Are the labor market conditions causing the terms of trade to deteriorate?

- A statistical evaluation of the Prebisch-Singer hypothesis.

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Abstract

The study examines to what extent weak labor unions and an abundance of labor have a negative effect on less developed countries terms of trade, as hypothesized by Hans Singer (1950) and Rául Prebisch (1950). Using a sample from panel data for 74 less developed countries during the period 1980 – 2010 in OLS-regressions with fixed effects, I find some evidence that weak labor unions and abundance of labor is negatively correlated with the terms of trade, which could be interpreted in favor of the Prebisch-Singer hypothesis. The marginal effect of an abundance of labor also appears to have less negative impact on the terms of trade as labor unions grow stronger.

Keywords: Terms of trade, Prebisch-Singer hypothesis, Marginal effect of unemployment

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1. Introduction

International trade is a much debated and researched topic in the field of economics. The overall perception, established through economic models such as the Heschnner-Ohlin- and Richardian model, is that countries generally gain from trade. However, this view is not and has not always been undisputed, as one nowadays might get the impression of. The question if and when a country could be worse off from trade is still a present one. According to the economic school of structuralism, which became largely influential shortly after World War II, trade might have severe negative effects on growth and industrialization for less developed countries (LDCs).

We will in this paper focus on the so called Prebisch-Singer (PS) hypothesis which portrays a picture of an unbalanced and unequal system of international trade that to a large extent favors the developed countries in the North and disfavors the LDCs in the South. Both Singer (1950) and Prebisch (1950) hypothesized that the primary-product exporting South would experience a secular decline in their terms of trade (TOT). In other words that the price of their export goods would in time become relatively lower then the price of their imports. Hence the fruits of the technological achievements being made in the primary producing sector in the LDCs would be transferred to the manufacture-producing North (Sarkar 2001 p.312).

Whether this has been the case, that the primary producing South has experienced a deterioration in TOT over time has been largely debated in the field of development economics where some have found evidence in favor of the PS-hypothesis (Erten 2011; Bloch & Sapsford 1997; Grilli & Yang 1988) while others remain skeptical (Bairoch 1975; Meier 1958). However, less attention has been turned to the fundamental mechanisms behind the secular decline in TOT as hypothesized by PS. Studies are especially scare concerning one mechanism mentioned by PS as causing the TOT to deteriorate for the primary producing South. This is how different labor market conditions affect the TOT (or as we in this paper will label it, the “supply mechanism”).

According to Singer (1950 p.478) and Prebisch (1950 p.8-14), many of the LDCs (as opposed to the developed country’s) have an abundance of labor supply and to a large extent weak (or non-existing) labor unions. Therefore the productivity improvements in the primary sector will convey lower prices on their commodities and not higher wages for the producers, making imports relatively more costly vis-à-vis exports (Oatley 2010 p.123). This leads to a deterioration in the TOT for primary producers and technological achievements being made does not come to gain the peripheral countries but the already industrialized North trough lower import prices.

I will in this paper examine how certain characteristics of the labor market in LDCs may affect their TOT. More specifically I pose the question; if, and in that case how, an abundance
of labor and weak unions in LDCs affect their TOT? I try to answer this by estimating the effect using various fixed effect regressions using a sample from panel data for the years 1980 – 2010 in 74 LDCs.

The paper proceeds as follows; section 2 elaborates on the PS-hypothesis in order to develop three hypotheses on how an abundance of labor and weak labor unions might effect the TOT in LDCs. Following is section 3 were I discuss the data and the different operationalizations of the variables as well as its potential flaws. Section 4 presents the empirical models used to estimate these effects and furthermore I elaborate on its results. The paper ends with a brief summary of the results and some concluding remarks in section 5.

2. Theory
In order to fully understand the PS-hypothesis one needs a clear view of what TOT is. We will therefore in this theoretical section begin by exploring how the net barter terms of trade (NBTT), which is used in this study, is measured. Moreover we continue by examining the PS-hypothesis and carefully study the “supply mechanism” of it. At the end of the section three hypotheses regarding the effects of an abundance of labor and weak labor unions on the TOT are formulated.

2.1 Terms of Trade
TOT could be described as the relative price between a country’s exports and its imports. An improvement in a country’s TOT basically means that the price of its exports is rising relative to its imports given the quantity. In algebra this can be described as,

\[
\frac{P_{EX}Q_{EX}}{P_{IM}Q_{IM}} = TOT.
\]

Where \( P_{EX/IM} \) is the price of the export/import goods and \( Q_{EX/IM} \) is its corresponding quantities. The NBTT is the most commonly used measure of TOT and is often used as an index set to a specific baseline year and in our case “[...] calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000” (World Bank 2011a). A negative TOT hence means that money is flowing out of the country whereas a positive TOT implies that the country is accumulating capital. The TOT is therefore highly linked to a country’s current account balance.
2.2 The Prebisch-Singer hypothesis

The general proclamation of the PS-hypothesis is that the NBTT between primary products (such as agricultural products and raw materials) vis-à-vis manufactures have been subjected to a long-run deterioration (Toye & Toye 2003 p.437). The PS-hypothesis therefore implies that the gains from trade will be unequally (or some might say unfairly) distributed between the mainly primary producing South and the North, which mainly produces manufactured goods. This also implies that as trade grows the income-gap between the North and the South will continue to widen rather than being reduced (Ibid. p.437f).

