTA) raised concerns that low labor standards in Mexico could be a threat to firms in the United States, leaving the latter at a comparative disadvantage and forcing them to close down or relocate production. Even though such discussions have resurfaced in recent trade negotiations, similar ones on the issue of trade and labor standards were also one of the reasons that led to the establishment of the International Labor Organization (ILO) back in 1919[1] - since its creation, the ILO has worked towards improving labor conditions worldwide. As Alam (1992) points out, the rise of foreign competition at the beginning of the twentieth century meant that costs of production and equality in competition started becoming important in determining labor laws, thus leading to the emergence of workers' organizations.

The main argument that is made by labor interests in high-standards countries today is that low labor standards are an unfair source of comparative advantage. Hence, increasing imports from low-standards countries will have an adverse impact on wages and working conditions in high-standards countries, as the latter will have to lower their standards to remain competitive in the absence of offsetting productivity improvements,

[1] The ILO, as a specialized agency of the United Nations, is unique in that it is a tripartite body that brings workers, employers and governments together. As part of its mandate, it formulates international labor standards in the form of Conventions and Recommendations that establish minimum standards of basic labor rights.

thus leading to a "race to the bottom" of standards across countries (the case of 'bad' standards driving out the 'good'). Indeed, the OECD (1996) has pointed out that the increase in unemployment rates in several OECD countries in recent years has led to allegations of unfair trade practices associated with competition from low-standards countries. Opponents of this view attribute the rise in unemployment to internal structural rigidities in labor and product markets. They argue that differences in labor standards do not have any significant impact on trade patterns and foreign direct investment. The even more recent anti-WTO demonstrations in Seattle are further evidence that the issue of trade and labor standards is far from being resolved.

The purpose of this paper is to make an empirical contribution to the above ongoing debate by answering the following two questions. First, does the imposition of labor standards affect export performance? Second, do labor standards have an influence on foreign direct investment (FDI) flows, or put another way, to what extent is the decision to invest dependent on low labor standards abroad? If the popular views on the issue of trade and labor standards are correct, one should expect low-standards countries to enjoy a better export performance and attract more FDI than high-standards countries, *ceteris paribus*.

The structure of the paper is as follows. Section 3.2 provides a definition of labor standards, namely what constitutes "core labor standards", and presents some arguments in favour of a set of international labor standards. Section 3.3 sketches the major existing contributions to the empirical analysis of trade and labor standards. Section 3.4 presents the data that will be used for estimation purposes. In section 3.5, the models that will be tested are presented, and empirical results are reported. Section 3.6 concludes.

## 3.2 What are Labor Standards and Why do we Need them?

The OECD (1996) defines labor standards as norms, rules and conventions that govern working conditions and industrial relations. As such, they include almost all the institutional elements of labor markets, such as minimum wages, number of hours worked, the length and organization of working time, occupational health and safety, non-discrimination in employment, and child labor practices. The literature on labor standards also typically refers to the following "core" labor standards[2], which are sometimes synonymous with the notion of a Social Clause or Charter: freedom of association for workers, collective bargaining rights, elimination of exploitative forms of child labor, prohibition of forced labor, and non-discrimination in employment among genders.

There is now an ongoing debate on the possible inclusion of a Social Clause in the World Trade Organisation (WTO), namely linking trade and labor standards by making labor standards prerequisites for market access. It is quite obvious that some countries will never go along with that. One related problem is that the ILO has by itself not clearly identified a set of standards that will be part of the Social Clause. Bhagwati (1996), for instance, mentions that:

> Indeed, the reality is that diversity of labor practices and standards is widespread in practice and reflects, not necessarily venality and wickedness, but rather diversity of cultural values, economic conditions and analytical beliefs and theories concerning the economic (and therefore moral) consequences of specific labor standards...The alleged claim for the universality of labor standards is (except for a rare few cases such as slavery) generally unpersuasive. (pp. 39-41)

[2] Appendix 3B provides definitions and important guidelines regarding the core labor standards.

Opponents of the social clause therefore view the international harmonisation of labor standards as an infringement of national sovereignty and as a disguised form of protectionism. Imposing higher standards on low-standards countries is criticised on the grounds that it might just be a way to raise the latter's production costs. Some authors (for instance Leary (1996) and Rodrik (1996)) are in favour of a limited social clause, whereby trade sanctions would be applied whenever fundamental labor rights are violated; however, there should be no harmonisation of working conditions. In general, proponents of a limited social clause call for multilateral (either at the ILO or WTO) negotiations for such a clause rather than adopting it unilaterally; this would, in a sense, preclude resorting to unilateral measures, which are more likely to be harmful for developing countries.

Core labor standards represent basic human rights in the same spirit as human rights declarations emanating from the United Nations, and as such they command universal acceptance. They also enable labor markets to operate more efficiently by removing the constraints on the individual choices facing workers and by preventing employees from resorting to anti-competitive employment practices. In other words, labor standards can grant workers certain freedoms and therefore make them more efficient. Fields (1995) distinguishes between labor standards and labor rights. In his own words,

> A "labor standard" is something we would aim towards and rather have than not have, whereas a "labor right" is something that is not to be violated except under the most extreme circumstances. "Labor standards" thus include "labor rights" but go beyond them. (p. 11)

For example, minimum work ages would be considered as a labor standard and the right to bargain collectively would be treated as a labor right. Portes (1990), on the other hand, chooses a set of labor rights and then identifies those rights that are "basic", namely prohibition against involuntary servitude, freedom from discrimination, and the absence of exploitative use of child labor. For the purposes of this paper, the term "labor standard" will be used more loosely to include both standards and rights. The focus will be mostly on the core ILO standards mentioned above and which are represented by: ILO Conventions 29 (forced labor), 87 (freedom of association), 98 (right to organise and collective bargaining), 105 (abolition of forced labor) and 111(non-discrimination in employment).

At the national level, labor standards are binding in the sense that governments can enforce them and can even impose sanctions in case of non-compliance. At the international level, the ILO conventions are the main source of international labor standards, and they are binding only on those countries that have ratified them. In case of non-compliance, the ILO does not impose sanctions but has instead traditionally relied on softer measures such as technical assistance, moral suasion or peer pressure (OECD 1996). Even though there now seems to be a consensus on what the "core" labor standards should be, namely those related to basic human rights, there is still a lot of debate as to whether international labor standards *per se* are needed or not.

The objective of the ILO in having a set of international labor standards is that it can eliminate or reduce social injustice and thus contribute to lasting peace. International labor standards guarantee humane conditions of labor, and it is believed that the success

of any nation in adopting humane conditions of work can pave the way for other nations which desire to improve labor conditions within their own boundaries.

The rest of this section summarises the theoretical arguments for international labor standards. Various economic arguments have been advanced in favour of (and against) international labor standards.[3] The following words by Freeman and quoted by Rodrik (1996) provide a good summary of what the debate is all about:

> The argument about labor standards [is] one of a set of running battles between those who believe the unfettered market can do no wrong and those who believe governmental regulations can make things better. If you like standards, trot out the (usual) arguments about market imperfections, externalities, unequal bargaining power, prisoners' dilemma or coordination games, etc. If you don't like standards, trot out the (usual) arguments about the wonders of the Invisible Hand, the ineffectiveness of governments to act in the public interest, rent-seeking, etc. (p. 37)

Ehrenberg (1994) has shown that in an efficient competitive model of the labor market, labor standards cannot raise the welfare of a nation as a whole, but can only make some workers better off at the expense of others. In such a model, workers are rewarded by an amount that corresponds to their marginal revenue product. Due to Pareto optimality of every country's economy, government policies cannot make someone better off without making somebody else worse off. Workers receive higher wages to compensate for a lack of proper labor standards, and interestingly enough, it is assumed that child labor not only receives a wage which reflects its contribution to output, but also rationally decides to work or go to school. Ehrenberg argues that workers are likely to bear the costs of the standards in the form of lower wages.

Industrial countries, responding to internal pressure from lobbying groups, still seek to impose labor standards in this model to prevent competition from developing

[3] For a more detailed discussion, please refer to Krueger (1996).

countries. In practice, however, imperfections exist and labor standards can be an efficient means to prevent a "race to the bottom" of social policies. Furthermore, even an efficient market may not properly redistribute incomes or provide desirable working conditions. For instance, if low-skilled labor is earning extremely low wages, a large proportion of the labor force remains poor such that society may opt for a redistribution of income towards the needy ones. Krueger (1996) argues that even though redistribution of income leads to some deadweight loss, a minimum wage, for example, may be desirable since it increases the income of low-paid workers when the elasticity of demand for labor is less than one (even though it can also lead to some unemployment).

Market failures (especially in the labor market) may be a justification for international labor standards. Labor market imperfections may be due to imperfect and asymmetric information, unequal market power, discrimination and externalities. Forced labor, for instance, even though being an extreme case, provides a good example where employers have market power. In such a case, labor standards can potentially improve efficiency and equity. Consumer sovereignty and the enhancement of labor market institutions are other reasons that have been advanced in favor of international labor standards. Society may pursue national or international labor standards in the same way that individuals may opt not to buy products that are made from morally unacceptable labor practices such as forced or child labor. It is also possible for labor standards to improve social relationships and thus lead to better production methods.

Now that I have considered some definitional problems related to labor standards as well as arguments justifying international labor standards, the next section reviews existing empirical work on trade and labor standards.

## 3.3 Literature Review

This section discusses some of the recent empirical contributions to the issue of trade and labor standards. The OECD (1996) study tries to establish possible links between core labor standards, trade, foreign direct investment, economic development and employment. The actual effects of core labor standards (measured by freedom of association rights) on output are found to be negligible compared with other factors such as technological shifts, prices of raw materials and the terms of trade. There is also no correlation between real wage growth and freedom of association. As far as trade performance is concerned, the study finds no evidence that countries with low labor standards achieve a better export performance than countries with high labor standards. The latter analysis concentrates mainly on labor standards related to freedom of association and collective bargaining.

The OECD (1996) study also considers selected trade liberalization episodes, and it is not clear whether trade reforms or freer association rights occur first. Countries that have liberalized trade do not necessarily face a worsening of freedom of association rights; it is also not obvious that the promotion of these rights hinders further liberalization of trade. However, over time, there appears to be a positive relationship between successful trade reforms and improvements in core standards. Regarding FDI flows, a review of the evidence shows that core labor standards are not important determinants of investors' decisions. All the above results, according to the OECD, lead to the conclusion that the concerns of developing countries that core standards will adversely influence their international competitiveness is unfounded.

Mah (1997) analyzes the relationship between core labor standards and the export performance of developing countries. More specifically, he considers the ratification of ILO conventions related to core labor standards for forty-five developing countries as an independent variable to analyse their export performance for 1993. Unlike the OECD (1996) study, which is based on just plots and did not involve any rigorous statistical analysis, Mah's regression results (based on two models which are explained in greater detail in section 5 of the paper) show that ratification of the conventions related to freedom of association, collective bargaining, and non-discrimination lead to a deterioration of export performance. Similar results are obtained even when a capital cost element is added as an additional explanatory variable. The ILO conventions related to forced labor are insignificant in all cases. Mah's results thus contradict the OECD findings that there is no relationship between export performance and the level of labor standards.

Rodrik (1996) uses a variety of measures of labor standards (number of ILO conventions ratified, democracy index representing civil and political rights, indicator for child labor, statutory hours of work in manufacturing, days of paid annual leave in manufacturing, and percentage of the labor force that is unionized) to analyze their effects on (i) labor costs (ii) comparative advantage and hence trade flows, and (iii) FDI. His results indicate that labor standards are important determinants of labor costs but not comparative advantage. Regarding the effect of labor standards on FDI flows, by controlling for policy distortions, population and the growth rate, he finds that his indicators for democracy and child labor are significant and that low labor standards are in fact a deterrent for foreign investors. His results also show that ratification of

conventions, both with regards to core labor standards and other labor standards, are not significant determinants of FDI.

### 3.4 Data

In order to estimate the relationship between 1) export performance and labor standards and 2) FDI and labor standards, cross-sectional macro-data are used for a sample of countries that consists of both developed (OECD) and developing countries. For the purposes of this paper, the sample of countries examined is taken from the OECD (1996) study and for which reliable data are available.[4] The latest available data are gathered regarding indicators of labor standards, and these are explained below.

I obtain data concerning the ratification of core ILO conventions from ILOLEX, which is a database of international labor standards from the ILO. The database contains information on the number of core conventions ratified by each country as well as the date of ratification. It is thus possible to identify the core conventions that have been ratified by each country in our sample up till the end of 1995, which is the reference date for the estimates in this paper. The total number of ILO conventions (*tconv*) ratified is obtained from the World Labor Report (1995), and it varies widely across countries. For instance, France, Italy and Spain have each ratified over one hundred conventions, whereas Korea and Botswana have ratified only four and two conventions respectively.

I consider an indicator of civil liberties obtained from Freedom House (1995), which is an annual survey of political rights and civil liberties and denote this variable as *civilb*. The checklist for civil liberties includes questions regarding the presence of trade

[4] Please refer to the appendix for a list of countries examined and for data sources.

unions, the effectiveness of collective bargaining, and freedom from exploitation by employers or union leaders. It is measured on a scale of 1 to 7, with smaller values indicating more rights. Rodrik (1996) uses a formula that combines the civil liberties index and the political rights index to arrive at an index of labor standards. In fact, his "democracy" index is obtained from the following transformation: (14-(*civilb* + *pright*))/12, where *pright* stands for political rights. In the present paper, only the civil liberties index is used because it is our view that the political rights checklist includes questions that are related to human rights that go beyond just labor standards.

I consider the normal weekly hours of work as per the labor regulations that are in effect in each country and denote this variable as *hour*. Some countries report the range of hours (for example, 44 to 48 per week according to industry), and in that case the minimum is chosen. The number of days of paid annual leave allowed in each country in accordance with domestic laws is also considered and this variable is denoted as *leave*. The number of days of annual leave normally increases with the number of years of service. To be consistent, the minimum is always picked. I consider union membership as a percentage of the non-agricultural labor force for 1995. For some countries, due to a lack of data, trade union density for the years 1993 and 1994 are taken. I denote this variable as *union*. Finally, variable *injuries*, which indicates occupational injuries per thousand people employed, is considered. This variable can be interpreted as an indicator of safety at the workplace.

## 3.5 Results of Empirical Analysis

In this section, the results of the empirical analysis are presented. The section is divided into two parts. In the first one, I consider the effect of labor standards on export performance. The second part looks at the effect of labor standards on FDI flows.

### 3.5.1 Labor Standards and Export Performance

The following model from Mah (1997) is used to assess the impact of ratifying core labor standards on export performance:

$$log\ (exp/gdp)_i = \alpha_0 + \alpha_1\ labstd_i + \varepsilon_i \qquad (1)$$

where,

*exp* is the export value in US dollars in 1995;

*gdp* is gross domestic product in US dollars in 1995;

*labstd* is any one of the following core conventions ratified or not ratified: *fa* (freedom of association), *rocb* (right to organise and collective bargaining), *fl* (forced labor), *afl* (abolition of forced labor), *nd* (non-discrimination), or *cconv* (the number of core conventions ratified, hence ranging from zero to five); and ε is a disturbance term. Hence, except for *cconv*, $labstd_i$ is a dummy variable, which is equal to one if country 'i' ratified the ILO convention being examined and zero if the country did not ratify it. The variable *cconv* being the number of core conventions ratified, varies from zero to five. It is equal to zero if a given country did not ratify any of the core conventions and five if the country ratified all of them.

A second model from Mah (1997), which includes the capital cost effect on the export performance, is also considered:

$$log(exp/gdp)_i = \beta_0 + \beta_1 rint_i + \beta_2 labstd_i + \varepsilon_i \quad (2)$$

where, *rint* is defined as the lending rate minus the rate of inflation and the other terms are as indicated above in equation (1). Equation (2) is just equation (1) augmented by the capital cost variable *rint*.

Equations (1) and (2) are in fact an application of the perfect and imperfect substitutes model, which have been used to model the behaviour of exports and imports. The perfect substitutes model assumes that homogeneous goods such as wheat or sugar are traded on international markets at a common price, while the imperfect substitutes model is more suitable for differentiated products. In the perfect substitutes model, a country's export volume depends on domestic prices, money income, and factor costs within the country. In fact, for a given country *i*:

$$D_i = f(P_i, Y_i), f_1 < 0, f_2 > 0 \quad (3)$$

$$S_i = g(P_i, F_i), g_1 > 0, g_2 < 0 \quad (4)$$

where $D_i$ is the quantity of goods demanded in country *i*; $S_i$ is the supply of goods produced in country *i*; $P_i$ is the domestic price of traded goods; and $Y_i$ and $F_i$ are money

income and factor costs. The quantity of country *i's* exports is given by the following equation,

$$X_i = S_i - D_i \tag{5}$$

such that if we insert equations (3) and (4) in equation (5), the following equation is obtained:

$$X_i = g(P_i, F_i) - f(P_i, Y_i) \tag{6}$$

Equation (6) is what forms the basis for equations (1) and (2). The interaction of world demand and world supply in the perfect substitutes model determines a unique world price, which is equal to the import, export and domestic prices of traded goods (abstracting from transport costs and other trade barriers).

In the imperfect substitutes model, on the other hand, prices have to adjust in each time period to maintain the equality between demand and supply. Furthermore, there exist costs to changing prices in imperfect markets, and the variable *rint* in equation (2) captures these additional costs of adjustment. In fact, firms have to weigh the costs of changing prices against adjustment costs such as changes in inventories or unfilled orders.[5] Both equations (1) and (2) assume that the export performance of a country is determined by its price competitiveness. The dependent variable is expressed in log terms because it reduces the risk of the presence of heteroskedasticity that might be expected with cross-sectional data.

The effect of imposing a labor standard can therefore be viewed as an increase in the labor cost, which in turn results in a deterioration of the price competitiveness of a country. Indeed, one of the results from Rodrik's (1996) analysis is that labor costs tend to increase when higher labor standards are imposed. It is important, however, to distinguish between labor costs and labor standards. Labor costs are endogenous, and differences in labor costs across countries drive comparative advantage, thus resulting in gains from trade. Even though the debate is about labor standards and not labor costs, the former may lead to an increase in the latter.

Since equations (1) and (2) estimate a model where log of the export-to-GDP ratio depends mainly on indicators of labor standards, we will attempt to control for other potential determinants of the export ratio by considering the considering the inclusion of a variable $z_i$ in equations (1) and (2), that is,

$$log\ (exp/gdp)_i = \alpha_0 + \alpha_1\ labstd_i + \Updownarrow z_i + \varepsilon_i \qquad (1a)$$

$$log(exp/gdp)_i = \beta_0 + \beta_1\ rint_i + \beta_2\ labstd_i + \Updownarrow z_i + \varepsilon_i \qquad (2a)$$

where $z_i$ is a vector of independent variables. In the present case, because of data limitations, we will only consider income per capita ($z_i = gdppc_i$) as a control for the export ratio. Also, in order to check whether income per capita is a relevant variable in our equations, we will perform a redundancy test (LM test for adding variables) for the

[5] The perfect and imperfect substitutes models are more explicitly presented in Goldstein and Khan (1985).

significance of this variable in order to decide whether to include it or exclude it from the regressions.

In order to interpret the results obtained from estimating equations (1a) and (2a), we are principally interested in the null hypothesis that the coefficients ($\alpha_1$ and $\beta_2$) of $labstd_i$ are zero, hence implying that the export performance of the countries under study is not influenced by the ratification of the labor standards. The alternative hypothesis in Mah's (1997) study is that ratification of labor standards erodes the price competitiveness of exports significantly such that the signs of the coefficients ($\alpha_1$ and $\beta_2$) of $labstd_i$ are negative. Also, $\beta_1$ is expected to have a negative sign because an increase in the real interest rate can raise the capital cost and hence lead to a deterioration of price competitiveness.

Hence, for the purposes of the present paper, the alternative hypothesis is that the signs of $\alpha_1$ and $\beta_2$ are different from zero such that a two-tail test is considered for the significance of the labor standard. Indeed, it is quite possible that some labor standards can improve the production process, stimulate workers, and hence enhance productivity, as suggested by the OECD (1996) study. The overall effect on efficiency and export performance may therefore not be as clear as one would expect.

I first replicate Mah's empirical analysis but using 1995 data for exports and gross domestic product and core conventions ratified as of the end of 1995. The year 1995 is chosen because this is the year for which the latest data are available for other indicators of labor standards, such as the degree of unionization and total ILO conventions ratified. This allows me to test the robustness of Mah's results, especially when the conventions ratified are considered in isolation (see Tables 3.1 to 3.4) as carried

out by Mah but also when they are included all at the same time in equations (1a) and (2a), as shown in Table 3.5. In all cases where more than one labor standard is included in the regressions, we perform a Wald test for the joint significance of the labor standards and report the results. The null hypothesis in this case is that all the coefficients associated with the labor standards are equal to zero. I also check whether the choice of different (and more realistic) indicators for labor standards yields different conclusions (see Tables 3.6 and 3.7). Whereas Mah's analysis focuses on core labor standards for developing countries only, I also consider all the conventions that have been ratified with respect to labor standards (denoted as variable *tconv*) and report the results for both developing countries and a broader sample that includes developing and developed countries.

The method of estimation for the various equations is ordinary least squares, and the estimates for equation (1a), with ILO conventions ratified as the labor standard variable, are reported in Tables 3.1 and 3.2 below. The number of observations for each regression is indicated by "N", and this excludes outliers detected by visual inspection of the graphs in appendix 3C. Since we are dealing with cross-sectional data involving a heterogeneity of countries, heteroskedasticity is a possibility and I therefore automatically use the White heteroskedasticity-consistent standard errors as suggested recently by some authors (see for example Gujarati, 2003, pp. 417-418).

According to the estimates in Table 3.1, only the ratification of the conventions related to forced labor (*fl* and *afl*) appears to be insignificant. This is indeed not a surprise since forced labor is quasi non-existent in most countries. There is strong evidence in support of the view that ratification of the other conventions has a negative

effect on export performance. Equally important is the fact that total conventions ratified, which goes beyond just core labor standards, is also significant for the sample of developing countries when controlling for income per capita. The variable *gdppc* is only significant for this case. The results obtained confirm Mah's (1997) findings and the coefficients on freedom of association (*fa*) and the right to organize (*rocb*) are, in fact, more significant than the ones that he obtained in his analysis.

Table 3.1: Estimated coefficients for equation (1a) – Developing countries

| Labor Standards Variable | Constant | *log(gdppc)* | *labstd* | $R^2$ | N | F-stat (p-value) |
|---|---|---|---|---|---|---|
| *fa* | -0.60** (-10.18) | - | -0.16* (-1.73) | 0.10 | 43 | 2.92 (0.10) |
| *rocb* | -0.52** (-6.20) | - | -0.23** (-2.31) | 0.11 | 43 | 4.97 (0.03) |
| *fl* | -0.67** (-8.76) | - | -0.01 (-0.15) | 0.01 | 43 | 0.01 (0.91) |
| *afl* | -0.65** (-7.77) | - | -0.05 (-0.49) | 0.01 | 43 | 0.22 (0.64) |
| *nd* | -0.53** (-6.80) | - | -0.24** (-2.59) | 0.15 | 43 | 7.31 (0.01) |
| *cconv* | -0.49** (-6.09) | - | -0.06** (-2.73) | 0.10 | 43 | 4.17 (0.05) |
| *tconv* | -1.08** (-4.77) | 0.09** (2.94) | -0.01** (-5.14) | 0.49 | 38 | 16.16 (0.01) |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

Table 3.2: Estimated coefficients for equation (1a) – All countries

| Labor Standards Variable | Constant | *log(gdppc)* | *labstd* | $R^2$ | N | F-stat (p-value) |
|---|---|---|---|---|---|---|
| *fa* | -0.95** | 0.04* | -0.10 | 0.06 | 66 | 2.10 (0.13) |
| | (-5.50) | (1.75) | (-1.16) | | | |
| *rocb* | -0.56** | - | -0.12 | 0.03 | 66 | 2.26 (0.14) |
| | (-7.92) | | (-1.53) | | | |
| *fl* | -0.69** | - | 0.04 | 0.01 | 66 | 0.15 (0.70) |
| | (-9.09) | | (0.45) | | | |
| *afl* | -0.68** | - | 0.02 | 0.01 | 66 | 0.08 (0.78) |
| | (-8.25) | | (0.27) | | | |
| *nd* | -0.87** | 0.04* | -0.16* | 0.10 | 66 | 3.62 (0.03) |
| | (-5.42) | (1.80) | (-1.81) | | | |
| *cconv* | -0.87** | 0.04* | -0.03 | 0.07 | 66 | 2.35 (0.10) |
| | (-5.21) | (1.84) | (-1.60) | | | |
| *tconv* | -1.09** | 0.07** | -0.01** | 0.15 | 59 | 5.02 (0.01) |
| | (-6.24) | (2.49) | (-2.10) | | | |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

Table 3.2 shows the estimates of equation (1a) for a larger sample consisting of both developed and developing countries. The coefficients on the labor standards variable still lead to a deterioration of export performance, but are not as significant as in Table 3.1. In fact, the coefficient on non-discrimination is weakly significant and the one related to total conventions ratified is very significant. Hence, it appears that once developed countries are included in the sample of countries, the labor standards variables lose some of their significance. One possible explanation for this might be because richer countries tend to produce more capital intensive goods such that labor is not as

important a factor as in developing countries. In fact, when the sample of developed countries is considered on its own (results not reported here), except for the abolition of forced labor, all the other labor standards variables are less significant when compared to the sample of developing countries.

Table 3.3: Estimated coefficients for equation (2a) – Developing countries

| Labor Standards Variable | Constant | *rint* | *log(gdppc)* | *labstd* | $R^2$ | N | F-stat (p-value) |
|---|---|---|---|---|---|---|---|
| *fa* | -0.98** | -0.01** | 0.06 | -0.18** | 0.32 | 43 | 6.06 (0.01) |
| | (-3.64) | (-9.47) | (1.40) | (-2.23) | | | |
| *rocb* | -0.55** | -0.01** | - | -0.15* | 0.23 | 43 | 5.86 (0.01) |
| | (-8.77) | (-7.81) | | (-1.77) | | | |
| *fl* | -0.63** | -0.01** | - | -0.04 | 0.18 | 43 | 4.50 (0.02) |
| | (-8.21) | (-13.81) | | (-0.40) | | | |
| *afl* | -0.61** | -0.01** | - | -0.08 | 0.19 | 43 | 4.84 (0.01) |
| | (-7.42) | (-11.81) | | (-0.80) | | | |
| *nd* | -0.55** | -0.01** | - | -0.19** | 0.27 | 43 | 7.45 (0.01) |
| | (-8.12) | (-9.07) | | (-2.19) | | | |
| *cconv* | -0.49** | -0.01** | - | -0.05** | 0.25 | 43 | 6.84 (0.01) |
| | (-6.50) | (-13.10) | | (-2.46) | | | |
| *tconv* | -1.08** | 0.01 | 0.09** | -0.01** | 0.49 | 38 | 10.98 (0.01) |
| | (-4.75) | (0.63) | (2.92) | (-4.74) | | | |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

Tables 3.3 and 3.4 show the regression results for equation (2a), which includes a capital cost variable (*rint*) as an explanatory variable. The results reported in Table 3.3 are quite similar to the ones in Table 3.1. The coefficients on freedom of association,

non discrimination in employment, core conventions ratified and total ILO conventions ratified are highly significant while the ones related to forced labor are not significant. The coefficients on the capital cost variable are of the expected sign and statistically significant in all regressions, except for the one related to total ILO conventions ratified.

Table 3.4: Estimated coefficients for equation (2a) – All Countries

| Labor Standards Variable | Constant | *rint* | *log(gdppc)* | *labstd* | $R^2$ | N | F-stat (p-value) |
|---|---|---|---|---|---|---|---|
| *fa* | -0.97** | -0.01** | 0.05** | -0.12 | 0.22 | 66 | 5.85 (0.01) |
| | (-6.43) | (-10.76) | (2.23) | (-1.47) | | | |
| *rocb* | -0.90** | -0.01** | 0.04** | -0.07 | 0.19 | 66 | 4.92 (0.00) |
| | (-5.58) | (-8.87) | (2.02) | (-0.94) | | | |
| *fl* | -0.95** | -0.01** | 0.04* | -0.01 | 0.18 | 66 | 4.62 (0.01) |
| | (-5.99) | (-12.31) | (1.95) | (-0.08) | | | |
| *afl* | -0.94** | -0.01** | 0.04* | -0.03 | 0.18 | 66 | 4.68 (0.01) |
| | (-5.88) | (-10.98) | (1.96) | (-0.36) | | | |
| *nd* | -0.90** | -0.01** | 0.04** | -0.11 | 0.22 | 66 | 5.72 (0.01) |
| | (-6.50) | (-10.64) | (2.04) | (-1.39) | | | |
| *cconv* | -0.89** | -0.01** | 0.04** | -0.03 | 0.21 | 66 | 5.39 (0.00) |
| | (-6.03) | (-12.64) | (2.09) | (-1.37) | | | |
| *tconv* | -1.05** | -0.01 | 0.06** | -0.01* | 0.16 | 59 | 3.50 (0.02) |
| | (-5.57) | (-1.24) | (2.25) | (-1.85) | | | |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

As far as Table 3.4 is concerned, when developed countries are included in the sample, the significance of the labor standards variables decreases once again. Except for total number of conventions ratified, the capital cost variable is again very significant

for all regressions. Total conventions ratified is weakly significant and the other labor standards variables are not significant. However, the variable *gdppc* is important in all equations. Once again, when only developed countries are considered (results not reported here), the labor standards are less significant, except for the abolition of forced labor. Overall, it seems that labor standards are relatively more important for developing countries when the ratification of ILO conventions is considered as an explanatory variable.

Equations (1a) and (2a) are also re-estimated using all the conventions ratified at the same time, thus departing from Mah's analysis which consists in looking at the individual effects of each convention. There is no a priori reason to consider individual effects since many countries have ratified more than one convention. We thus estimate the following equations:

$$log(exp/gdp)_i = \alpha_0 + \alpha_1 fa + \alpha_2 rocb + \alpha_3 fl + \alpha_4 nd + \varepsilon_i \quad (1b)$$

$$log(exp/gdp)_i = \beta_0 + \beta_1 rint_i + \beta_2 fa + \beta_3 rocb + \beta_4 fl + \beta_5 nd + \varepsilon_i \quad (2b)$$

The null hypotheses in the above cases are that all the $\alpha$'s and $\beta$'s associated with the conventions ratified are jointly equal to zero. The alternative hypothesis is that the $\alpha$'s and $\beta$'s are different from zero. Only one of the two conventions related to forced labor (the more general one) is included in the above equations to avoid the problem of multicollinearity. As mentioned earlier, I also perform a Wald test for the joint significance of the labor standards and report the results below. The results for both

developing countries and a sample consisting of developing and developed countries are shown in Table 3.5 below, and are, in fact, quite puzzling.

Table 3.5: Estimated coefficients for equations (1b) and (2b)

| Explanatory Variables | Developing Countries | | All Countries | |
|---|---|---|---|---|
| | Equation (1b) | Equation (2b) | Equation (1b) | Equation (2b) |
| Constant | -0.52** | -0.53** | -0.60** | -0.92** |
| | (-7.84) | (-8.46) | (-7.26) | (-5.53) |
| *rint* | - | -0.01** | - | -0.01** |
| | | (-3.18) | | (-4.09) |
| log*(gdppc)* | - | - | - | 0.04* |
| | | | | (1.76) |
| *fa* | 0.12 | -0.01 | 0.13 | -0.06 |
| | (0.85) | (-0.11) | (1.15) | (-0.45) |
| *rocb* | -0.24** | -0.13 | -0.21** | -0.04 |
| | (-2.02) | (-1.01) | (-2.14) | (-0.39) |
| *fl* | 0.16 | 0.08 | 0.18 | 0.06 |
| | (1.57) | (0.75) | (1.94) | (0.57) |
| *nd* | -0.30** | -0.17 | -0.21** | -0.08 |
| | (-2.08) | (-1.34) | (-1.97) | (-0.82) |
| N | 43 | 43 | 66 | 66 |
| $R^2$ | 0.24 | 0.30 | 0.13 | 0.23 |
| F-stat (p-value) | 3.05 (0.03) | 3.17 (0.02) | 2.32 (0.07) | 2.94 (0.01) |
| Wald Test (p-value) | 3.78 (0.01) | 2.60 (0.05) | 2.33 (0.07) | 0.96 (0.43) |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

The ratification of conventions has a less significant effect on export performance when equations (1b) and (2b) are estimated. The Wald test indicates that overall, all labor standards are important, at least at 10% or less, except for the last equation. With regards to developing countries, only the conventions related to the right to organise and non-discrimination are significant (for equation (1b)). The same is true when all countries are considered. It is also not clear from Table 3.5 whether labor standards are more significant for developing countries than for developed countries as observed previously. The main conclusion that one can draw from this analysis is that Mah's results are not very robust to the specification used. All the above results should, however, be interpreted with care because the ratification of a convention does not necessarily mean that standards are in fact being enforced. In Bhagwati's (1996) own words:

> True, the ILO has many Conventions that many nations have signed. But many have been signed simply because in effect they are not binding. (p. 39)

The next two tables show the results which are obtained when equations (1a) and (2a) are re-estimated using different indicators of labor standards other than conventions ratified. The variables that are considered are *civilb*, *hour*, *leave*, *union* and *injuries*, and, in effect, we are replacing *labstd* in equations (1a) and (2a) by the latter variables. The index for civil liberties and the degree of unionization are obtained from actual surveys and as such can be considered as more realistic indicators of labor standards. Furthermore, *hour* and *leave* are guaranteed by domestic laws and are more likely to be enforced than the ratification of conventions from the ILO.

Table 3.6: Estimated coefficients for equation (1a)– Developing countries

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | 4.61** | 4.55** | 4.70* | 0.04 | -0.71** | -2.23** |
| | (2.19) | (2.29) | (1.97) | (0.12) | (-6.73) | (-2.84) |
| log(*gdppc*) | - | - | - | - | - | 0.17* |
| | | | | | | (2.15) |
| *civilb* | 0.01 | - | - | - | - | 0.07 |
| | (0.39) | | | | | (0.90) |
| log(*hour*) | -1.30** | -1.27** | -1.22* | - | - | - |
| | (-2.18) | (-2.26) | (-1.96) | | | |
| log(*leave*) | -0.15 | -0.15 | -0.27** | -0.27** | - | - |
| | (-1.12) | (-1.03) | (-2.12) | (-2.21) | | |
| *union* | - | - | -0.01 | -0.01 | - | - |
| | | | (-0.28) | (-0.22) | | |
| *injuries* | - | - | - | - | -0.29 | -0.30 |
| | | | | | (-0.53) | (-0.76) |
| $R^2$ | 0.14 | 0.14 | 0.24 | 0.16 | 0.01 | 0.21 |
| N | 39 | 39 | 27 | 27 | 18 | 18 |
| F-stat (p-value) | 1.89 (0.15) | 2.83 (0.07) | 2.47 (0.09) | 2.35 (0.12) | 0.20 (0.66) | 1.27 (0.32) |
| Wald Test (p-value) | 3.22 (0.03) | 5.18 (0.01) | 2.89 (0.06) | 2.58 (0.10) | 0.28 (0.60) | 0.56 (0.58) |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

Columns (1) to (6) of Table 3.6 show some of the results when different combinations of labor standards are tried as explanatory variables. This procedure is a departure from Mah's (1997) methodology, which consists of introducing one indicator at a time to isolate the individual effects. It turns out that the significance of the variables

in Tables 3.6 and 3.7 is not much altered (as opposed to when they were considered individually) when this change is implemented. Once again, I report the results for the joint significance (Wald test) of the labor standards when more than one standard is included in the regressions. The Wald test indicates that, overall, labor standards are important for columns (1)-(4) in Table 3.6.

On the other hand, when the same procedure was applied to conventions ratified, the significance of the variables changed considerably. As shown in Table 3.6, when equation (1a) is estimated using these more realistic indicators for labor standards, the civil liberties index variable, the unionization variable and the variable related to occupational injuries are all insignificant. The coefficients for hours worked and paid annual leave are both negative and significant. This shows that longer hours of work (more demanding working conditions) are associated with a deterioration of export performance, whereas better conditions of work (in terms of more paid annual leave granted) also lead to a deterioration of export performance. These results constitute a paradox since it is not clear whether better working conditions will lead to an improvement in export performance, or put another way, whether countries that tend to be characterized by lower labor standards do in fact have a competitive advantage in trade. Hence, the fears by developing countries that the imposition of higher labor standards upon them will erode their international competitiveness do not seem entirely justified.

Table 3.7: Estimated coefficients for equation (2a)– Developing countries

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | 4.69** | 4.67** | 4.68* | 0.02 | -0.66** | -2.26** |
| | (2.23) | (2.30) | (1.93) | (0.05) | (-4.17) | (-2.76) |
| *rint* | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | 0.01 |
| | (-1.50) | (-1.63) | (-0.92) | (-0.82) | (-0.56) | (0.12) |
| log(*gdppc*) | - | - | - | - | - | 0.17* |
| | | | | | | (2.10) |
| *civilb* | 0.01 | | | | | 0.08 |
| | (0.16) | | | | | (0.91) |
| log(*hour*) | -1.31** | -1.31** | -1.22* | - | - | - |
| | (-2.20) | (-2.29) | (-1.94) | | | |
| log(*leave*) | -0.14** | -0.13 | -0.25* | -0.26** | - | - |
| | (-0.95) | (-0.90) | (-1.89) | (-1.97) | | |
| *union* | - | - | -0.01 | -0.01 | - | - |
| | | | (-0.26) | (-0.21) | | |
| *injuries* | - | - | - | - | -0.34 | -0.30 |
| | | | | | (-0.58) | (-0.69) |
| $R^2$ | 0.15 | 0.15 | 0.25 | 0.17 | 0.02 | 0.21 |
| N | 39 | 39 | 27 | 27 | 18 | 18 |
| F-stat (p-value) | 1.55 (0.21) | 2.12 (0.12) | 1.85 (0.15) | 1.59 (0.22) | 0.18 (0.84) | 0.89 (0.50) |
| Wald Test (p-value) | 3.03 (0.04) | 4.81 (0.01) | 2.32 (0.10) | 2.01 (0.16) | 0.34 (0.57) | 0.55 (0.59) |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

Table 3.7 is the same as Table 3.6 but including variable $rint_i$. The results are quite similar to the ones obtained in Table 3.6, as only *hour* and *leave* are significant once again. The Wald test indicates that, overall, labor standards are important in

columns (1)-(3) of Table 3.7. The capital cost coefficient is of the expected sign but is not statistically significant. Once again, it is not clear whether export performance improves or deteriorates with higher labor standards since longer hours of work and more days of annual leave seem to both be a deterrent to export performance.