Many structural economists have therefore argued that the international trade system is designed in a way that mostly benefits the already developed countries in the North on behalf of the LDCs in the South (Oatley 2010 p.123). This in line with the Marxist school of dependency where the center is assumed to be exploiting the periphery. Nevertheless, unlike the Marxist view on trade and development, structuralism though differs in one critical aspect. Although there are imbalances between North and South both in power and in trade conditions “[s]tructuralist theory argues that the international system can be reformed, [and] that the natural process can be altered” (Spero & Hart 2010 p.197).

Relaying on the arguments and the empirical evidence of the PS-hypothesis and other economic arguments against trade (such as the “infant-industry” argument), led many structural economists to advocate policies of “inward-looking industrialization” (see for example, Myrdal 1956). In line, Prebisch (1959 p.251-257) also argued that the technological progress made in the primary producing sector in the South would never foster industrialization as long as free international markets forces where allowed to operate.

Both Singer (1950) and Prebisch (1950), independently of one another, challenged many of the classical economists whom for long had predicted a secular improvement in the TOT for primary producers (see Smith 1776 p.173-206; Keynes 1912 p.631; Mill 1848 p.218). Classical belief bases this prediction on the law of diminishing returns in the primary producing sector and the law of increasing returns in manufactures (Sarkar 2001 p.310) and according to the assumptions made by comparative advantage theory “[…] the benefits of technical progress tend to be distributed alike over the whole community, either by lowering of prices or the corresponding raising of incomes” (Prebisch 1950 p.1). This would therefore give the primary producing South a more favorable TOT and the LDCs would then be able to take advantage of the technological progress in the developed countries and have no need to industrialize themselves.
However, PS argued that the opposite had been true for quite some time. The price for northern manufactured goods had been rising compared to the primary goods produced by the South. They claimed that the TOT of the peripheral South had worsened since the 1870's (Prebisch 1950 p.9f). Mr. Folke Hilgerdt was first in presenting evidence for such a pattern. He showed that primary product prices had fallen for about 60 years preceding 1938 (League of Nations 1945 p.157). Later on the United Nations (1949) presented a study showing “[…] a secular decline in the terms of trade of primary products vis-à-vis manufactures over the period 1876-1938, and inferred a corresponding decline in the terms of trade of the ‘underdeveloped’ countries (constituting the South, or the Periphery)” (Sarkar 2001 p.311f). Later studies have also found significant results of deterioration in the TOT of LDCs (see for example, Erten 2011; Bloch & Sapsford 1997; Grilli & Yang 1988).

The reason why LDCs wouldn’t gain from trade in the present international trade system where formulated in the PS-hypothesis and can be divided into two mechanisms. One of these concerns the price elasticity of demand for primary products. Since the elasticity for these goods are presumed to be low, an increase in income gives little change in the demand. And in accordance with Engels law, which tells us that “[…] people tend to spend smaller percentages of their total income on food and other primary commodities as their incomes rise” (Oatley 2010 p.124), this implies that as income increases in the North, a decreasing share of its income will be spent on importing primary goods from the South (though in absolute values it might increase). At the same time when income in the South raises a larger share will be spent on importing manufactured goods from the North since the elasticity for these goods is higher. Singer (1950 p.479) thus claimed that these large price falls was not to be seen as cyclical but rather structural. This in turn yields a steady deterioration in the TOT of the primary-producing countries and the fruit of technological progress will to a large extent be transferred to the North due the inelasticity of demand for primary products (Sarkar 2001 p312).

This “demand mechanism” has been extensively researched and studies have shown that there indeed seems to be a lower price elasticity of demand for primary products then manufactured ones (Grilli & Yang 1988). In this paper however I try to, if thou not omit this mechanism, lay little focus on it since the research made on this particular mechanism is far more extensive then the “supply mechanism”.
### 2.2.1 The supply mechanism

The other mechanism causing deterioration in the TOT of the LDCs, concerns the specific labor market conditions within a country that in turn affects the distribution of technological achievements and productivity growth.

As this pattern of deterioration in the South’s TOT was presented, PS claimed that one reason for this was the difference of how technological advancements where distributed in the manufacturing producing North vis-à-vis the primary producing South. Prebisch stated that since,

> “[...] the [price]ratio actually moved against primary products in the period between the 1870’s and the 1930’s, it is evident that in the center the income of entrepreneurs and of productive factors increased relatively more than productivity, whereas in the periphery the increase in income was less than that in productivity” (Prebisch 1950 p.10).

In other words it was evident to Prebisch that technological advancements and productivity improvements in the North to a larger extent were transformed into higher wages for the producers in the North than what was the case in the South. In this way the already developed countries in the North kept the whole benefit of their productivity improvements. This while the technological achievements in the peripheral LDCs in the South mostly went to lowering prices on their commodities and because of this the South only transferred the “[...] share of the fruits of their own technical progress” (Prebisch 1950 p.10) to the North.

This was all due to the fact that labor market conditions were different in the North vis-à-vis the South. When an industry experiences technological progress the fruits of these can either be distributed towards the producer in the form of higher wages or to the consumer in the form of lower prices on the commodities (Singer 1950 p.478). In an economy where there is an abundance of low-skilled workers it would be easy for the firms to replace the worker with another. In combination with weak or even non-existing labor unions this renders the collective workforce to have a weak bargaining position against its employer. (Oatley 2010 p.123; Prebisch 1950 p.13) Given that firms are profit maximizing and hence will produce at the point where marginal cost is equal to marginal revenue, a decrease in marginal cost (from productivity growth) will reduce the price of the good all else equal. In economic jargon one might say that this type of labor market is characterized by perfect competition.