When developed countries are included in the regressions of Tables 3.6 and 3.7 (results not reported here), with the exception of the *union* variable, the other indicators for labor standards tend to become less significant. When developed countries are considered separately and the equations are re-estimated, the *union* variable is in fact very highly significant. While this result might be an indication that the degree of unionisation matters more for the export performance of developed countries than that of developing countries, it could also be due to an identification problem. Overall, the above results also tell us that labor standards appear to exert a greater influence on the export performance of developing countries rather than developed countries.

### 3.5.2 Labor Standards and Foreign Direct Investment

Another important feature of the world economy in the past two decades has been the phenomenal increase in foreign direct investment (FDI), or investment by transnational corporations or multinational enterprises in foreign countries. Since the early 1980s, world FDI flows have increased more rapidly than world trade or world output according to data from the International Monetary Fund (IMF). Equally striking is the fact that the developing countries' share in FDI inflows is also increasing, which means that the world market for FDI is becoming more competitive. Various competing explanations for the determinants of FDI can be found in the literature, and while most of

them have received some empirical support, it has been impossible to find enough favorable evidence on any one of them to discount all the others. This section of the paper adopts a new stance by trying to look at the influence of labor standards on FDI inflows across countries.

Lizondo (1990) categorizes the theories that try to explain FDI flows into four groups.[6] First, theories that assume perfect capital markets focus on differential rates of return, portfolio diversification and market size. The idea with 'differential rates of return' is that capital will flow to places where the rates of return are high (since firms equate expected marginal returns with the marginal cost of capital in making an investment decision). However, a firm is not only motivated by expected returns but also by the opportunities to reduce risk. Hence, by investing simultaneously in various places, it can diversify risk. Also, the decision to invest is based on market size or potential sales, which is usually proxied by the receiving country's gross national product.

Second, theories that assume imperfect markets argue that FDI occurs as a result of firms possessing some special attributes (technological and managerial) which they prefer to use rather than lease or sell due to problems in designing and enforcing contracts. They produce in foreign countries because the latter offer locational advantages, such as cheaper labor or proximity to markets. Hymer (1976) pointed out that multinational firms exist essentially because of market imperfections (structural imperfections and transactions-cost imperfections). Structural imperfections occur as a

[6] I briefly review the theory and empirical evidence on the determinants of investment here. Lizondo's paper is more detailed and comprehensive.

result of economies of scale, knowledge advantages, product diversification, and credit advantages among others, enabling the multinational firm to increase its market power.

The focus on structural imperfections led to the industrial organization theory of FDI, which argues that for a foreign firm to engage in foreign investment, it must have some firm-specific advantages when compared to domestic firms such as brand name, better technology and superior managerial skills. The internalization hypothesis argues that transaction-costs imperfections lead the multinational firm to substitute an internal market for external transactions so as to increase its profits. The eclectic approach to FDI developed by Dunning (1977) is a blend of the industrial organization theory, the internationalization theory, and the location theory. This approach argues that depending on the circumstances, different factors may explain FDI flows across countries and that there is no general theory to explain this phenomenon. Theories of FDI based on imperfect markets have also focused on product cycles and oligopolistic rivalry. As products mature, firms react to the threat of losing markets by investing abroad.

Third, other theories of FDI have looked at the high liquidity of subsidiaries and the relative strengths of currencies as factors that might explain FDI. It has been postulated that subsidiaries will expand their activities by investing out of their local profits. A country whose currency is strong is less likely to attract FDI, but its firms are more likely to invest abroad. Finally, other variables such as political instability, tax policy and government regulations have also been incorporated into the different theories that try to explain FDI.

On the empirical front, several studies have been carried out on the determinants of FDI. As De Jong and Vos (1994) have indicated, in most cases multiple regression is

used to test hypotheses coming from different strands of the theoretical literature or to find out the statistical significance of different possible explanatory variables. Furthermore, a proper theoretical framework is absent when the determinants of FDI are considered. As pointed out in section 3 of this study, Rodrik (1996) has analysed the effect of labor standards on FDI flows. More specifically, he considers manufacturing FDI by United States majority-owned foreign affiliates over the period 1982-89 and the extent to which they were influenced by measures of labor standards. He includes the black market premium for foreign currency, population and the growth rate as other possible explanatory variables in his regressions.

The approach followed in this paper is different in that FDI inflows for 1996 is considered across a sample of countries taken from the OECD (1996) study and for which data are available. The decision to invest abroad in a particular country by any enterprise is motivated by the expectations of higher profits when ranked alongside alternative investment opportunities (at home or other countries). Hence, the two explanatory variables included in the benchmark regressions are the gross national product (an indicator of market size) and the growth rate of gross domestic product (an indicator of future development potential). These two factors are found in many empirical studies related to FDI. In fact, most studies that have dealt with the determinants of FDI at an empirical level concentrate mainly on economic factors, and this approach is followed here. The model that I posit is essentially one that considers internal economic conditions in the host country as being important determinants of FDI. The equation that will be estimated is as follows:

$$log\ (FDI)_t = \alpha_0 + \alpha_1\ log\ (gnp)_{t-1} + \alpha_2\ growth_{t-1} + \alpha_3\ labstd_{t-1} + \varepsilon_t \qquad (7)$$

where *gnp* refers to gross national product, *growth* refers to the growth rate of real gross domestic product, *labstd* is an indicator for labor standards (all included with a lag to be consistent with other studies) and $\varepsilon$ is a disturbance term. As in the previous section of the paper, the 'log' of FDI is considered, and we automatically use the White heteroskedasticity-consistent standard errors. Outliers are excluded from the regressions based on visual inspection of the graphs in appendix 3D. It is expected that the estimated coefficients $\alpha_1$ and $\alpha_2$ in equation (7) will be positive. A higher gross national product and a high rate of growth are signs that an economy is doing well and that the future looks promising.

As far as labor standards are concerned, the popular view suggests that FDI tends to flow to countries that are characterised by low labor standards. Hence, I want to test the hypothesis that low labor standards are attractive to foreign investors. The estimates for a sample of non-OECD countries are reported in Table 3.8.

Table 3.8: Foreign Direct Investment - Developing countries, 1996

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | -4.92** | -5.27** | 5.63 | -4.87** | -4.41* | -6.93* |
| | (-6.51) | (-4.52) | (0.62) | (-3.30) | (-2.40) | (-2.40) |
| log(*gnp*) | 1.07** | 1.09** | 1.08** | 1.03** | 1.00** | 1.30** |
| | (14.14) | (9.42) | (11.77) | (8.52) | (4.79) | (3.47) |
| *growth* | -0.01 | 0.01 | -0.01 | 0.04 | 0.05 | 0.01 |
| | (-0.12) | (0.09) | (-0.05) | (1.10) | (0.83) | (-1.00) |
| *cconv* | - | -0.02 | - | - | - | - |
| | | (-0.15) | | | | |
| *tconv* | - | 0.01 | - | - | - | - |
| | | (0.56) | | | | |
| *civilb* | - | - | -0.17 | -0.05 | - | 0.04 |
| | | | (-1.24) | (-0.27) | | (0.61) |
| log(*hour*) | - | - | -2.53 | - | - | - |
| | | | (-1.06) | | | |
| log(*leave*) | - | - | -0.09 | - | - | - |
| | | | (-0.23) | | | |
| *union* | - | - | - | 0.03 | - | - |
| | | | | (1.01) | | |
| *injuries* | - | - | - | - | 0.11 | -0.11 |
| | | | | | (0.03) | (-0.50) |
| $R^2$ | 0.75 | 0.70 | 0.74 | 0.68 | 0.66 | 0.68 |
| N | 45 | 40 | 43 | 29 | 21 | 21 |
| F-stat (p-value) | 61.99 | 20.61 | 20.95 | 12.98 | 10.85 | 8.44 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Wald Test (p-value) | - | 0.25 | 1.17 | 0.69 | - | 0.48 |
| | | (0.78) | (0.33) | (0.51) | | (0.63) |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. Standard errors are White-robust. *(**) indicates 10(5) percent level of significance.

The benchmark regression with the gross national product and the growth rate as explanatory variables is shown in the first column. The other columns show the results when different combinations of labor standards are included. As expected, the sign of the coefficient for *gnp* is positive and is highly significant in regressions (1) to (6). On the other hand, the growth rate is not a very important factor that accounts for FDI inflows, at least for the period that is being considered. The Wald test shows that overall, labor standards are not important. In fact, the labor standard variables are all insignificant in Table 3.8. The coefficient on *civilb* in regression (3) is negative (even though statistically insignificant), and this implies that high labor standards are attracting more FDI contrary to the popular view. The *union* variable has a positive coefficient (even though statistically insignificant) implying that a higher degree of unionization attracts more FDI and this again contradicts the general belief on the relationship between FDI and labor standards.

Equation (7) is also estimated for a sample that includes developed countries only (results not reported here). Overall, the results obtained are mixed. For instance, in the case of regression (4), the coefficients for *gnp* and *growth* are significant at 5% and 10% respectively, the coefficient on *civilb* is negative and significant at 10% for regression (4) and this implies that high labor standards are attracting more FDI. On the other hand, the *union* variable has a negative coefficient and is also significant at 10%, implying that a higher degree of unionization (better working conditions) attracts less FDI. In sum, the above results reveal that there is no evidence that countries with low labor standards are attracting more FDI than those with high labor standards.

## 3.6 Conclusion

This paper has built on the report from the OECD (1996) and subsequent papers by Rodrik (1996) and Mah (1997) to answer two fundamental questions related to the issue of trade and labor standards. The paper first provided a working definition for labor standards, and namely what constitutes core labor standards. The term "labor standard" is used more loosely in this paper and includes both standards and rights, and this allows the choice of a wider range of indicators for labor standards. The case for a set of international labor standards was then considered by paying particular attention to the economic arguments that have been put forward in support of (and against) international labor standards, the latter serving as a means to reduce social injustice and guaranteeing humane conditions of labor.

Concerning the effect of labor standards on export performance, it was discovered that the results of Mah's analysis were not robust to the specification used. When better and more realistic indicators for labor standards (other than core ILO conventions ratified or total ILO conventions ratified) are used as explanatory variables, lower levels of labor standards can both improve or lead to a deterioration of export performance. The latter results are also more robust to different combinations of labor standards being used as explanatory variables. This result contradicts both the OECD (1996) and Mah's (1997) findings, and does not fully support the argument made by developing countries that raising their labor standards will erode their international competitiveness.

As far as FDI is concerned, it is not always the case that low-standards countries are, as often claimed, a haven for foreign investors. In fact, it was discovered that high labor standards, despite being statistically insignificant, could in fact attract rather than

discourage FDI, which confirms some of the existing available empirical evidence on this issue. This should not come as a surprise since the bulk of world FDI to date still flows to developed countries where labor standards are usually higher. In fact, appendix D shows the relationship between FDI flows and the level of economic development for both developed and developing countries. The higher the level of GDP per capita (and presumably, the higher the labor standards), the more FDI is attracted. By and large, the evidence assembled in this paper regarding trade and labor standards is mixed.

A few words of caution are, however, needed at this juncture. The empirical estimates obtained in this paper were based on cross-sectional macroeconomic data for a sample of countries. In terms of future work, looking at firm level or microeconomic data might prove more useful because some sectors are likely to be more influenced by labor standards than others. Such an analysis might also throw some light on labor standards and their effects on firm competitiveness. Furthermore, as pointed out by Mah (1997), time series analysis might also provide a better picture by analyzing the changes that occur after the date that a given convention is ratified.

**Appendix 3A**

## Country List

| | | |
|---|---|---|
| Argentina | Honduras | Pakistan |
| Australia | Hong Kong | Panama |
| Austria | Iceland | Papua New Guinea |
| Bahamas, The | India | Peru |
| Bangladesh | Indonesia | Philippines |
| Barbados | Ireland | Portugal |
| Belgium | Israel | Singapore |
| Bolivia | Italy | South Africa |
| Botswana | Jamaica | Spain |
| Canada | Japan | Sri Lanka |
| Chile | Jordan | Suriname |
| China | Kenya | Swaziland |
| Colombia | Korea, Rep. | Sweden |
| Denmark | Kuwait | Switzerland |
| Ecuador | Luxembourg | Syrian Arab Republic |
| Egypt | Malaysia | Tanzania |
| Ethiopia | Malta | Thailand |
| Fiji | Mauritius | Turkey |
| Finland | Mexico | United Kingdom |
| France | Morocco | United States |
| Germany | Netherlands | Uruguay |
| Greece | New Zealand | Venezuela |
| Guatemala | Niger | Zambia |
| Haiti | Norway | Zimbabwe |

**Appendix 3B**

**Definitions and Guidelines for Core Labor Standards**

Freedom of Association concerns relations between unions and employers and involves the right of workers and employers

(a) to establish and join organisations of their own choosing without previous authorisation.

(b) to draw up their constitutions and rules, elect their representatives in full freedom, organise their administration and activities and formulate their programmes.

(c) to be shielded from being dissolved or suspended by administrative authority.

(d) to establish and join federations and confederations and affiliate with international organisations of workers and employers.

Right to Organise and Collective Bargaining concerns relations between unions and employers and involves the right of workers

(a) to enjoy adequate protection against acts of anti-union discrimination in respect of their employment.

(b) to enjoy adequate protection against interference with union activities.

Machinery appropriate to national conditions shall be established for the purpose of ensuring respect for the right to organise. Measures appropriate to national conditions shall be taken to encourage and promote the full development and utilisation of machinery for voluntary negotiation between employers or employers' organisations and

workers' organisations, with a view to the regulation of terms and conditions of employment by means of collective agreements.

Forced Labor shall mean all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily.

Each Member of the International Labor Organisation which ratifies this Convention undertakes to suppress the use of forced or compulsory labor in all its forms within the shortest possible period.

Abolition of Forced Labor

Each Member of the International Labor Organisation which ratifies this Convention undertakes to suppress and not to make use of any form of forced or compulsory labor:

(a) as a means of political coercion or education or as a punishment for holding or expressing political views or views ideologically opposed to the established political, social or economic system.

(b) as a method of mobilising and using labor for purposes of economic development.

(c) as a means of labor discipline.

(d) as a punishment for having participated in strikes.

(e) as a means of racial, social, national or religious discrimination.

Discrimination includes:

(a) any distinction, exclusion or preference made on the basis of race, colour, sex, religion, political opinion, national extraction or social origin, which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation;

(b) such other distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation as may be determined by the Member concerned after consultation with representative employers' and workers' organisations, where such exist, and with other appropriate bodies.

Each Member for which this Convention is in force undertakes to declare and pursue a national policy designed to promote, by methods appropriate to national conditions and practice, equality of opportunity and treatment in respect of employment and occupation, with a view to eliminating any discrimination in respect thereof.

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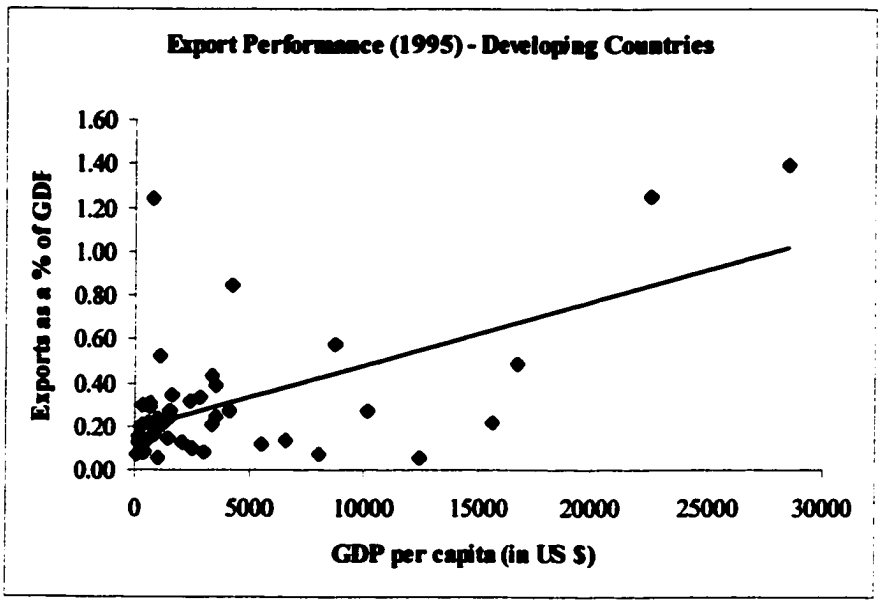
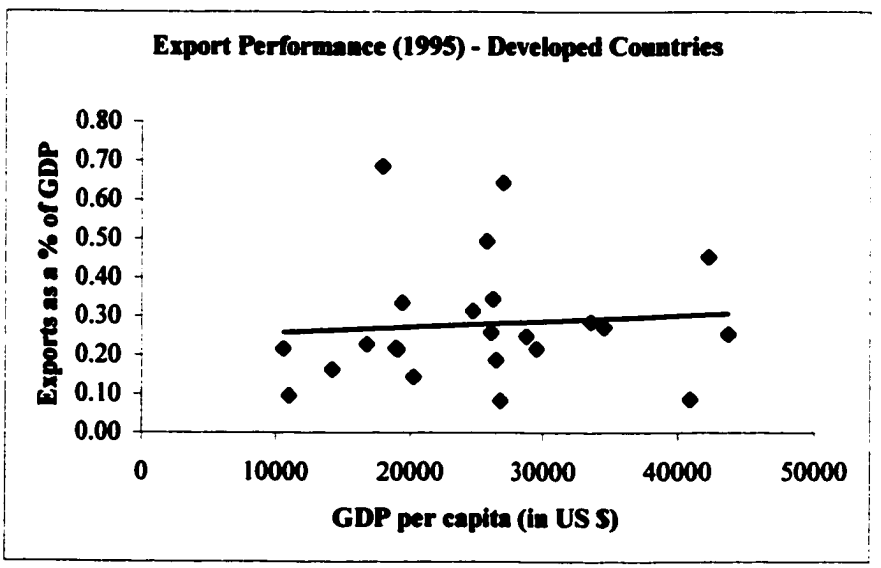
Source: Adapted from ILO Website http://www.ilo.org and Brown, Deardoff, Stern (1996)

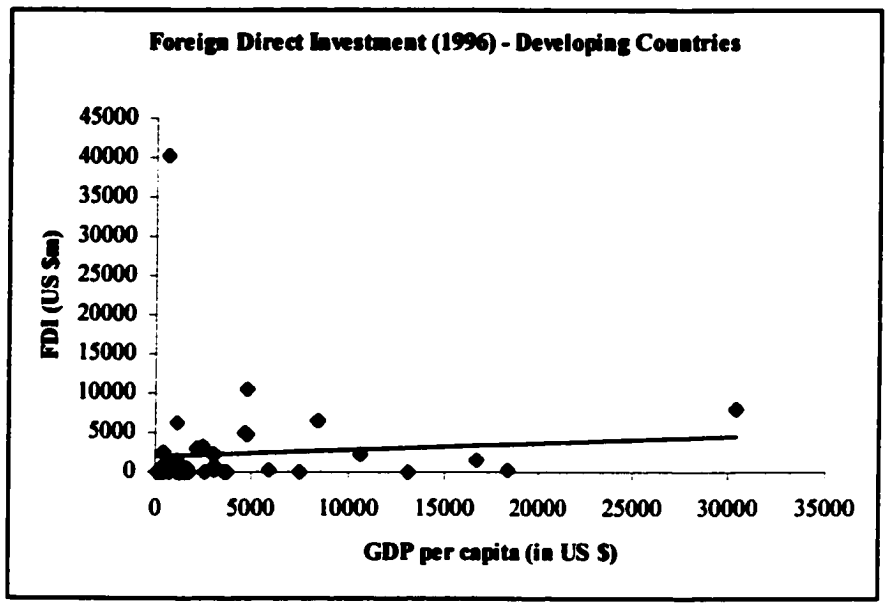
**Figure 3.1: Export Performance and Economic Development**

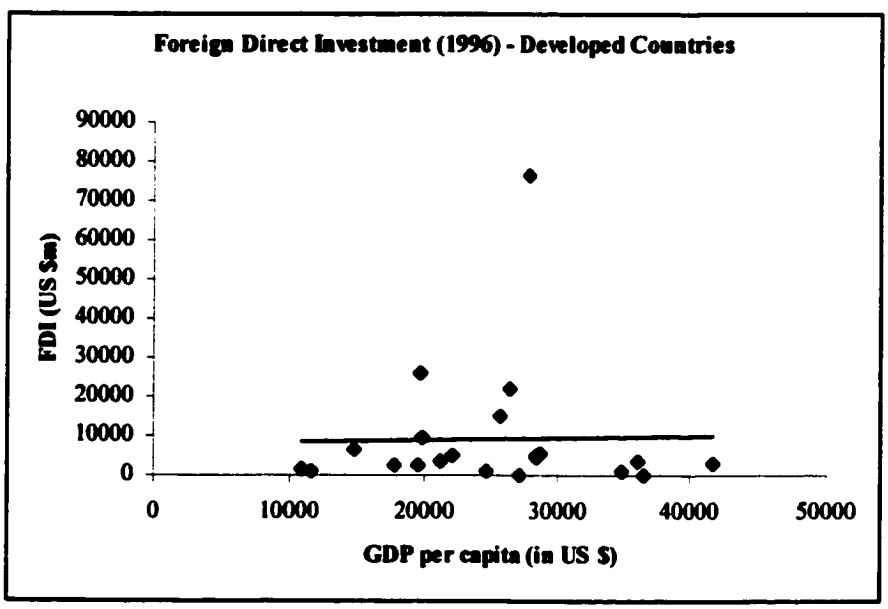


**Appendix 3D**

**Figure 3.2: Foreign Direct Investment and Economic Development**



**Appendix 3E**

## Mean and Standard Deviation of Variables Used

| Variable | Mean | Standard Deviation |
|---|---|---|
| *exp* | -0.64 | 0.31 |
| *rint* | 5.42 | 26.88 |
| *fa* | 0.65 | 0.48 |
| *rocb* | 0.76 | 0.43 |
| *fl* | 0.84 | 0.37 |
| *afl* | 0.79 | 0.41 |
| *nd* | 0.66 | 0.48 |
| *cconv* | 3.71 | 1.58 |
| *tconv* | 47.23 | 29.56 |
| *civilb* | 3.06 | 1.74 |
| *hour* | 44.30 | 3.76 |
| *leave* | 17.30 | 6.47 |
| *union* | 23.32 | 18.46 |
| *injuries* | 0.10 | 0.09 |
| *fdi* | 4493.60 | 10951 |
| *gnp* | 367900 | 1069700 |
| *growth* | 3.58 | 3.58 |

## Appendix 3F

### Correlation Matrices

| | *rint* | *fa* | *rocb* | *fl* | *afl* | *nd* | *cconv* | *tconv* |
|---|---|---|---|---|---|---|---|---|
| *rint* | 1.00 | | | | | | | |
| *fa* | 0.08 | 1.00 | | | | | | |
| *rocb* | 0.12 | 0.50 | 1.00 | | | | | |
| *fl* | -0.01 | 0.23 | 0.49 | 1.00 | | | | |
| *afl* | -0.04 | 0.46 | 0.38 | 0.42 | 1.00 | | | |
| *nd* | 0.11 | 0.66 | 0.24 | 0.29 | 0.45 | 1.00 | | |
| *cconv* | 0.07 | 0.81 | 0.71 | 0.64 | 0.74 | 0.75 | 1.00 | |
| *tconv* | 0.17 | 0.59 | 0.45 | 0.47 | 0.39 | 0.50 | 0.66 | 1.00 |

| | *rint* | *civilb* | *hour* | *leave* | *union* | *injuries* |
|---|---|---|---|---|---|---|
| *rint* | 1.00 | | | | | |
| *civilb* | -0.46 | 1.00 | | | | |
| *hour* | 0.00 | 0.53 | 1.00 | | | |
| *leave* | 0.16 | 0.19 | 0.16 | 1.00 | | |
| *union* | 0.06 | -0.10 | -0.35 | 0.11 | 1.00 | |
| *injuries* | -0.19 | -0.01 | -0.04 | 0.05 | -0.42 | 1.00 |

| | *gnp* | *growth* | *cconv* | *tconv* | *civilb* | *hour* | *leave* | *union* | *Injuries* |
|---|---|---|---|---|---|---|---|---|---|
| *gnp* | 1.00 | | | | | | | | |
| *growth* | 0.07 | 1.00 | | | | | | | |
| *cconv* | -0.43 | -0.19 | 1.00 | | | | | | |
| *tconv* | -0.13 | -0.56 | 0.75 | 1.00 | | | | | |
| *civilb* | -0.29 | -0.10 | 0.15 | 0.00 | 1.00 | | | | |
| *hour* | -0.23 | 0.30 | 0.18 | -0.26 | 0.52 | 1.00 | | | |
| *leave* | -0.48 | -0.26 | 0.36 | 0.34 | 0.15 | 0.20 | 1.00 | | |
| *union* | 0.06 | -0.26 | 0.09 | 0.47 | -0.08 | -0.41 | -0.10 | 1.00 | |
| *injuries* | 0.58 | -0.13 | -0.55 | -0.29 | -0.04 | -0.10 | 0.05 | -0.35 | 1.00 |

**Appendix 3G**

## Data Sources

| Variables | Sources |
|---|---|
| *exp* | International Financial Statistics Yearbook 1999 (Washington D.C: IMF, 1999) |
| *gdp* | Global Development Finance and World Indicators |
| Lending rate | International Financial Statistics Yearbook 1999 (Washington D.C: IMF, 1999) |
| Rate of inflation | World Economic Outlook October 1999 (Washington D.C: IMF, 1999) |
| *fa, rocb, fl, afl, nd* | ILOLEX – ILO's Database on International Labor Standards |
| *tconv* | World Employment Report 1995 |
| *hour, leave* | Conditions of Work Digest: Working Time around The World (Geneva: International Labor Office, 1995) |
| *civilb* | Freedom in the World: The Annual Survey of Political Rights and Civil Liberties 1994-1995 (New York: Freedom House, 1995) |
| *union* | World Labor Report 1997-98: Industrial Relations, Democracy and Social Stability (Geneva, International Labor Office, 1997) |
| *injuries* | LABORSTA – ILO Database |
| *fdi* | World Investment Report 1999: FDI and the Challenge of Development (New York and Geneva, United Nations, 1999) |
| *gnp* | World Development Report 1997 (Washington D.C: World Bank, 1997) |
| *growth* | World Development Report 1997 (Washington D.C: World Bank, 1997) |

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# Chapter 4

# Analyzing the Effects of Labor Standards on Export Performance: A Time Series Approach with Structural Change.

# Analyzing the Effects of Labor Standards on Export Performance: A Time Series Approach with Structural Change.

## 4.1 Introduction

There is still a lot of debate as to whether labor standards should be uniform (or harmonized) across countries, and this discussion, even though it has a long history, is unlikely to be resolved in the near future. This debate will also very likely be part of future trade talks, as it remains a means for high-standard countries to attempt to maintain a protectionist policy against imports from low-standard countries (Anderson, 1995). Indeed, both the United States (henceforth US) and France unsuccessfully attempted to introduce the issue of labor standards during the Uruguay Round, and in the last ten years, the US has included a worker rights clause into many of its trade agreements. Efforts by some governments, albeit extensive, to include core labor standards in the World Trade Organization (WTO) have also led to the acceptance that this issue should be raised, but only at WTO preparatory meetings (Aggarwal, 1995).[1]

Many, on the contrary, have argued that only the International Labor Organization (ILO), whose main role is to improve labor standards worldwide, should deal with the issue of labor standards. However, proponents of the latter argument have to acknowledge the lack of enforcement mechanisms by the ILO to ensure that labor standards are observed across countries. According to Van Beers (1998), the debate on the relationship between labor standards and international trade can be broken down into

[1] The proposition that trade agreements should not include labor standards has lost ground over the years. Indeed, the WTO has already considered intellectual property rights and environmental matters, and indicated that it will also have to deal with labor standards in some manner.

two parts. First, it is often claimed that high-standard countries experience a loss of competitiveness in the production and exports of labor-intensive goods (due to higher production costs resulting from higher labor standards) vis-à-vis low-standard countries. As a result, one should expect high-standard countries to produce less labor-intensive products, or alternatively, labor-intensive industries should relocate to low-standard countries. Second, the use of import restrictions against products imported from low-standard countries, so as to prevent a race to the bottom of standards across countries, has also been considered as part of this debate.

The present paper focuses on the first question and considers the effect of labor standards on export performance. Even though the debate is usually considered within a North-South framework, this neglects its importance among developed nations that are characterized by similar political systems, and that are part of regional trade arrangements. Indeed, the issue of trade and labor standards has come up in the context of creating new, or extending existing regional trade arrangements such as the European Union and the North American Free Trade Agreement (NAFTA). It is quite possible that members of regional trade arrangements will be at different levels of economic development and hence will be characterized by different labor standards. In fact, NAFTA and the previously agreed US–Canada Free Trade Agreement (FTA) have raised issues related to free trade and its impact on labor standards between the US and Canada. For instance, Block and Robert (2000) mention that in the case of Canada and the US,

> The open trade encouraged by NAFTA and FTA is expected to cause increased competition between firms in both countries, raising concerns about how workplace standards will be affected. As competition and international trade increase, firms are likely to view the maintenance of quality employment relations as affecting their competitive advantage in the product market. (p. 274)

Equally important is the fact that these two economies are related by massive trade flows and are one another's largest trading partner. Both are developed countries sharing similar cultures, and with similar economic institutions and living standards (Card and Freeman, 1994). Traditionally, however, it has been found that labor standards in the US are lower than Canadian labor standards (Burton, 1989).[2] More recently, Block and Roberts (2000) have devised a methodology to measure differences in labor standards between these two countries, and their results suggest that labor standards are higher in Canada than in the US.

Assuming that the previous observation is correct, two things can happen. First, lower production costs in the US (due to lower labor standards) compared to Canadian firms will mean that the prices of similar goods produced by firms in the US will be lower than those of Canadian firms, ceteris paribus. As a result, firms in Canada will lose market share or, in the extreme case, close down; either way, employment will be reduced. Second, Canadian producers may also decide to move their industries to the US and this, even though being beneficial to them, will still cause unemployment in Canada. Looking at the above issue within a North-North framework can therefore be a quite useful exercise, even more so, given the availability of reliable data on labor standards for these two countries.

Indeed, in the present paper I am able to consider data for labor standards for a period extending over almost fifty years in order to analyze the effect of labor standards on export performance for Canada and the US. Unlike the general approach in the

[2] Important differences of opinion regarding the relationship between the individual and the government, and the role of the state, are possible explanatory factors for the difference in labor standards between Canada and the US.

literature (see for example Rodrik (1996), Mah (1997) and the previous chapter of this thesis), which is based on cross-sectional analysis, I use a time-series approach based on the structural change literature. This allows one, not only to identify structural breaks in the data, but also to see how export performance and labor standards evolve over time.[3]

The structure of the paper is as follows. Section 4.2 presents a short discussion of existing empirical work on the issue of trade and labor standards. Section 4.3 presents the models that will be tested. Section 4.4 describes the indicators for labor standards, which will be used for estimation purposes. Empirical results and their implications are reported in section 4.5. Section 4.6 briefly investigates whether labor standards have converged between Canada and the US. Section 4.7 concludes.

## 4.2 Literature Review

Due to a lack of reliable data on labor standards, empirical work on this issue is rather scarce. Aggarwal (1995) argues that the imposition of core labor standards in developing countries is likely to increase production costs and, therefore, investigates whether labor standards are being suppressed by developing countries so that they can reduce production costs and encourage exports. Her examination of the export patterns of ten developing countries to the US for 1994 reveals the following:

> Sectors typically identified as having egregious labor conditions do not occupy the only or even the primary share of these countries' exports.
>
> Comparisons across more export-oriented and less export-oriented sectors indicate that core labor standards are often lower in less export oriented or non-traded sectors such as agriculture and services.

[3] This is even more crucial if one considers the possibility that the effects of labor standards on export performance may be different at different time periods.

> Similarly, within an export-oriented sector, labor conditions in firms more involved in exporting are either similar to or better than those in firms that are less involved in exporting.
>
> ...Wages and working conditions in developing countries have been exhibiting positive trends. In general, these have been in line with productivity changes. (p.7)

A comprehensive study by the OECD (1996) finds no evidence that countries with low labor standards, as measured by freedom of association and collective bargaining rights, can achieve a better export performance than countries with high labor standards. The study also finds that countries that have liberalized trade do not necessarily face a worsening of their labor standards, in that case equated with freedom of association rights. Mah (1997) examines the relationship between core labor standards and export performance of developing countries. His cross-sectional study is, however, limited in that he uses the ratification of core conventions as an indicator for labor standards. The fact that countries ratify conventions does not necessarily mean that the standards they represent are being enforced.[4] Despite this major shortcoming, overall his results indicate that higher labor standards have a negative impact on export performance.

Rodrik (1996), on the other hand, uses different proxies for labor standards (such as ILO conventions ratified, Freedom House indicators of civil liberties and political rights, an indicator of the incidence of child labor, statutory hours in a normal week in manufacturing and construction, days of paid annual leave in manufacturing, and percentage of the labor force that is unionized) and looks at their effects on labor costs

[4] In fact, I have shown in the third chapter of this thesis that the impact on export performance is largely dependent on the choice of indicators for labor standards and that Mah's model is very sensitive to the type of specification used.

and comparative advantage. His results show that labor standards are significant determinants of labor costs when one controls for productivity; but they are not important determinants of comparative advantage, the latter being determined mostly by factor endowments.

Another study of interest is Van Beers (1998), who considers the relationship between labor standards and trade flows of OECD countries using a labor standard indicator based on actual labor regulations. The indicator is a synthetic index constructed by the OECD and which takes into account the enforcement of various government regulations such as working time, employment contracts, minimum wages and worker's rights. Van Beers extends a gravity model, which considers bilateral trade flows, with variables that represent the strictness of labor regulations and tests the hypothesis whether labor standards have a detrimental effect on exports due to a fall in competitiveness. His results do not show any significant impact of labor standards stringency on exports of labor-intensive commodities. However, when a distinction is made in terms of skill-intensities, both the exports of labor-intensive and capital-intensive commodities, which are produced with relatively high-skilled labor, deteriorate with an increase in the strictness of labor standards. Van Beers attributes the latter result to the relatively inelastic demand for high-skilled labor which implies that labor costs rise more than in the case of low-skilled labor intensive commodities.

Most of the studies related to the issue of trade and labor standards, including the ones outlined above in the preceding paragraphs, assume that firms, industries or countries can boost their competitiveness by lowering labor standards since the latter involves a cost. However, in my view, this is not always true, and it is quite possible that

the lowering of standards may have adverse effects on productivity and efficiency, and hence on export performance. In other words, weaker labor standards, instead of providing a competitive advantage, may raise costs.

Maskus (1997) and Martin and Maskus (1999) have actually shown, through a series of simple partial equilibrium models, that the lack and enforcement of core labor standards, reduces an economy's efficiency and alters its comparative advantage. Their contention is that the competitiveness argument is reversed once one takes into account the supply side, rather than focusing solely on the demand side of labor markets. For example, in a competitive labor market for women characterized by discrimination in the form of a maximum wage being imposed below the market determined wage, employment would be determined on the supply side with excess demand for women, leading to a fall in employment, output and competitiveness. In the empirical analysis in this paper, I allow for the possibility of such reversals.

## 4.3 The Model

The model that I seek to estimate is derived from the perfect and imperfect substitutes models, which are used to analyze the time-series behavior of exports and imports. In these models, relative prices and aggregate incomes are what essentially determine exports and imports. The choice of a proper model depends on several factors, such as the type of good being traded (for instance homogeneous vs. differentiated products), whether the traded commodity will be used for final consumption or as a factor input, the purpose of the modelling exercise, and the availability of data (Goldstein and Khan, 1985).

The perfect substitutes model is based on the assumption that homogeneous goods are traded on international markets at a common price. Demand and supply in this model are dependent on the domestic price of traded goods, money income and factor costs. The excess demand and excess supply for domestic goods yield the country's imports and exports respectively. Abstracting from transport costs and other trade barriers, the interaction of world demand and world supply determines the price of traded goods. Therefore, the model implies that a country's export volume depends on domestic prices, money income, and factor costs within the country.[5]

The main assumption of the imperfect substitutes model is that imports and exports are not perfect substitutes for domestic goods.[6] If this were not true, then contrary to what is often observed, a given country should not import or export the same traded good. The main difference between the imperfect substitutes model and the perfect substitutes model is that domestic and export prices are not equal in the former. The model itself does not explain why domestic prices are not equal to export prices, but this may be due to different elasticities of demand in the home and export market, or because of different cost structures for production of goods for local use and those for exports. As a result, the demand function for imports shows quantity demanded as a function of income, the good's own price, and the price of domestic substitutes. For a given export price, changes in factor costs of exportables lead to changes in profitability. Since factor costs tend to move more in line with domestic prices, the latter serve as a proxy for the former.

[5] In the third chapter of this thesis, I explain the model more fully.

In order to analyze the impact of labor standards on export performance, the basic equation, which is an application of the perfect substitutes model described above, and used by Mah (1997), is as follows:

$$log\ (exp/gdp)_t = \alpha_0 + \alpha_1\ labstd_t + \varepsilon_t \qquad (1)$$

where

*exp* is the export value in US dollars

*gdp* is the gross domestic product in US dollars

$labstd_t$ is a measure of the labor standard; and $\varepsilon_t$ is the disturbance term which is assumed to be i.i.d. $(0,\sigma_\varepsilon^2)$.

In the imperfect substitutes model, prices have to adjust in each time period to maintain the equality between demand and supply. Due to the existence of costs to changing prices in imperfectly competitive markets, firms have to weigh the costs of changing prices against adjustment costs, such as changes in inventories or unfilled orders. The basic equation to analyze the effects of labor standards on export performance in the case of the imperfect substitutes model will therefore be as follows:

$$log(exp/gdp)_t = \alpha_0 + \alpha_1\ labstd_t + \alpha_2\ rin_t + \varepsilon_t \qquad (2)$$

where $rin_t$ is defined as the lending rate minus the rate of inflation, and the other terms are as indicated above in equation (1). Variable $rin_t$ is included to take into account these additional costs (capital cost effects) of adjustment.

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[6] For a comprehensive treatment of the imperfect substitutes model, please refer to Goldstein and Khan (1985).

Equations (1) and (2) both assume that the export performance of a country is determined by its price competitiveness. The effect of a labor standard is to lead to an increase in labor costs and hence cause a deterioration in the price competitiveness of a country's exports. In order to interpret the results in the next section of the paper, the null hypothesis is that the coefficient of $labstd_t$ (that is, $\alpha_1$) is zero such that labor standards do not influence export performance. As far as the alternative hypothesis goes, it is assumed that the sign of $\alpha_1$ is different from zero. Even though one would expect $\alpha_1$ to be negative since the labor standards lead to a rise in labor costs, it is quite possible, as explained at the end of the previous section of this paper, that they may have the opposite effect.[7] The coefficient $\alpha_2$ is expected to have a negative sign because an increase in the real interest rate can raise the capital cost and hence lead to a deterioration of price competitiveness.