On the contrary an economy where labor is scare, firms need to compete for labor by increasing the wage in order to keep workers from switching jobs, or to attract new workers. This of course puts the workers in a strong position to bargain with firms. Furthermore, if the workers are highly organized trough labor unions their bargaining power trough collective force is likely to be much stronger. This market, characterized by imperfect competition, would
therefore transform a big part of its productivity improvements into higher wages for workers rather than lower prices on the commodities. Prebisch thus stated that,

"[t]he characteristic lack of organization among the workers employed in the primary production prevents them from obtaining wage increases comparable to those of the industrial countries and from maintaining the increases to the same extent. The reduction of income – whether profits or wages – is therefore less difficult at the periphery" (Prebisch 1950 p.13).

Since the wage rate in a country will be a determinant of its product price the North’s export goods (i.e. the South’s import goods) would continue to raise whereas the South would get less paid for their own exporting goods. This mechanism (which we label as the “supply mechanism”) established in the PS-hypothesis would therefore generate a less benefitting rate of exchange for the South, which could be seen in their TOT.

Nevertheless, this reasoning of course hinges on the assumption that a more rapid technological development actually is to be found in the North contrary to the South. In the case where the opposite were to be true, the experienced drop in price of the South’s primary products would only be natural according to, for example, the comparative advantage model. However, Singer clearly dismisses this option since “[a]ll the evidence is that productivity had increased if anything less fast in the production of food and raw materials, even in industrialized countries but most certainly in the underdeveloped countries[…]” (Singer 1950 p.477f).

To illustrate this supply mechanism, consider the following. ¹ Assume that there are only two countries (A and B) who trade with one another. Furthermore simplify by assuming that the only factor of production is labor (where country B’s labor supply can be said to be unlimited) and that both countries only produce two types of goods, one agricultural and one manufactured. One day’s production gives,

\[
\begin{align*}
\text{A: } 3 &= \text{ agricultural } & 3 &= \text{ manufactured (steel)} \\
\text{B: } 1 &= \text{ agricultural } & 1 &= \text{ manufactured (rubber)}
\end{align*}
\]

and the rate of exchange is 1 agricultural = 1 steel = 1 rubber. Now suppose that B experiences an increase in its agricultural productivity and are now able to produce 3 agricultural goods in one day. The rate of exchange is consequently altered to 3 = agricultural = 1 steel = 1 rubber. Country A will now be able to buy 3 agricultural goods for 1 steel but the wage of the workers in country B remains at the same level (1 manufactured). A productivity increase in B’s export-

¹ This framework is a modification of the work of Lewis (1954) dealing with so called unlimited supply of labor. In other words, how large abundances of labor affects the TOT for the LDCs in the event of productivity growth.
oriented agricultural sector then causes a lowering of the rate of exchange (i.e. TOT). It will of course also benefit B if they also where a buyer of food, but since they aren’t this productivity increase mainly benefits country A.

If on the other hand the manufacturing industry in B would become more productive, wages would rise correspondingly. This for two main reasons: i) since the replaceability in the agricultural sector is high due to the nature of the low-skilled work, it can be said that there is an unlimited supply of labor for that industry. Whereas the manufacturing industry mostly demands high-skilled workers, the ability to replace workers is low because a higher wage is needed to keep them in the industry. Furthermore, ii) since the manufacturing industry in the LDCs presumably is the import-competing sector and hence supplies its goods to the domestic market and in others words operates in a closed economy, this doesn’t directly effect the TOT but merely raises the average wage level making it more profitable to work in the import-competing sector, forcing the export-oriented sector to push up wages. The producers and consumers can in a closed economy be seen as identical and “[…] the two methods of distributing the fruits of technical progress appear merely as two formally different ways of increasing real incomes” (Singer 1950 p.478).

This model could therefore be used to explain how an abundance of labor would cause the TOT to deteriorate due to the fact that productivity increases in the export-oriented agricultural sector is transformed to lower prices for the consumers, or in other words the North. From this we can formulate a hypothesis that: *the larger the abundance of labor, the lower the terms of trade will be.*

However, this process could possibly be altered if the workers in the export-oriented sector where organized trough strong labor unions. Given that the firms wouldn’t substitute its entire workforce at once, a collective threat from the unions for strikes or termination would enable them to push up wages and hence transform the productivity improvements to their benefit. Studies show that workers with union membership tend to earn about 15 - 20 percent more then workers who are not members of some union (Borjas 2010 p.446f). Interestingly enough, for some countries, this wage gap also tends to widen in periods of high unemployment and narrow during periods of economic expansion (Pencavel & Hartso 1984). Thus we can expect that even in countries where there is an abundance of labor, a strong union would indeed foster higher wages. Hence we can formulate a second hypothesis, that; *the stronger labor unions, the higher the terms of trade.*