### 4.4 Indicators for Labor Standards

Ideally, one would first agree on the labor standards (or the indicators thereof) to be considered in the analysis, and then use them to assess their effects on export performance. There are, however, several difficulties in trying to follow such a procedure. The first is definitional: what do we mean by labor standards? Following the OECD definition (1996), I take labor standards as being norms, rules and conventions that govern working conditions and industrial relations. For example, the ratification of ILO conventions, the number of hours worked, and occupational health and safety standards at the workplace would fit that definition. Several authors, among which Stern

[7] Swinnerton (1997) also provides a detailed explanation of these efficiency effects.

(1998), Aggarwal (1995) and Fields (1995), have discussed these definitional issues at length. The biggest difficulty, it seems, is to distinguish labor rights (that is, standards that should apply to everybody regardless of a country's stage of development, also known as core labor standards) from other labor standards, which are more dependent on national characteristics. There is now, however, a growing consensus that core labor standards should include freedom of association, collective bargaining rights, elimination of exploitative forms of child labor, prohibition of forced labor, and non-discrimination in employment among genders.

What is more important in the present case is to find indicators that can encapsulate rules related to the conditions of work, and this leads us to a second difficulty, which is the availability of data. Because of the nature of the present analysis, namely the time-series approach, I have to find data for labor standards that go back far enough in time, and this is not an easy task. As a result, the number of indicators that I use for labor standards is limited to the ones described below. Another difficulty lies in the fact that labor standards in Canada and the US are not set and enforced in the same way. Different levels of government have the power to set labor standards in the two countries. In the US, a federal system of labor law prevails throughout the country and has more powers than the state laws. On the other hand, the role of the federal government in setting labor standards is limited in Canada, and each province sets its own labor laws independently. In other words, the federal and provincial authorities set their own labor standards within their respective jurisdictions.

With these limitations in mind, time series data is collected for Canada and the US for the period 1950 to 1998, and we define the labor standards that we considered in the following paragraphs.

### 4.4.1 The ILO Conventions

Data concerning the ratification of conventions related to ILO conventions is obtained from ILOLEX, a database of international labor standards from the ILO. ILOLEX records the number of conventions ratified by each country as well as the date of ratification. I am thus able to construct two indicators for labor standards, namely:

1) *cconv* which is the number of core conventions ratified among the following five conventions, namely Conventions 29 (forced labor), 87 (freedom of association), 98 (right to organize and collective bargaining), 105 (abolition of forced labor) and 111 (non-discrimination in employment) and therefore ranges from zero to five in any given year, and 2) *tconv* which is the total number of ILO conventions ratified at any point in time.

The ratification of ILO conventions varies considerably among countries, and this may partly be because they are in conflict with national laws. For instance, as of end 1998, the US had ratified only one of the core conventions, whereas Canada had ratified three. The numbers for *tconv* for the same date were twenty-nine for Canada and twelve for the US. However, as mentioned in the previous section of this paper, even when conventions are ratified, they may not be a good indicator of existing national labor standards if they are not properly enforced. As such, one has to be careful in interpreting the results obtained when ILO conventions are used as indicators of labor standards. In

the empirical analysis I use *cconv* and *tconv* only in the case of Canada because of the nature of the analysis itself.

### 4.4.2 Other Indicators of Labor Standards

I consider the actual number of weekly hours worked in the manufacturing sector. The numbers are obtained from various issues of the *Yearbook of Labor Statistics* of the ILO and generally represent the average hours worked by wage earners. They range from roughly 37 to 42 hours per week for the period considered. This variable is denoted by *hour* and I use the logarithm of this variable (*lhour*). I consider the occupational injuries per thousand people employed in manufacturing industries, and it can be interpreted as an indicator of safety at the workplace. The series for Canada and the US are constructed from various issues of the *Yearbook of Labor Statistics* of the ILO. This variable is denoted as *inj*.

Finally, I consider the union membership as a percentage of the non-agricultural paid workers. The data for the Canadian unionization rate is obtained from *Historical Statistics of Canada* (Statistics Canada, 1983) and the *Directory of Labor Organizations in Canada*. The data for the US is obtained from the *Datapedia of the United States* (1994) and the *World Labor Report* (1997). Since 1960, union membership as a percentage of the non-agricultural labor force has been higher in Canada than in the US. This variable is denoted as *union*.

## 4.5 Empirical results and Implications

In this section, the empirical analysis applied to the US and Canadian data is presented. The data are annual and span the period 1950 to 1998. The section is divided into two parts. First, the stationarity properties of each variable are presented. Second, the methodology used to estimate the models and the results obtained from these estimations are presented.

### 4.5.1 Stationarity Analysis

#### 4.5.1.1 The Test Statistics

In order to investigate the univariate process of each of the time series that I am considering, three tests are applied. The first and second tests are the augmented Dickey-Fuller test proposed by Dickey and Fuller (1979) and by Said and Dickey (1984) (hereafter *ADF*) and the *ADF* test based on the Generalized Least Squares (GLS) detrending procedure proposed by Elliot, Rothenberg and Stock (1996) (hereafter *ERS*). This test is labeled as $ADF^{GLS}$. The third test allows for a more complex dynamic by introducing the possibility that the series are best represented by a shifting mean, a broken trend, or both simultaneously. Originally, this kind of test was proposed by Perron (1989) using a known break point. After that, Zivot and Andrews (1992), Banerjee, Lumsdaine and Stock (1992) and Perron (1997), have proposed similar tests but considering an unknown break point. The version of Perron (hereafter *P97*) is used here.[8]

[8] All of these unit root tests use OLS detrended data. In recent years, there have appeared some other unit root tests with structural change using GLS detrended data (see Perron and Rodriguez (1998)).

The class of process considered can be described as follows. I denote the relevant data series by $y_t$ (in the paper, this variable represents one of the following time series ($log(exp/gdp)_t$, $inj_t$, $lhour_t$, $rin_t$, $union_t$)[9] and write:

$$y_t = d_t + u_t \tag{3}$$

$$A(L)u_t = B(L)e_t$$

where $A(L)$ is a $p^{th}$ order autoregressive polynomial in the lag operator $L$ (defined such that $Lx_t = x_{t-1}$) defined by $A(L) = 1 + \phi_1 L + \ldots + \phi_p L^p$. Similarly, $B(L)$ is a $q^{th}$ order moving-average polynomial defined by $B(L) = 1 + \theta_1 L + \ldots + \theta_q L^q$. The errors $\{e_t\}$ are assumed to be martingale differences. The system (3) simply describes a process that is the sum of a deterministic time trend ($d_t$) and a noise function modeled as an *ARMA* process. The null hypothesis is that one root of the autoregressive polynomial is unity. The term $d_t$ is equal to $\psi' z_t$ where $z_t$ is the set of deterministic components in the series. Hence, we can have $z_t = \{1\}$ or $z_t = \{1,t\}$.

[9] I do not apply the stationarity analysis to the variables *cconv* and *tconv* (ILO Conventions ratified) since they are not continuous. Only for Canada do we consider ILO Conventions as an indicator for labor standards. Also, as indicated in section 4.1 of the paper, the results obtained when conventions are used as an indicator have to be interpreted with care because of enforcement difficulties.

The *ADF* test of Dickey and Fuller (1979) (also extended by Said and Dickey (1984) to the case of data having an *ARMA* structure) is based on the idea that a stationary and invertible *ARMA* process can be approximated by an autoregression. Hence, the relevant autoregression estimated by *OLS* is:

$$y_t = d_t + \alpha y_{t-1} + \sum_{j=1}^{k} c_j \Delta y_{t-j} + v_t \tag{4}$$

Here, the parameterization (4) is such that the coefficient $\alpha$ is the sum of the autoregressive coefficients. Hence, the null hypothesis can be tested using the t-statistic constructed for $\alpha = 1$.

The *ERS* approach consists of first locally removing the deterministic components of $\{y_t\}$ via *GLS*. Denoting $y_t^{\bar{\alpha}}$ and $z_t^{\bar{\alpha}}$ as:

$$\left\{ \begin{array}{ll} y_t^{\bar{\alpha}} = y_1, (1 - \bar{\alpha}L) y_t & t = 2,3,...,T \\ z_t^{\bar{\alpha}} = z_1, (1 - \bar{\alpha}L) z_t & t = 2,3,...,T \end{array} \right\} \tag{5}$$

where $\bar{\alpha} = 1 + \bar{c}T^{-1}$, with $\bar{c}$ = -7.0 for the case where $z_t = \{1\}$, and $\bar{c}$ = -13.5 when $z_t = \{1,t\}$. I define $\tilde{\psi}$ as the estimator which minimizes the squared sum of residuals:

$$S(\psi, \alpha) = \sum_{t=0}^{T} (y_t^{\bar{\alpha}} - \psi' z_t^{\bar{\alpha}})^2 \tag{6}$$

Then I use $\tilde{\psi}$ to construct the detrended series $\tilde{y}_t = y_t - \tilde{\psi}' z_t$ and to apply an *ADF* test on $\tilde{y}_t$:

$$\tilde{y}_t = \alpha \tilde{y}_{t-1} + \sum_{j=1}^{k} c_j \Delta \tilde{y}_{t-j} + v_t \qquad (7)$$

An issue of empirical importance is the choice of the order of the autoregression $k$ in (4) and (7). Following Campbell and Perron (1991) and Ng and Perron (1995), a data-dependent method based on a general to specific recursive procedure is used. Starting from a maximal order of $k$ (say, $k$ max), the method tests if the last lag included is significant[10], and if not, the order of the autoregression is decreased by one, and the coefficient of the last lag again examined. This is repeated until a rejection occurs or the lower bound zero is reached. In the present paper, $k$ max = integer$(10 \times \frac{T}{100})^{\frac{1}{4}}$ is considered.

For the unit root test in the presence of structural change, three possible cases are considered according to the deterministic components. In the first model, $z_t = \{1, t, DU_t\}$ with $DU_t = 1$ $(t > T_B)$. This model considers the possibility that there is a break in the intercept, which in the terminology of Perron (1989) corresponds to the "crash model". The second model considers $z_t = \{1, t, DT_t\}$, where $DT_t = 1$ $(t > T_B)(t\text{-}T_B)$. In this model, a change in the slope of the trend function is allowed. Finally, a third model where $z_t = \{1, t, DU_t, DT_t\}$ is also considered. In this model both changes are allowed. In all cases, $T_B$ is the date of the breakpoint, which is also defined as $\lambda = T_B/T$.

In order to choose $T_B$, I estimate the $ADF$ statistic above through $t = k\,max + 1$, ..., $T$-1, and I select the date, $\hat{T}_B$, as the point associated to the infimum value of the $t_{\hat{\alpha}}$. This method is called the "infimum" procedure.

### 4.5.1.2 The Results of Stationarity Analysis

*United States Data*

Table 4.1: Unit root tests for the United States

| Statistic | $\hat{\alpha}$ | $t_{\hat{\alpha}}$ | $k^*$ | $\hat{T}_B$ |
|---|---|---|---|---|
| | | $log(exp/gdp)_t$ | | |
| $ADF^{GLS}$ | 0.65 | -3.77[a] | 2 | |
| *ADF* | 0.62 | -4.04[a] | 6 | |
| *P97* | 0.53 | -6.38[a] | 8 | 1970 |
| | | $rin_t$ | | |
| $ADF^{GLS}$ | 0.80 | -2.90[d] | 0 | |
| *ADF* | 0.61 | -2.90 | 3 | |
| *P97* | -0.05 | -6.31[a] | 8 | 1979 |
| | | $lhour_t$ | | |
| $ADF^{GLS}$ | 0.66 | -3.06[a] | 0 | |
| *ADF* | 0.65 | -3.09 | 0 | |
| *P97* | 0.42 | -4.36[c] | 8 | 1981 |
| | | $inj_t$ | | |
| $ADF^{GLS}$ | 0.90 | -1.90[d] | 1 | |
| *ADF* | 0.84 | -2.64[d] | 1 | |
| *P97 – Slope* | 0.62 | -3.31 | 8 | 1970 |
| *P97 – Slope and Intercept* | 0.70 | -4.24 | 8 | 1976 |
| *P97 – Intercept* | 0.63 | -4.10 | 8 | 1978 |
| | | $union_t$ | | |
| $ADF^{GLS}$ | 0.80 | -2.31 | 4 | |
| *ADF* | 0.69 | -2.34 | 4 | |
| *P97* | -0.54 | -5.95[a] | 8 | 1982 |

a, b, c, d, denote significance levels at the 1%, 2.5%, 5% and 10% respectively. First and second superscripts indicate significance using asymptotic and finite critical values, respectively.

Results are presented in Table 4.1 above. For all variables, except for $inj_t$, an intercept and a time trend in the specification of the deterministic components of the time series are included. For the statistic *P97*, only the case where a rejection was obtained is

[10] According to the recommendation of Campbell and Perron (1991), a significance level of 90.0% is used.

presented. When no rejection is found, results for the three models considered for the analysis of stationarity are presented.

In general, the $ADF$ and $ADF^{GLS}$ statistics present evidence of non-stationarity. The only exception is the dependent variable. When the test with one break of Perron (1997) is applied, a more clear evidence in favor of stationarity is obtained. In the case of the variable $log(exp/gdp)_t$, a rejection of the hypothesis of a unit root is obtained with the model where only a break in the intercept is allowed. A break point is found at the year 1970. The variable $rin_t$ also shows evidence of stationarity with the year 1979 as the break point. The logarithm of the variable related to hours of work ($lhour_t$) is also stationary using the model where there is only a break in the slope of the trend function. In this case, the break point found corresponds to 1981. Finally, the variable $union_t$ is stationary using the model where a break is allowed only in the intercept. In this case, the break point corresponds to the year 1982. It is interesting to note that the break points obtained for the variables $rin_t$, $lhour_t$ and $union_t$ correspond to the second oil-price shock of 1979 to 1982, and the ensuing worldwide recession, the effects of which were also felt in the US.

*Canadian data*

In the case of Canada, I perform ADF tests by again including an intercept and a time trend in the specification of the deterministic components of the time series. In general, the ADF statistic presented evidence of non-stationarity and it turns out that except for $inj_t$, the other labor standards variables, as well as the dependent variable, were difference stationary (by taking the first difference of these variables and performing a

unit root test, I was able to conclude that the variables are difference stationary). When the test with one break of Perron (1997) is applied, I have evidence of stationarity with break only for the variable $inj_t$. In fact, I obtain a rejection of the hypothesis of a unit root using the model where only a break in the intercept is allowed. I found a break point at the year 1980 (which again corresponds to the 1979-82 oil-price shock). No other break points were found for the other variables.

### 4.5.2 Estimation

According to the results from the stationarity analysis for the US variables, the latter are stationary when a broken trend is considered. Because of these results, I will estimate a model with endogenous breaks for the US that enables one to have different coefficients for each regimen found by the estimation method. This method to estimate multiple structural change models was proposed by Bai and Perron (1998a,b). For Canadian data, I first use ordinary least squares to estimate the models, by including the first difference of the relevant variables (because of the stationarity properties thereof), as well as the variable $inj_t$, which is stationary with a break point. I also estimate a vector autoregression (VAR) model and I use the informational criteria such as the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) to specify the lag length of the VAR. Once I have picked the correct VAR, I perform Johansen's test for cointegration and estimate a vector error correction model wherever I have the presence of a cointegrating equation. The methodologies used and the results obtained are explained in detail below.

### 4.5.2.1 The Methodology

*Unites States*

Following Bai and Perron (1998a,b) and using similar notation, the following multiple linear regression with $m$ breaks ($m$+1 regimes) is considered:

$$\left\{\begin{array}{ll} i_t = z_t'\gamma_1 + x_t'\beta + \varepsilon_t, & t = 1,2,...,T_1 \\ i_t = z_t'\gamma_2 + x_t'\beta + \varepsilon_t, & t = T_1 + 1,...,T_2 \\ \cdot & \\ \cdot & \\ \cdot & \\ i_t = z_t'\gamma_{m+1} + x_t'\beta + \varepsilon_t, & t = T_m + 1,...,T \end{array}\right\} \quad (8)$$

According to this specification, $i_t$ is the observed dependent variable at time $t$; $z_t$ ($q$ x 1) and $x_t$ ($p$ x 1) are vectors of covariates and $\gamma_j$ ($j$ = 1, 2, ..., $m$+1) and $\beta$ are the corresponding vectors of coefficients; and $\varepsilon_t$ is the disturbance term at time $t$. The indices ($T_1$, ..., $T_m$) or the break points, are explicitly treated as unknown. The purpose is to estimate the unknown regression coefficients together with the break points when $T$ observations on ($i_t$, $x_t$, $z_t$) are available.

Bai and Perron (1998a) define an $m$-partition of the integers (1, ..., $T$) as an $m$-tuple vector of integers ($T_1$, ..., $T_m$) such that $1<T_1<...T_m<T$. Defining the block-diagonal matrix $\bar{Z} = diag(Z_1, ..., Z_{m+1})$ with $Z_i = (z_{T_{i-1}+1}, ..., z_{T_i})'$ where they use the convention that $T_0 = 1$ and $T_{m+1} = T$, the multiple linear regression system (8) may be expressed in matrix form as

$$I = X\beta + \bar{Z}\gamma + \varepsilon \quad (8a)$$

where $I = (i_1, \ldots, i_T)'$, $X = (x_1, \ldots, x_T)'$, $\varepsilon = (\varepsilon_1, \ldots, \varepsilon_T)'$, $\gamma = (\gamma_1', \gamma_2', \ldots, \gamma_{m+1}')'$, and $\bar{Z}$ is the matrix which diagonally partitions $Z$ at $(T_1, \ldots, T_m)$. The vectors $x_t$ and $z_t$ may contain either one of the explanatory variables: $log(exp/gdp)_t$, $rin_t$, $lhour_t$, $inj_t$, $union_t$. In the present case, $d = \psi' z_t$, where $z_t = \{1\}$, that is, I only include an intercept in the specification of the deterministic components. If the analyst has reasons to believe that one or more coefficients are stable through time, then we have a model where both $q > 0$ and $p > 0$, which is known as a "partial structural change model" since the coefficients contained in $\beta$ are not allowed to shift. Whereas if $p = 0$, we then have a "pure structural change model" and all the coefficients are shifting.

The method of estimation considered is that based on the least squares principle. For each $m$-partition $(T_1,\ldots,T_m)$, the associated least-squares estimates of $\beta$ and $\gamma_j$ are obtained by minimizing the sum of squared residuals

$$\left(I - X\beta - \bar{Z}\gamma\right)'\left(I - X\beta - \bar{Z}\gamma\right) = \sum_{i=1}^{m+1} \sum_{t=T_{i-1}+1}^{T_i} [i_t - x_t'\beta - z_t'\gamma_i]^2 \qquad (9)$$

Estimation of (9) enables one to obtain $\hat{\beta}\left(\{\hat{T}_{B_j}\}\right)$ and $\hat{\gamma}_j\left(\{\hat{T}_{B_j}\}\right)$ which can be considered as the resulting estimates based on the given $m$-partition $(T_1,\ldots,T_m)$ denoted by $\{T_j\}$. Substituting these estimates in the objective function and denoting the resulting sum of squared residuals as $S_T(T_1,\ldots,T_m)$, the estimated break points $\left(\hat{T}_1,\ldots,\hat{T}_m\right)$ are such that

$$\left(\hat{T}_1,\ldots,\hat{T}_m\right) = \arg\min_{\{T_1,\ldots,T_m\}} S_T(T_1,\ldots,T_m) \qquad (10)$$

where the minimization is taken over all partitions $(T_1,\ldots,T_m)$. Then, the break-point estimators are global minimizers of the objective function. Finally, the regression parameter estimates are obtained using the associated least-squares estimates at the estimated $m$-partition $\{\hat{T}_j\}$, i.e. $\hat{\beta} = \hat{\beta}(\{\hat{T}_j\})$, $\hat{\gamma} = \hat{\gamma}(\{\hat{T}_j\})$.