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2 This is also one of the reasons why a country like Sweden for example, has made a habit of letting the export-oriented industry serve as guideline for wage negotiations for other industries in a collective bargaining round. This so called “industrial agreement”, which was singed in 1997, has indeed to a large extent fulfilled its purpose and kept wage increases at a moderate level. For an excellent overview of the rather unique Swedish wage bargaining model see Erixon (2010, 2011)
This however can seem counterintuitive, especially when dealing with “easy replaceable” low-skilled workers. Labor union strength might fall when unemployment rises due to the fact that the supply of labor is high and therefore there would be stark competition over the jobs at hand. People might also be leaving the union since they no longer have a job. This would indeed weaken the unions bargaining strength and consequently lead to lower wage increases. This type of interaction lets us formulate a third hypothesis, that; **the larger the abundance of labor, the lower the terms of trade as labor union strength declines.**

### 3. Data and operationalizations

As was described above, the PS-hypothesis explicitly infers the deterioration of TOT for primary producers to LDCs. However, wanting to examine the “supply mechanism” of the PS-hypothesis we need to analyze data, not only on the TOT, but also for variables that would function as a valid indicator of labor supply and union strength. As with any kind of quantitative research the main problem however tends to be a lack of data for the specific variables of interest. This issue of data scarcity also tends to be even more so significant in the study of LDCs. The less developed or industrialized a country is the scarcer the data appears to be. Nevertheless we are heading down a dangerous path if we start to formulate our research questions depending on the data available to us.

In this section I begin by examining the data and discuss the sample used in the empirical examination. Furthermore I inspect and discuss the operationalizations made on the dependent-, independent- and the control variables (all of which are summarized in Appendix I).

#### 3.1 Data

The dataset contains information on 74 countries during a period of 31 years (1980 – 2010). All and all this gives us a possible 2294 observations. All data is collected via the World development indicators published by the World Bank (2011b) with exception of the data on labor union membership and number of people in lockouts or strikes that are accessed through the International Labour Organization (ILO 2011b, 2011c). However, the panel-dataset has a number of unfilled gaps in the different variables, which in turn leads to a decrease in the number of complete and useful observations.

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3 If these observations aren’t missing at random but instead is based in part on the error term in a regression a sample selection bias might arise leading to an inconsistency and bias in our OLS estimator (Stock & Watson p.364f).

4 In order to avoid perfect multicollinearity in the regressions one needs to exclude one year (1980). This actually gives us a number of 2220 potential observations for all the 74 countries.
As our research question narrows down to examine how TOT is affected by labor supply and union strength in LDCs we undoubtedly need to specify which countries could be characterized as “less developed”. In order not to fall into detailed descriptions along different classifications of different countries we have merely classified a LDC as a country which is listed by the World Bank (2011b) as either a “Low income”- or “Low-middle income” country (henceforth labeled as “LIC” respectively “LMIC”). From this we generate two different samples.

Sample 1, which consists of 8 countries with a number of 99 observations, is used in some direct effect models and the interaction models (see specification in section 4.1). Due to scarcity of data on primarily union membership rates, which functions as a proxy for union strength (see section 3.2.2), sample 1 unfortunately only consists of LMICs. Therefore, in order to try to broaden the sample to also include LICs I generate an alternative sample based on another indicator for union strength, namely the number of people in strikes or lockouts. This congregates sample 2, which in turn consists of 15 countries with a number of 141 observations. The samples are listed in Appendix II. One should however be careful when trying to compare the results between the models where different samples are being used.

3.2 Operationalization of variables

In order to be able to evaluate the hypotheses formulated in section 2.2, we need to find reasonable and relevant indicators that could “make numbers” out of the dependent-, independent- and the potential control variables used. Here follows a brief elaboration on the variables used in the study.

3.2.1 Dependent variable

TOT - The dependent variable used is as mentioned earlier the NBTT which is an index used to measure the value of a country’s exports compared to its imports. Depending on which of the two samples that are used the distribution of the dependent variable varies a bit. Figure 3.1a illustrates the distribution of the variable TOT in sample 1 and figure 3.1b in sample 2. The distribution in sample 2 is slightly more skewed, however no real large outliers can be found and we can therefore assume that the dependent variable is normally distributed.
3.2.2 Independent variables

Unemployment – The study uses unemployment rates as a proxy for the available supply of labor (i.e. the abundance of labor) in a specific country. The theory section led to believe that an abundance of labor would indeed keep wages at a constant rate since the worker demanding a higher wage could easily be replaced by another one, willing to work for less. Therefore the unemployment rate of a country can be a measure of the number of people who would be willing to be that replacement.

As with any proxy variable, this operationalization might not be without its flaws. A person who doesn’t have employment and is actively looking for work are usually characterized as unemployed. Many people have however actually given up looking for a job and hence per definition isn’t unemployed since they have left the labor force. Nevertheless, they might be willing to take up on a job offer if it were presented to them. This is what is most often referred to as the discouraged worker effect. Given this effect one might suspect that the unemployment rates, which in our case is supposed to reflect the excess of labor supply, is biased downwards and therefore do not represent the true availability of capable labor. One might also suspect that this feeling of “hopelessness” of getting a job, creating the discouraged worker effect, might be more substantial in LICs (as opposed to LMICs). Thus creating an even bigger downward bias in our estimate.

The data is probably also more likely to suffer from measurement errors in LICs. Both due to the fact that the collecting and reporting of data are rather uncommon in these countries and the appropriate framework and methods might not have been used in the approximations. This might therefore give raise to some inaccuracy in the data reported. It is also possible that the data’s impartiality from political propaganda might be of concern and false-reporting might be a
problem. These measurements errors could therefore create a lot of “noise” in the regressor on behalf of the “signal” and therefore this variable may cause our estimates to suffer from a potential attenuation bias. Despite these potential problems the unemployment rate can very well function as a valid proxy for the abundance of labor as long as these concerns are properly dealt with in the final analysis.

Membership – Our main variable for measuring union strength are the actual labor union membership rates for each specific country and it’s measured in logarithms in order to be able to analyze percentage changes instead of nominal. This indeed can be a good proxy of the collective force and strength of the union (ILO 2011a p.2). However it’s important to understand the limitations of this kind of operationalization, as it doesn’t really tell us the unions actual influence and bargaining power in the specific labor market. In some countries where the union density is relatively low, the terms of employees can still to a large extent be set by collective bargaining and therefore “[t]rade union density rates should always be interpreted within the particular political and social context and according to the legal and institutional framework” (ILO 2011a p.2). However such context-based analysis are often difficult to make in large-N quantitative studies.

Moreover, there are discrepancies in sector specification among the reported membership rates for different countries. While some countries report the number of trade union members for the entire work force, some merely report it for the public- or private sector. The data is therefore “[…] not directly comparable between countries” (ILO 2011a p.3, authors emphasis).

As Prebisch (1950 p.13) rather explicitly referred to the lack of organization among the primary procuring industry when deliberating on this problem, this can become problematic as the data in no way shows the sector composition of the unionization. It’s therefore possible, or perhaps even probable, that the union membership isn’t equally divided among the manufacturing- and primary sector. A worst-case scenario would be that we mistake these membership rates as representing the workers in the primary sector, while it in fact could to a extent actually reflect the unionized manufacturing workers. We would then regress the union strength of the manufacturing sector on the TOT instead of the primary product sectors union strength/weakness, as asserted by Prebisch as the main problem (1950 p.13). This issue is further addressed in section 5.

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5 This is nevertheless a general problem when dealing with large sets of data, especially from LDCs, and should therefore be taken to account on all the variables reported by the countries them self’s.

6 For a more detailed analysis of the trade-off between the number of entities vs. properties, often referred to as the ”ladder of abstraction”, see Mair (2011 p.186-192).
Strike - Due to the lack of data on trade union membership rates and in order to try to increase and broaden the sample used in our study, we’ve specified an alternative proxy for union strength. That is the number of people in strikes or lockouts during a year in each country which is examined in logarithmic values in order to, rather then observing nominal changes, study percentage changes.

Rather then showing the union strength per se, one might argue that this variable shows the collective strength of all workers (unionized or not). This measurement then somewhat deviates from our original proposition of weak or strong unions and it might not be as good of a proxy as Membership. However the data isn’t as scarce as with the membership rates (see Appendix I).

3.2.3 Control variables

Agemployment – Since the hypothesis clearly deals with LDCs with large primary production, we should also control for that being the case so we don’t end up examining countries where the manufacturing sector actually dominates. This is done by controlling for the percentage employed in agriculture of total employment in a country. This can therefore function as an indicator of the importance of the primary-producing sector in a country.

In line with the PS-hypothesis we would certainly expect a large agricultural employment to be negatively correlated with TOT. This however doesn’t seem to be the case. When Agemployment is regressed on TOT (with fixed effects) we find a slight positive correlation between the two (see figure 3.3). The estimate on 0.334 is also significantly different from zero at the 1 percent level with a p-value of p>0.008. This doesn’t however necessarily need to discard the PS-hypotheses altogether since this regression probably suffers from other omitted variables and therefore might also change when conditional on other variables.
Figure 3.3 – Regression of Agricultural employment on TOT

Note: The regression as shown in figure 3.3 is based upon the available observations for all countries. It contains a number of 424 observations spread out over 57 countries. However the figure excludes three observations for display purposes where tot > 600. These observations however don’t change the estimate significantly.
Source: World Bank (2011b)

Agexport – An alternate way to control for the importance of the agricultural export sector is done by controlling for agricultural raw materials exports as a percentage of merchandise exports. As Singer (1950 p.474) points out, the agricultural sectors importance for trade can be overestimated by looking at the total number of employed in that sector since the productivity in that sector tends to be rather low. The estimate of the importance and dominance of the agricultural sector when looking at its contribution to the total merchandise exports might therefore be a less biased.

4. Empirical examination

This section contains a presentation of the estimation method and the different models used to measure the “supply effect” in the PS-hypotheses. Moreover I present and interpret the results obtained by the models.

4.1 Model specification

The statistical method used is ordinary least squares (OLS) and the regressions are made with fixed entity- and time effects in order to avoid omitted variable bias (OVB). The purpose of the time fixed effect (FE) is to control for the unobserved variables that change over time but are constant across different countries. The entity FE controls for unobserved variables that varies
from one entity to another but do not change over time (Stock & Watson 2011 p.396-402). A fictive example of the entity FE is illustrated in figure 4.1 where we have a number of observations from two countries. In figure 4.1a we haven’t taken into account that the countries are different from each other. When treating them as the same entity, a strong positive correlation between X and Y is found. However this is comparing apples with oranges since it could be a variety omitted of variables within the entity’s that from this pattern. When treating them as two separate entities and controlling for FE in (figure 4.1b), the correlation between X and Y doesn’t exist for neither of them.