Bai and Perron (1998a) also propose some test statistics to detect for multiple breaks. The first statistic is the *sup F* type test of the null hypothesis of no structural break ($m = 0$) versus the alternative hypothesis that there are $m = k$ breaks. Let $(T_1,\ldots,T_k)$ be a partition such that $T_i = [T\lambda_i]$ $(i = 1, \ldots, k)$. Let $R$ be the conventional matrix such that $(R\gamma) = (\gamma'_1-\gamma'_2, \ldots, \gamma'_k-\gamma'_{k+1})$. The *sup F* test proposed is asymptotically equivalent and it uses the estimates of the break dates obtained from the global minimization of the sum of squared residuals. Denote these estimates by $\hat{\lambda}_i = \frac{\hat{T}_i}{T}$ for $i = 1, \ldots, k$, the test is then

$$sup\, F_T(k;q) = F_T\left(\hat{\lambda}_1,\ldots,\hat{\lambda}_k;q\right) \tag{11}$$

where $\left(\hat{\lambda}_1,\ldots,\hat{\lambda}_k\right)$ are the arguments that maximize the following $F$-statistic:

$$F_T\left(\hat{\lambda}_1,\ldots,\hat{\lambda}_k;q\right) = \frac{1}{T}\left(\frac{T-(k+1)q-p}{kq}\right)\hat{\gamma}'R'(R\tilde{V})(\hat{\gamma})R')^{-1}R\hat{\gamma}, \tag{12}$$

and

$$\tilde{V}(\hat{\gamma}) = \left(\frac{\bar{Z}'M_x\bar{Z}}{T}\right)^{-1} \tag{13}$$

is the covariance matrix of $\hat{y}$ assuming spherical errors. Maximizing this $F$-statistic is equivalent to minimizing the global sum of squared residuals. This procedure is asymptotically equivalent since the break dates are consistent even in the presence of serial correlation. The asymptotic distribution still depends on the specification of the set $\Lambda_\varepsilon$ via the imposition of the minimal length of a segment. Hence, $\varepsilon = h / T$.

When the investigator wishes not to pre-specify a particular number of breaks to make inference, Bai and Perron (1998a) propose two sets of the null hypothesis of no structural break against an unknown number of breaks given some upper bound $M$. These are called the double maximum tests. The first is an equal weighted version defined by (in its asymptotically equivalent version)

$$UD\max F_T(M,q) = \max_{1 \le m \le M} F_T\left(\hat{\lambda}_1,...,\hat{\lambda}_m;q\right), \tag{14}$$

where, $\hat{\lambda}_i = \frac{\hat{T}_i}{T}$ for ($i$ = 1, ..., $m$) are the estimates of the break points obtained using the global minimization of the sum of squared residuals. The second test applies weights to the individual tests such that the marginal $p$-values are equal across values of $m$. This implies weights that depend on $q$ and the significance level of the test, say $\alpha$. This test is defined by (in its asymptotically equivalent version)

$$WD\max F_T(M,q) = \max_{1 \le m \le M} \frac{c(q,\alpha,1)}{c(q,\alpha,m)} F_T\left(\hat{\lambda}_1,...,\hat{\lambda}_m;q\right), \tag{15}$$

where $c(q,\alpha,m)$ is the asymptotic critical value of the test $\sup(\lambda_1,...,\lambda_m) \in \Lambda_\varepsilon F(\lambda_1,...,\lambda_m;q)$ for a significance level $\alpha$.

Bai and Perron (1998a) also propose a test for $l$ versus $l + 1$ breaks which is applied in a sequential way. This test is labeled as the *sup* $F_T(l + 1|l)$. The method amounts to the application of $l + 1$ tests of the null hypothesis of no structural change versus the alternative hypothesis of a single change. The test is applied to each segment containing the observation $\hat{T}_{i-1}$ to $\hat{T}_i$ ($i = 1, ..., l+1$). The estimates $\hat{T}_i$ need not be the global minimizers of the sum of squared residuals, all that is required is that the break fractions $\hat{\lambda}_i = \frac{\hat{T}_i}{T}$ converge to their true value at rate $T$. I conclude for a rejection in favor of a model with $l + 1$ breaks if the overall minimum value of the sum of squared residuals (over all segments where an additional break is included) is sufficiently smaller than the sum of squared residuals from the $l$ breaks model. The break date is selected as the one associated with this overall minimum.

Other criteria to select for the number of breaks presented by Bai and Perron (1998a) are the *BIC* and *LWZ* methods. The *BIC*($m$) is calculated as:

$$BIC(m) = \ln \hat{\sigma}(m) + g \ln(T)/T \qquad (16)$$

where $g = (m+1)q + m + p$, and $\hat{\sigma}^2(m) = T^{-1}S_T(\hat{T}_1,...,\hat{T}_m)$. The method *LWZ* was proposed by Liu, Wu and Zidek (1997), and it is a modified version of the *BIC* method. The *LWZ* procedure is defined by:

$$LWZ(m) = \ln\left(\frac{S_T\left(\hat{T}_{B_1},\ldots,\hat{T}_{B_m}\right)}{T-g}\right) + \left(\frac{g}{T}\times c_0\left(\ln(T)\right)^{2+\delta_0}\right) \qquad (17)$$

where, according to Liu *et al.* (1997), $c_0 = 0.299$ and $\delta_0 = 0.1$.

Using different data generating processes, Bai and Perron (1998b) performed Monte Carlo experiments to investigate the behavior of each method. Their main conclusions are that

> ...the *BIC* works well when breaks are present but less so under the null hypothesis. (Bai and Perron (1998b), p.33).

According to them, if I suspect that no breaks are present in the model, then the *LWZ* method is more appropriate. Finally, they argue that the sequential procedure works best when compared with the other methods they investigated.

*Canada*

The presence of cointegration can be verified using the multivariate procedure proposed by Johansen (1988). This test uses the following *VECM* representation where $y_t$ is the vector that contains all variables (in the present case these variables are $log(exp/gdp)_t$, $inj_t$, $lhour_t$, $rin_t$, $union_t$):

$$\Delta y_t = \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \ldots + \Gamma_p \Delta y_{t-p+1} + \Pi y_{t-1} + d_t + \varepsilon_t \qquad (18)$$

where

$E(\varepsilon_t) = 0$

$$E(\varepsilon_t, \varepsilon_t) = \begin{Bmatrix} \Omega & t = \tau \\ 0 & otherwise \end{Bmatrix}$$

The matrix $\Pi$ contains the information on the possible cointegration relations between the $n$ elements of $y_t$. Equation (18) offers three possible cases according to the rank of the matrix $\Pi$. First, the matrix $\Pi$ can be the zero-matrix, which implies that the rank of $\Pi$ equals zero. In this case we do not have cointegration and a *VAR* in first differences has to be estimated. Second, the matrix $\Pi$ can have full rank $n$, which means that all variables are stationary. In this case, a *VAR* in level has to be estimated. Third, the matrix $\Pi$ can have rank deficiency, that is, $0 < rank\ (\Pi) < n$, and it can be decomposed as $\Pi = \alpha\beta$, where $\alpha$ and $\beta$ are $(n \times r)$ matrices. The matrix $\beta$ contains the $r$ cointegrating relations while the matrix $\alpha$ contains the adjustment parameters.

The Johansen maximum likelihood cointegration testing method aims to test the rank of the matrix $\Pi$ in (18) using the rank regression technique based on canonical correlation (see Franses (1999) or Johansen (1995) for a brief or more complete description of this approach). Assuming that the intercepts are not restricted, the procedure consists of obtaining an $n \times 1$ vector of residuals $r_{0t}$ and $r_{1t}$ from the so-called auxiliary regressions (regressions of $\Delta y_t$ and $y_{t-1}$ on a constant and the lagged $\Delta y_{t-1}$ through $\Delta y_{t-p+1}$). These residuals are used to obtain the $(n \times n)$ residual product matrices[11]:

$$S_{ij} = (1/T)\sum_{t=1}^{T} r_{it} r_{it}^{'}, \qquad i,j = 0,1 \tag{19}$$

The next step is to solve the eigenvalue problem

$$\left|\lambda S_{11} - S_{10} S_{00}^{-1} S_{01}\right| = 0 \tag{20}$$

which gives the eigenvalues $\hat{\lambda}_1 \geq ... \geq \hat{\lambda}_n$ and the corresponding eigenvectors $\hat{\beta}_1$ through $\hat{\beta}_n$. A test for the rank of the matrix $\Pi$ can now be performed by testing how many eigenvalues $\lambda$ equal unity. The first test statistic for the resulting number of cointegrating relations is the so-called Trace statistic (see Johansen (1988)), which is a likelihood ratio test defined by

$$Trace = -T\sum_{i=r+1}^{n} \log(1 - \hat{\lambda}_i) \tag{21}$$

The null hypothesis for this Trace test is that there are at most $r$ cointegration relations. I begin by testing whether there is no cointegration ($r = 0$) versus at most one such relation. If this is rejected, I test whether there are at most two cointegration relations and so on. Another useful test is given by testing the significance of the estimated eigenvalues themselves

[11] Of course, slightly different auxiliary regressions have to be estimated if the intercepts are restricted or they are considered zero, for example (see Franses (1999)).

$$\lambda_{max} = -T \log(1 - \hat{\lambda}_i) \tag{22}$$

which can be used to test the null hypothesis of $r$-1 against $r$ cointegration relations. Critical values for these tests have been tabulated by Osterwald-Lenum (1992). However, limiting distributions depend on the set of deterministic components considered in equation (18) and depend also on the set of deterministic components allowed in the cointegration relations. Given the nature of the series in this paper, I always consider an intercept in the *VECM* estimation. For the cointegration relations, I consider the presence of a time trend.

Another important issue in the application of the Johansen test, is the specification of the lag length. Many suggestions are in the literature, for example using information criteria such as AIC or SIC.[12] Using these criteria, we use k = 1 or k = 2 in the *VECM* specification, which is relatively standard considering that I have annual data. A warning note is useful here. I use small samples in the empirical applications, and there is evidence (see Maddala and Kim (1999) for a survey) that small samples can cause spurious rejection of the null hypothesis of no cointegration. One recommended solution for this problem is to adjust the values of the statistics to take into account small sample size. I do this in only one case below. Adjusting these values in the other cases below would result in a failure to reject the null hypothesis of no cointegration. This finding can be interpreted as evidence for the statement that results without adjustment

[12] Another suggestion is to use the likelihood ratio test, based either on the log value of the likelihood or based on the determinant of the covariance matrix. I discovered that this test yielded essentially the same results as the *AIC*.

are spurious cointegration. According to this way, I will present estimates from a *VAR* without cointegration and from a *VAR* with cointegration.

### 4.5.2.2 The Results

*Results for United States Data*

All the results were obtained using the Gauss program constructed by Bai and Perron (1998a). The results of the estimation of the models are presented in Tables 4.2 and 4.3. Tables 4.2a – 4.2c present the results when the dependent variable is explained using all labor standards indicators but the real interest rate ($rin_t$) is not included in the specification. Tables 4.3a and 4.3b present a similar specification but including the real interest rate.

In the configuration of the parameter of the model, a trimming of 15% ($\varepsilon = 0.15$) is considered, which corresponds to an $h = 7$. For results from Tables 4.2 and 4.3, I have $q = 5$ and 6, respectively, which specify the number of regressors that change in the time period. Given that I have the lagged dependent variable as another explanatory variable, I do not use automatic correction for autocorrelation. Finally, the maximum number of breaks allowed in the estimation was 5 (i.e., $M = 5$).

Firstly, consider the results from Tables 4.2a-4.2c. Table 2a shows results from the different tests applied to the equation. The statistics *UDmax* and *WDmax* show (at 1.0% level of significance) that there exists at least one break in the model. A similar conclusion is obtained when the statistic *sup* $F_T$ is used. In this case, I always reject the null hypothesis that there is no break in the model. The sequential application of the test *sup* $F_T$ rejects the null hypothesis of one break in favor of two breaks using 1.0% level of

significance. The next null hypothesis (of only two breaks) is also rejected in favor of three breaks but this time using 2.5% level of significance. Finally, the result using *BIC* also shows that there is evidence in favor of three breaks. Notice also that the sequential procedure found only one break when a 1.0% level of significance is used. Three breaks are found using other significance levels.

Table 4.2a: Statistics from the equation

$$log(exp/gdp)_t = \gamma_{1,t} + \gamma_{2,t}\, inj_t + \gamma_{3,t}\, lhour_t + \gamma_{4,t}\, union_t + \gamma_{5,t}\, log(exp/gdp)_{t-1} + \varepsilon_t$$

| Statistics/Specifications | $M=5,\ q=5,\ h=7$ |
|---|---|
| **Udmax** | 44.78[a] |
| *WDmax*(1%) | 65.22[a] |
| sup$F_T$(1) | 43.31[a] |
| sup$F_T$(2) | 35.19[a] |
| sup$F_T$(3) | 44.78[a] |
| sup$F_T$(4) | 41.43[a] |
| sup$F_T$(5) | 35.34[a] |
| sup$F_T$(2\|1) | 23.73[a] |
| sup$F_T$(3\|2) | 23.73[b] |
| sup$F_T$(4\|3) | 16.08 |
| sup$F_T$(5\|4) | 6.42 |
| **BIC** | 3 |
| **LWZ** | 0 |
| **Sequential** | 3[b,c,d], 1[a] |

a,b,c,d,denote significance levels at the 1%, 2.5%, 5% and 10%.

Using the previous results, Tables 4.2b and 4.2c show the results from the estimation of the model with three and one break, respectively.

Table 4.2b: Estimation with 3 breaks, equation:

$$log(exp/gdp)_t = \gamma_{1,t} + \gamma_{2,t}\, inj_t + \gamma_{3,t}\, lhour_t + \gamma_{4,t}\, union_t + \gamma_{5,t}\, log(exp/gdp)_{t-1} + \varepsilon_t$$

| Parameter | Estimated Coefficient | t-statistic |
|---|---|---|
| $\gamma_{1,1}$ | 8.406[a] | 2.92 |
| $\gamma_{2,1}$ | 0.566 | 1.12 |
| $\gamma_{3,1}$ | -2.495[a] | -3.30 |
| $\gamma_{4,1}$ | -0.033[a] | -3.46 |
| $\gamma_{5,1}$ | -0.352[c] | -2.16 |
| $\gamma_{1,2}$ | 1.138 | 0.87 |
| $\gamma_{2,2}$ | 0.018 | 0.03 |
| $\gamma_{3,2}$ | -0.658[c] | -2.05 |
| $\gamma_{4,2}$ | -0.005 | -1.26 |
| $\gamma_{5,2}$ | -0.039 | -0.25 |
| $\gamma_{1,3}$ | 9.865[a] | 3.15 |
| $\gamma_{2,3}$ | 10.571[a] | 5.32 |
| $\gamma_{3,3}$ | -2.704[a] | -3.18 |
| $\gamma_{4,3}$ | -0.047[a] | -4.69 |
| $\gamma_{5,3}$ | 1.095[a] | 6.52 |
| $\gamma_{1,4}$ | -2.366 | -1.07 |
| $\gamma_{2,4}$ | 1.112[a] | 3.09 |
| $\gamma_{3,4}$ | 0.553 | 0.96 |
| $\gamma_{4,4}$ | -0.012[c] | -2.06 |
| $\gamma_{5,4}$ | 0.671[a] | 8.04 |
| | Estimated Break Point | 95.0% Confidence Interval |
| $\hat{T}_{B_1}$ | 1956 | [1954-1958] |
| $\hat{T}_{B_2}$ | 1971 | [1969-1973] |
| $\hat{T}_{B_3}$ | 1981 | [1979-1982] |
| $\overline{R}^2$ | 0.979 | |
| $F$ | 108.54[a] | |

a, b, c, d denote significance levels at the 1%, 2.5%, 5% and 10%.

In Table 4.2b we have 4 regimes. In the first regime (1950-56), the variables $lhour_t$ and $union_t$ are significant at the 1% level and explain the behavior of $log(exp/gdp)_t$. In the second regime (1957-1971), it appears that only $lhour_t$ is important (significant at the 5% level). However, while the negative sign of variable $union_t$ implies that low labor standards are a boost to export performance, the negative sign of variable $lhour_t$ implies the contrary. In the third and fourth regimes (1972-1981 and 1982-1998

respectively), $inj_t$ also appears to explain the behavior of the dependent variable, and the positive sign on this variable implies that lower labor standards provide a comparative advantage in trade by leading to a higher export performance. Variable $union_t$ is also significant at the 5% level in the fourth regime and is again negative. Equally important is the fact that there is no change in the signs of the significant variables from one regime to another in Table 4.2b. The dependent variable lagged one period is also significant in all but one regime (1957-71).

Table 4.2c: Estimation with 1 break, equation:

$$log(exp/gdp)_t = \gamma_{1,t} + \gamma_{2,t} inj_t + \gamma_{3,t} lhour_t + \gamma_{4,t} union_t + \gamma_{5,t} log(exp/gdp)_{t-1} + \varepsilon_t$$

| Parameter | Estimated Coefficient | t-statistic |
|---|---|---|
| $\gamma_{1,1}$ | -1.253 | -0.86 |
| $\gamma_{2,1}$ | 1.100[a] | 2.71 |
| $\gamma_{3,1}$ | -0.116 | -0.29 |
| $\gamma_{4,1}$ | 0.007[a] | 3.31 |
| $\gamma_{5,1}$ | 0.057 | 0.35 |
| $\gamma_{1,2}$ | -2.567 | -1.49 |
| $\gamma_{2,2}$ | 1.974[a] | 4.09 |
| $\gamma_{3,2}$ | 0.588 | 1.27 |
| $\gamma_{4,2}$ | -0.000 | -0.22 |
| $\gamma_{5,2}$ | 0.855[a] | 11.18 |
| | Estimated Break Point | 95.0% Confidence Interval |
| $\hat{T}_{B_1}$ | 1971 | [1969-1973] |
| $\overline{R}^2$ | 0.956 | |
| $F$ | 103.48[a] | |

a, b, c, d denote significance levels at the 1%, 2.5%, 5% and 10%.

Results for Table 4.2c (only with one break) show similar evidence as in Table 4.2b. In this case, variable $inj_t$ explains the behavior of the dependent variable for the two regimes (1950-1971 and 1972-1998). The variable $union_t$ appears to be useful in the first regime. However, and once again, the signs of the variables $inj_t$ and $union_t$ imply

that labor standards can both increase or reduce export performance respectively. In fact, the sign of variable $union_t$ has changed from being negative in Table 4.2b to positive in Table 4.2c.

Table 4.3a presents the results about the existence of breaks when the real interest rate ($rin_t$) is also included in the model. The *UDmax* and *WDmax* tests show a clear evidence (at 1.0% level of significance) of the existence of breaks in the model. A similar conclusion (with similar level of significance) is found when the statistic $SupF_T$ is used. The sequential application of the $SupF_T$ shows evidence in favor of three breaks and this result is confirmed by the *BIC*.