In order to be able to establish a casual relationship between the dependent and independent variables one needs to fulfill the criteria of the least square assumptions. Apart from the possible threats to our study’s internal validity mentioned in section 3 (attenuation bias and sample selection bias) some further elaboration should be made regarding other possible threats to the conditional mean independence (CMI) assumption. The CMI assumption tells us that in order to get an unbiased OLS estimate the error term has to have a conditional mean of zero given all values of \( t \) of \( x \) given a specific entity (Stock & Watson p.404). This in turn implies that the estimate will not be submitted to OVB. OVB is always of great concern to researchers and as was stated above, the measures taken to avoid this is first of all to include variables that might be omitted. Moreover, as the study uses panel data I’m able to avoid OVB by using FE regressions.

Another concern might be that our study possesses simultaneous causality bias, meaning that the hypothesized causality goes in both directions or actually is reversed. In other words that, a
lower TOT would cause unemployment to raise and labor union strength to decrease. These concerns are further disused in section 5.

The data is examined through three slightly different baseline models where two of them are designed to measure the direct effect of an abundance of labor and union strength. The other one measures the marginal effect of an abundance of labor a on the TOT for different levels of union strength. As was mentioned in section 3 the abundance of labor is measured by the variable *Unemployment* and used in all three models. Union strength is primarily measured with the variable *Membership* but also tested with the alternative proxy *Strike* in some of the direct effect models. Important to notice is however that models 5 to 7 aren’t directly comparable with the others since the sample is different. The models are specified as accordingly.

<table>
<thead>
<tr>
<th>Model name</th>
<th>Model specification</th>
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<tbody>
<tr>
<td>Direct effect model</td>
<td>( \text{Tot} = \beta_1 \text{Unemployment}<em>{it} + \beta_2 \text{Membership}</em>{it} + \alpha_i + \lambda_t + \text{Controls}<em>{it} + \nu</em>{it} )</td>
</tr>
<tr>
<td>Direct effect model (regression 5-7)</td>
<td>( \text{Tot} = \beta_1 \text{Unemployment}<em>{it} + \beta_2 \text{Strike}</em>{it} + \alpha_i + \lambda_t + \text{Controls}<em>{it} + \nu</em>{it} )</td>
</tr>
<tr>
<td>Interaction model</td>
<td>( \text{Tot} = \beta_1 \text{Unemployment}<em>{it} + \beta_2 \text{Membership}</em>{it} + \beta_3 (\text{Unemployment} \ast \text{Membership})<em>{it} + \alpha_i + \lambda_t + \text{Controls}</em>{it} + \nu_{it} )</td>
</tr>
</tbody>
</table>

Note: The sample being used in the models are indicated by *= Sample 1 **= Sample2

Where \( \alpha \) is the entity FE, \( \lambda \) time FE, \( \beta \) the estimated coefficient of the variable and \( \nu \) the error term.

A further issue that needs to be addressed is whether we are to expect serial correlation among the variables at hand and how in that case this should methodologically be handled. If the error process can’t be seen as uncorrelated within units over time, i.e. that a prior value of \( X \) in part determines the next, this should be accounted for. This is to some extent done by using FE-regressions and since we don’t know how big of a concern serial correlation might be we desist from clustering the standard errors in our main empirical analysis. However in Appendix III, the results from each model can be found with clustered standard errors.

4.2 Results

The first two hypotheses, developed in section 2.2, that an abundance of labor (here measured as unemployment rates) and weak labor unions (measured by the number of members in labor unions, or alternately, the number of people in strike/lockout during a year) will correlate with low TOT are examined with several “direct effect” models (see table 4.2). The third hypothesis
that higher unemployment leads to lower TOT as labor union strength declines is evaluated in the interaction models (see table 4.3).

4.2.1 Direct effect models

In the first direct effect model (1) the effect of Unemployment on TOT, though moving in the hypothesized direction, isn’t significantly different from zero. Only when the percentage of the population working in the agricultural sector (Agemployment) is added in model 2, we are able to find some significance of an effect, however only at the 10-percent level. This potential effect of -1.102 points on the TOT of a percentage point increase in Unemployment is nonetheless of major impact on the TOT.

Model 1 and 2 however estimates a statistically significant effect at the 5-percent level of Membership on the TOT. A percentage point increase in union membership (i.e. union strength) appears to correlate with about an 8- to 10-point higher TOT. In other words, as unions become stronger and more influential it appears as if this can have positive effects on the TOT for LDCs, just as the PS-hypothesis foresaw. This effect on the TOT is also a reasonably large one, given that many of the LDCs to start with have relatively low membership rates and that an increase might be relatively “easy” to obtain. A sturdy increase in union strength thus seem to have a big positive impact on the TOT of LDCs and in a sense it appears as if strong unions will make it more beneficial for the LDC to trade. This indeed also implies that if unions are weak in LDCs, it will put them in a much less beneficial position to trade with other countries. The reason probably being, as identified in section 2, since they won’t be able to transform the productivity increases to higher income but rather to lower prices, making it less profitable to sell their goods.