Table 4.3a: Statistics from the equation

$$log(exp/gdp)_t = \gamma_{1,t} + \gamma_{2,t} rin_t + \gamma_{3,t} inj_t + \gamma_{4,t} lhour_t + \gamma_{5,t} union_t + \gamma_{6,t} log(exp/gdp)_{t-1} + \varepsilon_t$$

| Statistics/Specifications | $M=5,\ q=6,\ h=7$ |
|---|---|
| **Udmax** | 73.64[a] |
| *WDmax*(1%) | 133.97[a] |
| $supF_T(1)$ | 35.79[a] |
| $supF_T(2)$ | 37.49[a] |
| $supF_T(3)$ | 69.82[a] |
| $supF_T(4)$ | 66.53[a] |
| $supF_T(5)$ | 73.64[a] |
| $supF_T(2\|1)$ | 66.04[a] |
| $supF_T(3\|2)$ | 66.04[a] |
| $supF_T(4\|3)$ | 19.85 |
| $supF_T(5\|4)$ | 19.55 |
| **BIC** | 3 |
| **LWZ** | 0 |
| **Sequential** | 3 [a,b,c,d] |

a,b,c,d,denote significance levels at the 1%, 2.5%, 5% and 10%.

Table 4.3b: Estimation with 3 breaks, equation:

$$log(exp/gdp)_t = \gamma_{1,t} + \gamma_{2,t} rin_t + \gamma_{3,t} inj_t + \gamma_{4,t} lhour_t + \gamma_{5,t} union_t + \gamma_{6,t} log(exp/gdp)_{t-1} + \varepsilon_t$$

| Parameter | Estimated Coefficient | t-statistic |
|---|---|---|
| $\gamma_{1,1}$ | 32.588[a] | 7.19 |
| $\gamma_{2,1}$ | 0.032[a] | 5.55 |
| $\gamma_{3,1}$ | 5.835[a] | 5.99 |
| $\gamma_{4,1}$ | -9.215[a] | -7.35 |
| $\gamma_{5,1}$ | -0.091[a] | -8.09 |
| $\gamma_{6,1}$ | -1.747[a] | -6.70 |
| $\gamma_{1,2}$ | 0.202 | 0.18 |
| $\gamma_{2,2}$ | -0.017[a] | -2.86 |
| $\gamma_{3,2}$ | -0.622 | -1.25 |
| $\gamma_{4,2}$ | -0.517[d] | -1.97 |
| $\gamma_{5,2}$ | -0.008[c] | -2.20 |
| $\gamma_{6,2}$ | -0.479[c] | -2.39 |
| $\gamma_{1,3}$ | 12.130[a] | 4.11 |
| $\gamma_{2,3}$ | 0.005[d] | 1.88 |
| $\gamma_{3,3}$ | 13.188[a] | 5.99 |
| $\gamma_{4,3}$ | -3.330[a] | -4.15 |
| $\gamma_{5,3}$ | -0.050[a] | -5.67 |
| $\gamma_{6,3}$ | 1.308[a] | 7.14 |
| $\gamma_{1,4}$ | -2.613 | -1.22 |
| $\gamma_{2,4}$ | 0.003 | 1.07 |
| $\gamma_{3,4}$ | 1.412[a] | 3.16 |
| $\gamma_{4,4}$ | 0.607 | 1.09 |
| $\gamma_{5,4}$ | -0.012[c] | -2.11 |
| $\gamma_{6,4}$ | 0.681[a] | 8.39 |
| | **Estimated Break Point** | **95.0% Confidence Interval** |
| $\hat{T}_{B_1}$ | 1956 | [1954-1957] |
| $\hat{T}_{B_2}$ | 1971 | [1969-1972] |
| $\hat{T}_{B_3}$ | 1981 | [1979-1982] |
| $\overline{R}^2$ | 0.983 | |
| $F$ | 111.16[a] | |

a, b, c, d denote significance levels at the 1%, 2.5%, 5% and 10%.

Table 4.3b presents the results of the estimations with 3 breaks. Firstly, the variable $rin_t$ is important for all regimes except for the last one (1982-1998). However, even though the sign of $rin_t$ was expected to be negative, this is so only for the period 1957-1971. The variable $lhour_t$ is significant for the first three regimes (1950-1956,

1957-1971, 1972-1981). The variable $union_t$ appears to be important for all regimes. Finally, the variable $inj_t$ is significant for the first, third and fourth regimes. The signs of variables $inj_t$ and $union_t$ indicate that low labor standards are a source of comparative advantage since they lead to an improvement in export performance; variable $lhour_t$, however, shows the opposite. Just as in Table 4.2b, there is no change in the sign of the significant labor standard variables from one regime to another. Past export performance (the dependent variable lagged one period) is also significant for all regimes in explaining current export performance.

*Results for Canadian Data*

Tables 4.4a and 4.4b show the results when equations (1) and (2) are estimated for Canada using the method of ordinary least squares. In addition to the variables $inj_t$, $lhour_t$ and $union_t$ that were used as indicators for labor standards in the case of the US, I also consider the variables $cconv_t$ and $tconv_t$, which are the core and total ILO Conventions ratified, respectively. Variable *dtc* is a dummy variable (consisting of zeros for the period 1950 to 1979, and ones for 1980 to 1998) that is included to take into account the structural break in the intercept for $inj_t$. As mentioned in section 4.5.1.2 of the paper, following stationarity analysis for Canadian data, the break point in variable $inj_t$ was found at the year 1980. I report the results when the effects of the labor standards are examined in isolation (columns (1) to (5)) and when they are included together (column (6)), so as to be consistent with the analysis that was carried with US data. Also, because I am dealing with time series data, autocorrelation is checked for and corrected accordingly.

As one can see in Tables 4.4a and 4.4b, except for ILO conventions ratified, the other indicators for labor standards are all insignificant as far as explaining Canada's export performance. The real interest rate variable is also insignificant in all the regressions of Table 4.4b. Even though both $cconv_t$ and $tconv_t$ are significant, their signs indicate that higher labor standards have actually led to an improvement in export performance, which is contrary to the popular view. Once again, it is important to emphasize that ILO Conventions ratified may not necessarily be good indicators for labor standards because of lack of enforcement. One would, however, expect that these Conventions are both ratified and complied with in the case of Canada, which would in turn imply that the results suggest that productivity effects have outweighed the costs related to higher labor standards, thus leading to an improvement in export performance.

Table 4.4a: Estimated coefficients for equation (1), Canada, 1950-1998

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | -0.01<br>(-1.07) | -0.05**<br>(-2.14) | 0.03<br>(1.29) | 0.01**<br>(2.03) | 0.01<br>(1.31) | 0.02<br>(1.17) |
| $cconv_t$ | 0.01**<br>(2.24) | - | - | - | - | - |
| $tconv_t$ | - | 0.01**<br>(2.46) | - | - | - | - |
| $inj_t$ | - | - | -0.16<br>(-1.10) | - | - | -0.13<br>(-0.90) |
| $\Delta lhour_t$ | - | - | | 0.45<br>(1.18) | - | 0.36<br>(0.89) |
| $dtc_t$ | - | - | -0.01<br>(-0.39) | - | - | -0.01<br>(-0.43) |
| $\Delta union_t$ | - | - | - | - | -0.01<br>(-0.53) | -0.01<br>(-0.50) |
| $R^2$ | 0.10 | 0.12 | 0.04 | 0.03 | 0.09 | 0.06 |
| N | 48 | 48 | 47 | 48 | 47 | 47 |
| Durbin Watson | 1.56 | 1.59 | 1.53 | 1.53 | 1.98 | 1.57 |
| LM(1) & p-value<br>AR(1) | 2.15 (0.15) | 1.82 (0.18) | 2.51 (0.12) | 2.61 (0.11) | 0.06 (0.81)<br>0.28 (1.92) | 2.01 (0.16) |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. *(**) indicates 10(5) percent level of significance.

Table 4.4b: Estimated coefficients for equation (2), Canada, 1950-1998

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | -0.01<br>(-0.99) | -0.05**<br>(-2.14) | 0.03<br>(1.17) | 0.01<br>(0.98) | -0.01<br>(-0.03) | 0.03<br>(1.11) |
| $rin_t$ | -0.01<br>(-0.26) | -0.01<br>(-0.38) | 0.01<br>(0.10) | 0.01<br>(0.40) | 0.01<br>(0.96) | -0.01<br>(-0.05) |
| $cconv_t$ | 0.01**<br>(2.12) | - | - | - | - | - |
| $tconv_t$ | - | 0.01**<br>(2.36) | - | - | - | - |
| $inj_t$ | - | - | -0.15<br>(-1.04) | - | - | -0.13<br>(-0.88) |
| $\Delta lhour_t$ | - | - | - | 0.41<br>(1.03) | - | 0.36<br>(0.88) |
| $dtc_t$ | - | - | -0.01<br>(-0.40) | - | - | -0.01<br>(-0.39) |
| $\Delta union_t$ | - | - | - | - | -0.01<br>(-0.31) | -0.01<br>(-0.50) |
| $R^2$ | 0.10 | 0.12 | 0.04 | 0.03 | 0.11 | 0.06 |
| N | 48 | 48 | 48 | 48 | 47 | 48 |
| Durbin Watson | 1.57 | 1.61 | 1.52 | 1.51 | 1.95 | 1.57 |
| LM(1) & p-value | 2.02 (0.16) | 1.65 (0.21) | 2.54 (0.12) | 2.73 (0.11) | 0.27 (0.61) | 1.96 (0.17) |
| AR(1) | | | | | 0.29 (1.99) | |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. *(**) indicates 10(5) percent level of significance.

Results from Tables 4.4a and 4.4b can be improved using a vector autoregression *(VAR)* estimation where the variables can be considered as endogenous. In Table 4.5a, results for the estimation of a *VAR(1)* are presented and the lag was chosen using the AIC

criterion. As before, when the variable $inj_t$ is included in the regressions, a dummy ($dtc$) for a break in the intercept is considered. Overall, the results indicate that $inj_t$ and $\Delta hour_t$ are significant while the rate of unionization is not a significant factor. Total ILO Conventions ratified ($tconv_t$) is also significant at the 10% level. However, the signs of $tconv_t$ and $inj_t$ indicate that higher labor standards have led to an improvement in export performance. In the case of $\Delta hour_t$, higher labor standards have had the opposite effect on export performance. Hence, only the latter labor standard is consistent with the view that low labor standards provide a comparative advantage in trade and lead to an improvement in export performance in the case of Canada.

Finally, the set of VAR(1) estimates can be improved using the cointegration framework. In fact, given the results of the stationarity analysis, cointegration is a possibility among the set of variables considered. Using the Johansen test, I find evidence (at 5% level of significance) in favor of one cointegrating vector. The results are presented in Table 4.5b. The top panel of the table shows the estimate of the cointegration relation. The bottom panel shows the estimate for the error correction for the dependent variable. The coefficient associated to the long term equation is significant with the correct sign. In this specification, all the explanatory variables are significant except the variable $\Delta union_t(-1)$. Past export performance is a significant factor in explaining present export performance. As far as the signs of the labor standards variables are concerned, only $\Delta hour_t$ is consistent with the view that low labor standards lead to higher export performance. The rate of injuries has the opposite effect.

Table 4.5a: Estimated coefficients for equation (1), Canada, 1950-1998: VAR(1)

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | -0.01 | -0.04 | 0.05** | 0.01* | 0.01 | 0.05** |
| | (-0.86) | (-1.51) | (2.52) | (1.72) | (1.07) | (2.42) |
| $\Delta log(exp/gdp)_t(-1)$ | 0.20 | 0.19 | 0.23 | 0.22 | 0.30** | 0.20 |
| | (1.34) | (1.25) | (1.67) | (1.59) | (2.08) | (1.50) |
| $cconv_t(-1)$ | 0.01 | - | - | - | - | - |
| | (1.65) | | | | | |
| $tconv_t(-1)$ | - | 0.01* | - | - | - | - |
| | | (1.71) | | | | |
| $inj_t(-1)$ | - | - | -0.35** | - | - | -0.32** |
| | | | (-2.41) | | | (-2.27) |
| $\Delta hour_t(-1)$ | - | - | - | 0.90** | - | 0.79** |
| | | | | (2.34) | | (2.11) |
| $dtc_t$ | - | - | -0.02 | - | - | -0.01 |
| | | | (-1.60) | | | (-1.41) |
| $\Delta union_t(-1)$ | - | - | - | - | 0.01 | 0.01 |
| | | | | | (1.23) | (1.62) |
| $R^2$ | 0.14 | 0.14 | 0.20 | 0.18 | 0.11 | 0.32 |
| N | 46 | 46 | 46 | 46 | 46 | 46 |
| AIC | -4.53 | -3.05 | -9.60 | -11.12 | -1.83 | -13.34 |
| SIC | -4.30 | -2.81 | -9.28 | -10.88 | -1.59 | -12.38 |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. *(**) indicates 10(5) percent level of significance.

Table 4.5b: Cointegration and error correction model, equation (2), Canada:

| *Cointegrating Equation* | | | | |
|---|---|---|---|---|
| $log(exp/gdp)_t(-1)$ | $inj_t(-1)$ | $lhour_t(-1)$ | $union_t(-1)$ | constant |
| 1.00 | -6.41 | 16.26* | 0.07 | -60.67 |
| | (-1.41) | (1.87) | (1.45) | |

| *Error Correction Model for $\Delta log(exp/gdp)$* | | | | |
|---|---|---|---|---|
| Error Correction Term: -0.03* (-1.68) | | | | |
| $\Delta log(exp/gdp)_t(-1)$ | $inj_t(-1)$ | $\Delta lhour_t(-1)$ | $\Delta union_t(-1)$ | constant |
| 0.33** | -0.39** | 1.31** | 0.01 | 0.01 |
| (2.41) | (-2.17) | (2.98) | (1.08) | (1.36) |
| $R^2$ | 0.32 | | | |
| N | 46 | | | |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. *(**) indicates 10(5) percent level of significance.

Table 4.6a shows the results when the variable $rin_t$ is added in the estimations. This variable is, however, not significant. Both indicators for ILO Conventions ratified are also insignificant. The significance of the other labor standards variables ($inj_t$, $\Delta lhour_t$ and $union_t$) as well as their signs are similar to the results obtained in Table 4.5a.

Table 4.6a: Estimated coefficients for equation (2), Canada, 1950-1998: VAR(1)[a]

| Explanatory Variables | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | -0.01 | -0.04 | 0.05** | 0.01 | -0.01 | 0.05** |
| | (-0.99) | (-1.59) | (2.15) | (0.62) | (-0.41) | (2.22) |
| $\Delta log(exp/gdp)_t(-1)$ | 0.21 | 0.19 | 0.25* | 0.23 | 0.30** | 0.21 |
| | (1.37) | (1.14) | (1.74) | (1.59) | (2.09) | (1.48) |
| $\Delta log(exp/gdp)_t(-2)$ | - | -0.09 | - | - | - | - |
| | | (-0.56) | | | | |
| $rin_t$ | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.51) | (0.42) | (0.70) | (0.33) | (1.19) | (0.16) |
| $cconv_t(-1)$ | 0.01 | - | - | - | - | - |
| | (1.40) | | | | | |
| $tconv_t(-1)$ | - | 0.01 | - | - | - | - |
| | | (1.08) | | | | |
| $tconv_t(-2)$ | - | 0.01 | - | - | - | - |
| | | (-0.84) | | | | |
| $inj_t(-1)$ | - | - | -0.34** | - | - | -0.32** |
| | | | (-2.30) | | | (-2.22) |
| $\Delta hour_t(-1)$ | - | - | - | 0.86** | - | 0.78* |
| | | | | (2.10) | | (1.97) |
| $dtc_t$ | - | - | -0.02* | - | - | -0.02 |
| | | | (-1.73) | | | (-1.32) |
| $union_t(-1)$ | - | - | - | - | 0.01 | 0.01 |
| | | | | | (1.40) | (1.59) |
| $R^2$ | 0.14 | 0.17 | 0.21 | 0.19 | 0.14 | 0.32 |
| N | 46 | 46 | 46 | 46 | 46 | 46 |
| AIC | -4.45 | -4.49 | -9.52 | -11.08 | -1.85 | -13.20 |
| SIC | -4.14 | -4.25 | -9.13 | -10.76 | -1.53 | -12.09 |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. *(**) indicates 10(5) percent level of significance.
[a] except for column (2), which is a VAR(2)

Table 4.6b presents similar estimations to Table 4.5b but considering the variable $rin_t$ as an exogenous variable. Once again, the top panel of the table shows the estimate of the cointegration relation while the bottom panel shows the estimate for the error correction for our dependent variable. The coefficient associated to the long term equation is significant with the correct sign. In this specification, all the explanatory variables are significant except the variables $\Delta union_t(-1)$ and $rin_t$. Past export performance is a significant factor in explaining present export performance. As far as the signs of the labor standards variables are concerned, only $\Delta lhour_t$ is consistent with the view that low labor standards lead to higher export performance. The rate of injuries has the opposite effect.

Table 4.6b: Cointegration and error correction model, equation (2), Canada:

*Cointegrating Equation*

| $log(exp/gdp)_t(-1)$ | $inj_t(-1)$ | $lhour_t(-1)$ | $union_t(-1)$ | constant |
|---|---|---|---|---|
| 1.00 | -6.08 | 16.10* | 0.07 | -60.17 |
| | (1.41) | (1.89) | (1.44) | |

*Error Correction Model for $\Delta log(exp/gdp)$*

Error Correction Term: -0.03* (-1.71)

| $\Delta log(exp/gdp)_t(-1)$ | $inj_t(-1)$ | $\Delta lhour_t(-1)$ | $\Delta union_t(-1)$ | constant | $rin_t$ |
|---|---|---|---|---|---|
| 0.34** | -0.38** | 1.20** | 0.01 | 0.01 | 0.01 |
| (2.42) | (-2.15) | (2.74) | (1.16) | (0.30) | (0.48) |
| $R^2$ | 0.39 | | | | |
| N | 46 | | | | |

Note: Except where indicated otherwise, the figures in parentheses are the t-values. *(**) indicates 10(5) percent level of significance.

## 4.6 Have labor standards converged?

One issue which I have so far skirted but which is nevertheless important when discussing trade and labor standards is the issue of convergence of standards across countries, especially more so when regional trade agreements are reached among these same countries (resulting in increased trade and more competition among firms from different countries). This section thus addresses the issue of whether labor standards are influenced by the process of economic integration. Krueger (2000) has examined this concern in the context of the European Union. Overall, his results indicate that even though integration will cause some downward pressure on labor market protections (that is, looser regulation), this pressure will be modest, and European nations will continue to maintain distinct labor practices. Krueger gives several reasons why this should not come as a surprise. First, certain aspects of the labor compact[13] can improve economic efficiency; second, imperfect mobility of factor inputs and goods and services will tend to diminish the pressure placed on uncompetitive labor practices; and third, for political economy reasons, labor legislation within each country is a reflection of what the majority of the public wants.