The findings in model 3 suggest however that when controlling for agricultural raw materials exports as a percentage of merchandise exports (Agexport), there is a positive correlation to the TOT of 1.88 (significant at the 5-percent level). This finding can at first seem to contradict the PS-hypothesis of deterioration in the TOT of countries with large primary production, also since the recently noted positive effect of union strength on the TOT disappears. However we find a weak indication (significant at the 10-percent level) in model 2 that a high level of agricultural employment (Agempolyment) could be negatively correlated with the TOT. This difference in the estimates of Agexport and Agempolyment indicates that the two variables might not be as good of a substitute to one another as was first thought (see section 3.2), but rather should be seen as complements in our analysis. While the variable Agexport might very well reflect the importance of the agricultural sector in a country it doesn’t tell us much about the
productivity in the sector. And as was showed earlier in section 2.2 this is of rather big importance for how the labor market will function. Therefore it would be suitable to control for both the magnitude and dependence of the agricultural sector (in the form of \(\text{Agexport}\)) as well as for its productivity (in the form of \(\text{Agemployment}\)).

By controlling for both \(\text{Agemployment}\) and \(\text{Agexport}\) in model 4 the effect of union strength on the TOT re-emerge. An increase in \(\text{Membership}\) is now estimated to have a statistically significant positive effect on the TOT by 7.75 points. Moreover, the correlation between high levels of agricultural employment and lower TOT is now significant at the 5-percent level and estimated to -0.731. This while the significant correlation between \(\text{Agexport}\) and TOT remains and slightly increases. The R-squared value, which indicates how good the model is at explaining the variation in the dependent variable (TOT), is relatively high and estimated to 0.556.

As was mentioned in section 3.1 however, sample 1 merely consists of countries that by the World Bank are classified as LMICs. Hence the sample might not reflect the actual population of LDCs as was proclaimed by PS as being the ones exposed to deterioration in TOT. Since the scarcity of union membership data is rather large we substitute the variable \(\text{Membership}\) for the alternative proxy variable \(\text{Strike}\), in an attempt to broaden the sample to include more LICs. Now the number of observations is 141, spread out over 15 different countries (see Appendix II). However 12 out of 15 of the countries in sample 2 are though still LMICs and over 90 percent of the observations are for LMICs.

We find no significant effect of union strength on the TOT and the effect of an abundance of labor appears to be as uncertain as in our earlier models and at best significant at the 10-percent level. As was stated in section 3.2 the variable \(\text{Strike}\) is however a rather weak proxy for union strength as it essentially measures the number of people in strikes and lockouts. The workers in strikes needn’t to be organized by labor unions and hence this variable could very well merely reflect a more generally unstable labor market. Moreover, the R-squared values in the models 5 to 7 are much lower then in their equivalent models with the variable \(\text{Membership}\). This also indicates that the variable \(\text{Strike}\) is less suitable for explaining the variation in the TOT. Therefore it probably isn’t the different samples that are causing the relation between union strength and TOT to vanish but rather the \(\text{Strike}\) variable’s inability to function as a proxy for union strength.

In conclusion there appears to be some evidence in validation of the hypothesis formed in section 2.2 that the stronger the unions, the higher the TOT in LDC’s. Also in compliance with our theoretical illustration in section 2.2, this relationship might first and foremost be found in
Table 4.2 – Direct effect models

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
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<tr>
<td>Unemployment</td>
<td>-0.921</td>
<td>-1.102*</td>
<td>-0.229</td>
<td>-0.368</td>
<td>-1.910*</td>
<td>-2.034*</td>
<td>-1.889*</td>
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<td></td>
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<td>(0.633)</td>
<td>(0.497)</td>
<td>(1.137)</td>
<td>(1.143)</td>
<td>(1.129)</td>
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<td>9.937**</td>
<td>5.510</td>
<td>7.750**</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>(3.848)</td>
<td>(3.900)</td>
<td>(3.973)</td>
<td>(3.803)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strike</td>
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<td></td>
<td>-1.824</td>
<td>-1.896</td>
<td>-2.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-1.857)</td>
<td>(-1.874)</td>
<td>(-1.958)</td>
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<tr>
<td>Agemployment</td>
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<td>-0.731**</td>
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<td>157.2***</td>
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<td>(48.91)</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>1</td>
<td>1</td>
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<td>2</td>
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<td>99</td>
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<td>141</td>
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<tr>
<td>R-squared</td>
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<td>0.513</td>
<td>0.556</td>
<td>0.317</td>
<td>0.321</td>
<td>0.319</td>
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<td>8</td>
<td>8</td>
<td>8</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Robust standard errors are in parentheses. The level of significance is labeled *= 10-percent level, **= 5-percent level, ***= 1-percent level.

countries where the productivity in the agricultural sector is low. We find however no solid evidence for any direct effect on the TOT of an abundance of labor (as measured by *Unemployment*) and hence the hypothesis that large abundances of labor would render in lower TOT, cannot be said to have been validated.

### 4.2.2 Interaction models

As discussed in section 2.2 we suspect that an abundance of labor and union strength could work in interaction with one another. The hypothesis formulated was that the larger the abundance of labor, the lower the TOT as labor union strength declines.