In the case of Canada and the US, the NAFTA came into effect on January 1, 1994, and had as its main objectives the elimination of tariffs, the reduction of non-tariff barriers, as well as detailed provisions on how to conduct business in the free trade area.[14] The NAFTA agreement is also accompanied by a side-agreement, the North America Agreement on Labor Cooperation (NAALC), which deals explicitly with labor

[13] Krueger uses the term *labor compact* to capture the bargain among labor, capital and government, covering issues such as pay, social protection, union organization and safety standards.
[14] These provisions include rules regarding investment, services, intellectual property, competition and the temporary entry of business persons.

laws and standards. Initially, it was suggested that the NAFTA include a Social Charter to protect the interests of workers. Instead, and because the NAFTA had already been signed, the NAALC was pursued as a separate side agreement. The NAALC is unique in that it allows each partner country (either of Canada, the US or Mexico) to establish its own labor standards and to adopt/modify the laws and regulations; however, it does call for monitoring and enforcement structures

The fact that the NAALC allows each country to set its own standards, and also legitimizes the differences in rules governing labor, is in itself an indication of a retreat from attempts to harmonize labor standards. For instance, an important feature of NAFTA's labor policy is the use of strict migration controls so as to maintain the differences in the labor markets of each member country. As mentioned at the beginning of this paper, labor standards have traditionally been lower in the US than in Canada. Social protection expenditure as a percentage of GDP is always higher in Canada than in the US, regardless of how social protection is calculated. For instance, I calculated social welfare expenditure as a percentage of GDP for Canada and the US for the period 1988 to 1998, based on data from the Government Finance Statistics Yearbook (IMF 2000), by combining the social welfare expenditure from different levels of government (central, provincial or state, and local).

There does not seem to be any evidence of convergence, despite the coming into effect of NAFTA in 1994. Over a ten-year period (1988-1997), social welfare expenditure as a percentage of GDP has been on average 11.7 percentage points higher in Canada than in the US (see Appendix 4B, Figure 4.3). Concerning the indicators for labor standards that have been used in this paper, namely $inj_t$, $lhour_t$ and $union_t$, the only

case where convergence is weakly visible (at least graphically) is in the case of $inj_t$ (see Appendix 4B, Figure 4.4). As far as hours of work and the unionization rates in the two countries are concerned, the differences between each indicator ($lhour_t$ and $union_t$) for Canada and the US have remained fairly constant over the period 1988 to 1998.

I also apply unit root tests to the difference between the values of the variables $inj_t$, $lhour_t$ and $union_t$ for Canada and the US over the period 1950 to 1998, and to the residuals obtained from the regressions of the labor standard variables for Canada on the labor standard variables for the US, in order to check for cointegration and hence convergence. Basically, we want to test whether these variables have moved together or in different directions for the two countries. The results are summarized in Table 4.7 below.

Table 4.7: Results of ADF test

| | (1) | (2) | (3) |
|---|---|---|---|
| $inj_t$ | -3.71[c] | -3.67[b] | -3.62[d] |
| $hour_t$ | -4.45[a] | -2.16 | -3.71[d] |
| $union_t$ | -1.26 | -2.31 | -1.31 |

Note: a, b, c, d denote significance levels at the 1%, 2.5%, 5% and 10%.
Examples of tests conducted in each of columns (1) to (3):
(1) $inj_t^{Canada} - inj_t^{US} = u_t$
(2) $inj_t^{Canada} = \alpha + \gamma inj_t^{US} + u_t$
(3) $inj_t^{Canada} = \alpha + \beta t + \gamma inj_t^{US} + u_t$

Column (1) shows the result of the unit root tests when the ADF is applied to the difference between the values of the labor standards for Canada and the US. In columns (2) and (3), I run ADF tests for the residuals obtained from the regressions of the labor standard variable for Canada on the labor standard variable for the US (as illustrated in

the footnote to Table 7 above). In column (2), only a constant is included in the regression, and in column (3) both a constant and a time trend are included. The results obtained from this analysis, together with graphs of the residuals, show that $inj_t$ and $hour_t$ are cointegrated since the ADF is less than the critical values at the relevant levels of significance. I therefore obtain evidence of convergence for two of the three labor standards under consideration. I also estimate the cointegration relation in the labor standard variables by constructing the following variable based on the estimates obtained from regressions (2) and (3) described in the footnote to Table 7. Thus for variable $inj_t$ for instance:

$$inj_{1t}^{C} = \hat{\alpha} + \hat{\gamma} inj_t^{US} \tag{23}$$

$$inj_{2t}^{C} = \hat{\alpha} + \hat{\beta} t + \hat{\gamma} inj_t^{US} \tag{24}$$

Over the period 1950 to 1998, in the case of $inj_t$, $inj_{1t}^{C}$ has fallen from 14% to 10% based on equation (23), and $inj_{2t}^{C}$ from 18% to 6% based on equation (24). In the case of $hour_t$, similar results are obtained, but the fall is not as significant as in the case of $inj_t$. On the other hand, for $union_t$, there is an increase over the same period. Hence, there is no clear evidence of convergence for all labor standards.

## 4.7 Conclusion

This paper has analyzed the effects of labor standards on the behavior of exports for both the US and Canada using annual data for the period 1950 to 1998. The paper thus considered two developed countries that are one another's largest trading partner and that are members of a regional trade agreement in the form of the NAFTA. Unlike the general approach in the literature, which is based on cross-section analysis, I use a time series approach based on the structural change literature. This approach has some benefits. First, I am able to identify structural breaks in the data, especially in the case of the US, and thus I can look at the effects of labor standards on export performance, and the evolution of the direction of these effects under different regimes. In the case of the US for instance, the unionization rate is significant but has opposite effects under two different regimes. Second and because of the nature of the data, past export performance is included as an additional explanatory variable to control for current export performance, and it turns out to be a significant factor in many cases.

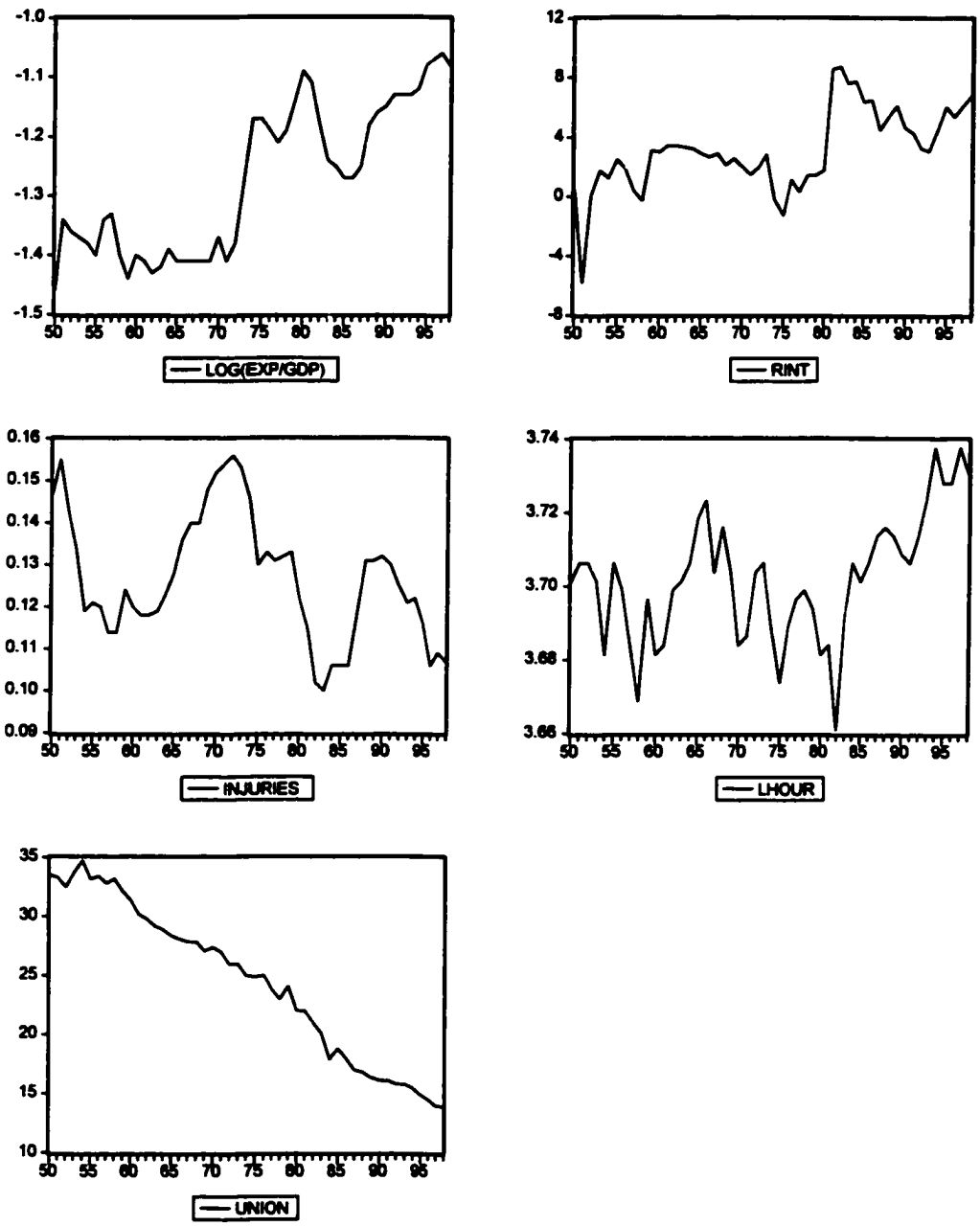
As far as the actual results are concerned, the evidence assembled in this paper shows that labor standards do have an impact on export performance in both countries. In the case of the US, both the unionization rate and the rate of occupational injuries are significant determinants and they support the general view that low labor standards can improve export performance. In the case of Canada, this view is supported only with respect to the number of hours worked. The possibility that lower labor standards may instead have an adverse effect on productivity and efficiency and hence raise costs is also confirmed by some of the results in the paper. Furthermore, when an *ECM* is estimated for Canada, all the labor standard variables are significant and once again, only the

number of hours worked is consistent with the view that lower labor standards lead to an improvement in export performance.

The policy implications of all these results have to be interpreted with care, especially if one wants to make a comparison of the findings for the US and Canada. After all, the models that were estimated in the paper for the two countries are not the same, and this occurred as a result of the characteristics of the data. Two obvious conclusions, however, come to mind. First, labor standards are important determinants of export performance, and irrespective of the size of the country. This contradicts conventional trade theory, which argues that large countries such as the US can influence their terms of trade while small countries such as Canada cannot, to the extent that export performance can change the terms of trade. Second, the popular view that lower labor standards will have a positive influence on export performance is not always verified.

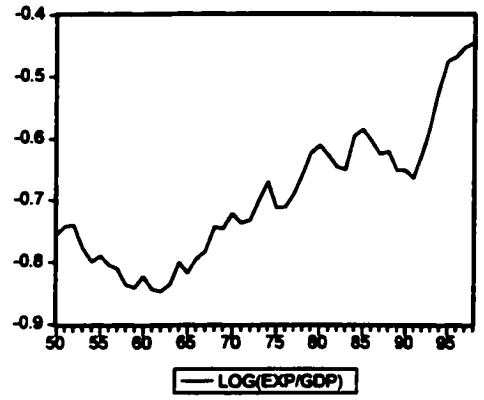
Finally, on the issue of convergence of standards, the evidence obtained is rather mixed. Over the years, and despite the signing and coming into effect of the NAFTA, it is likely that the US and Canada will continue to maintain distinct labor regulations. The difference in the ratios of social welfare expenditure to GDP, as well as the difference in the number of ILO Conventions ratified between the two countries, is a testimony to the maintaining of distinct labor practices. Our analysis provides a strong evidence in favor of cointegration and hence convergence in the case of $inj_t$ and weak evidence in the case of $hour_t$. The unionization rates are, however, still very different in the two countries.

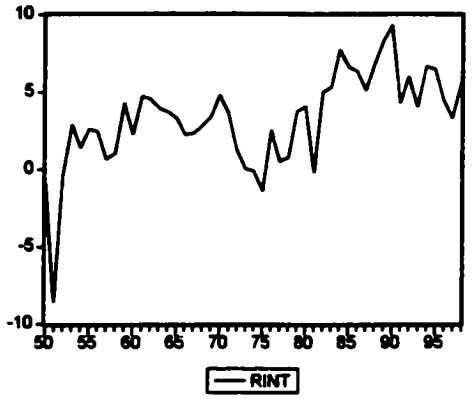
**Figure 4.1: Graphs for United States Data**

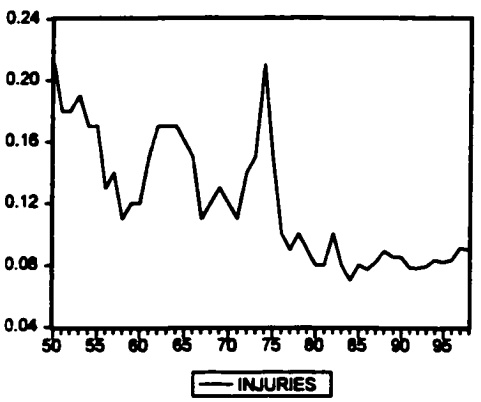


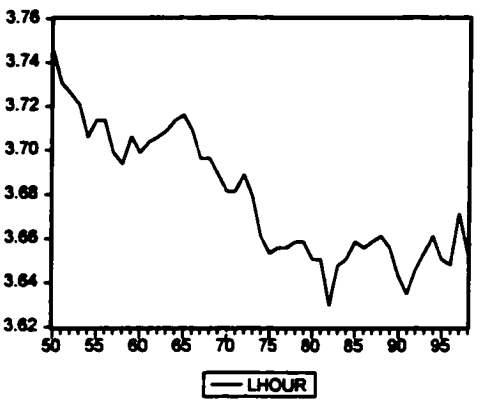
## Appendix 4A (contd.)

## Figure 4.2: Graphs for Canadian Data



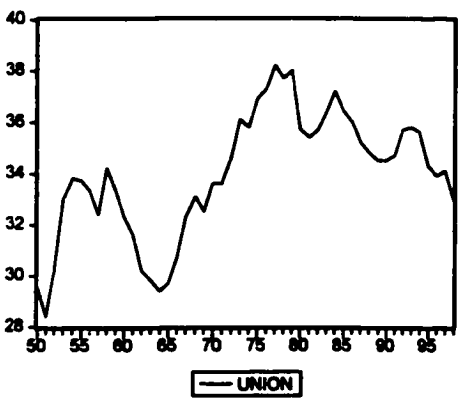
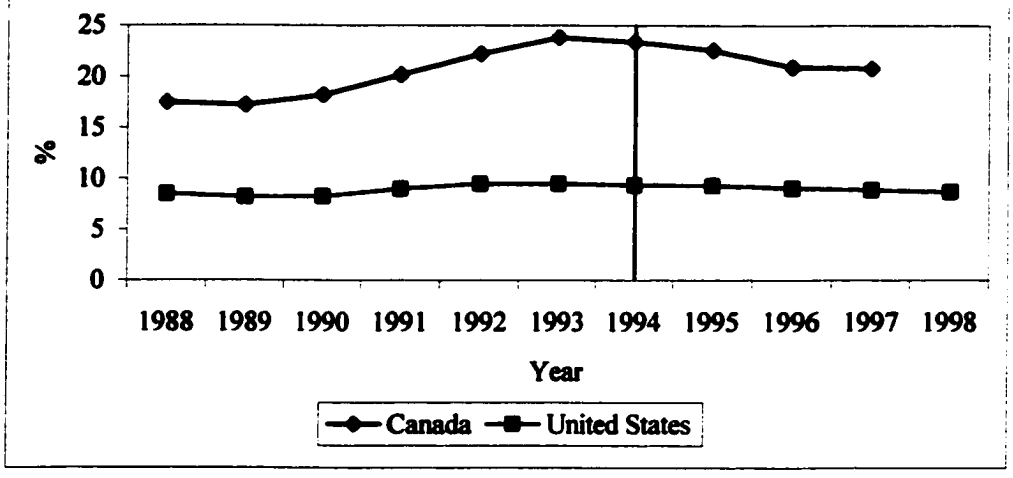
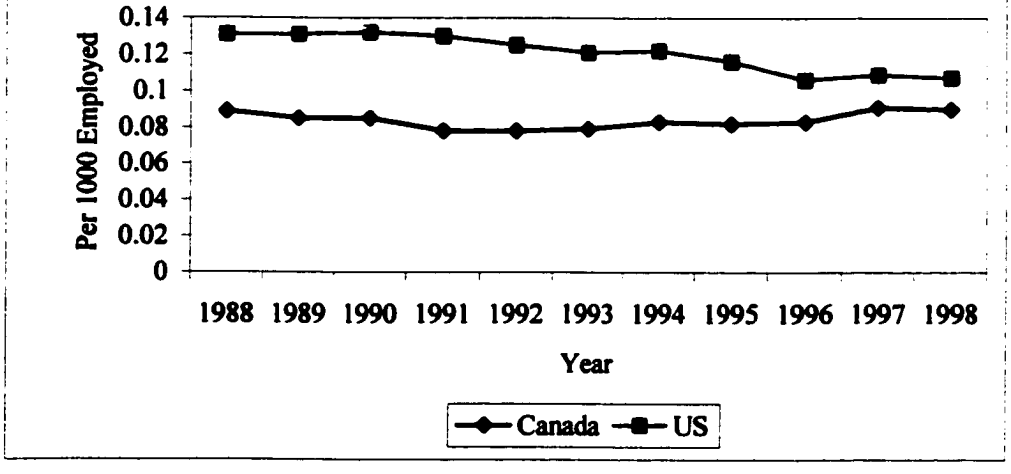



**Figure 4.3: Social Security and Welfare as a % of GDP**



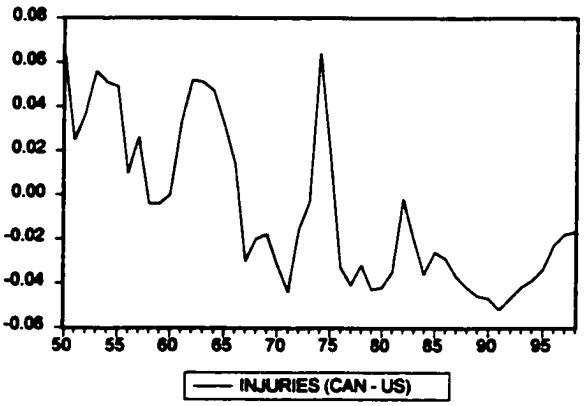

Source: Government Finance Statistics Yearbook, IMF 2000

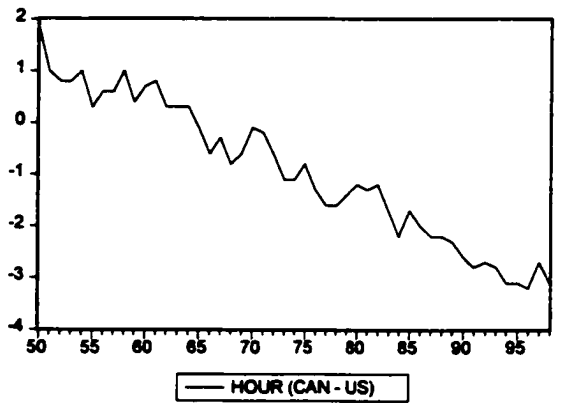
**Figure 4.4: Occupational Injuries in Manufacturing Industries**

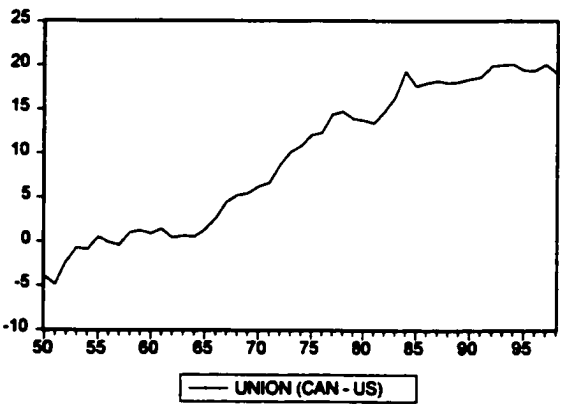


## Appendix 4C

**Figure 4.5: Differences in Labor Standards between Canada and the United States**



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