To model this kind of conditionality upon other variables we allow for interaction between the variables *Unemployment* and *Membership*. In this way we are able to estimate the marginal effect of an increase (or decrease) in the unemployment rate on the TOT for different levels of union strength. For example, if the estimated coefficient on the interaction variable ($\beta_3$) is positive this implies that the effect on the TOT of a percentage point increase in unemployment is greater...
for each level of union strength (given that the effect is positive to begin with) (Stock & Watson 2010 p.324). The marginal effect could thus be specified as,

\[
\frac{\partial TOT}{\partial Unemployment} = \beta_1 + \beta_2 \text{Membership}
\]

(2)

A common pitfall however when interpreting interaction variables, as acknowledged by Brambor et al. (2006), is that the “face-value” of the independent variables presented in the result table merely gives useful information when the conditioning variable is binary. However when the variable is continuous, and as in our study doesn’t have any values of 0, the estimates of the conditional independent variables becomes unsubstantive. The coefficient on Unemployment only captures the effect of Unemployment on TOT when the variable Membership is equal to zero and similarly the coefficient on Membership only captures the effect of the interaction variable when Unemployment is equal to zero (Brambor et al. 2006 p.72). And since this never is the case, a mere “face-value” in a result table doesn’t tell us much. Also, since the real effect of the independent variables varies, so does the standard errors and thereby default its respective significance level. Consequently the significance of the estimate must be evaluated for each and every point (Ibid.). All this of course implies that the estimates presented in table 4.3 should be handled with caution and in a framework these concerns are taken into account.

In model 8 the effect of an abundance of labor (as measured by the variable Unemployment) is estimated to -28.08 and significant at the 1-percent level (see table 4.3). This vast discrepancy in the effect of Unemployment on the TOT between the interaction models and the direct effect models in table 4.2 can seem confusing at first. However, the estimated coefficients of the variables in the direct effect models are average effects, whereas the coefficients on Unemployment and Membership in the interaction models are the effect when the conditional variable is equal to zero. Therefore the variable of interest is first and foremost the interaction variable (Unemployment*Membership), where its coefficient helps us estimate the marginal effect of Unemployment on the TOT given different values of Membership (see equation 2).

Model 8 estimates the coefficient on the interaction variable to be 2.091 and significant at the 1-percent level. What this tells us is that the negative effect of an abundance of labor on the TOT decreases by 2.09, as labor unions strength increases. For example, when Membership=2 the marginal effect of Unemployment on the TOT is -23,898 rather then -28,08 as the face-value in the result table implies.\(^7\) In other words, it appears as if an abundance of labor has a smaller effect

\(^7\) To see this look at the results from regression 8 in table 4.3 and apply them in equation 2 where the marginal effect at different values of Membership is presented as \(\beta_1 + \beta_2 \text{Membership}\). When Membership=2 this gives us
Table 4.3 – Interaction models

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(8)</th>
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<th>(10)</th>
<th>(11)</th>
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<tr>
<td>Unemployment</td>
<td>-28.08***</td>
<td>-26.62***</td>
<td>-23.73***</td>
<td>-20.41***</td>
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<tr>
<td></td>
<td>(7.369)</td>
<td>(7.665)</td>
<td>(6.433)</td>
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<td>(7.832)</td>
<td>(8.278)</td>
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</tr>
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<td>-0.489</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.348)</td>
<td>(0.348)</td>
<td></td>
</tr>
<tr>
<td>Ageexport</td>
<td></td>
<td></td>
<td>1.017</td>
<td>1.305</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.797)</td>
<td>(0.861)</td>
</tr>
<tr>
<td>(Unemployment*Membership)</td>
<td>2.091***</td>
<td>1.970***</td>
<td>1.785***</td>
<td>1.525***</td>
</tr>
<tr>
<td></td>
<td>(0.554)</td>
<td>(0.573)</td>
<td>(0.487)</td>
<td>(0.499)</td>
</tr>
<tr>
<td>Constant</td>
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<td>304.6***</td>
<td>279.0***</td>
<td>242.6***</td>
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<td>Observations</td>
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</table>

Note: Robust standard errors are in parentheses. The level of significance is labeled *= 10-percent level, **= 5-percent level, ***= 1-percent level.

on the TOT as unions become stronger. Likewise, the negative effect of an abundance of labor becomes more severe, the weaker the unions are.

Controlling for Agemployment and Ageexport the estimates of the coefficients on both Unemployment and (Unemployment*Membership) decreases but still remains significant at the 1-percent level. In model 11 the coefficient on interaction variable (Unemployment*Membership) is estimated to 1.525, which in turn suggests that the marginal effect of an abundance of labor doesn’t decline as fast as for example model 8 indicated. The marginal effect of Unemployment on the TOT in the different interaction models are illustrated with 95-percent confidence intervals in figure 4.1 and their respective slopes could be found by looking at the estimated coefficient of the interaction variable (Unemployment*Membership) in table 4.3. When reading the figures from left to right we clearly see a pattern where weaker unions increases the negative effect that an abundance of labor has on the TOT (however so does the uncertainty of the precision of the estimate). Our third hypothesis as formulated in section 2.2, that the larger the abundance of

\[-28.08 + 2.091 \times 2 = -23.898\]. Likewise, when Membership=3, the marginal effect of Unemployment on the TOT decreases by yet another 2.091 (\(-28.08 + 2.091 \times 3 = -21.807\)).
Figure 4.1 – Marginal effect of Unemployment on TOT as Membership changes (regression 7,8,9,10)

a)  

b)  

c)  

d)  

Source: World Bank (2011b) and ILO (2011b) in own regressions

labor, the lower the TOT would be as labor union strength declines, could to some extent be seen as validated. In all the interaction models the marginal effect of unemployment on TOT is significantly different from zero for each point examined (see figure 4.1). The estimated decrease or increase of the effect of abundance of labor on the TOT as union strength decreases/increases is estimated to lie somewhere between 2.091 and 1.525. This give us reason to believe that, as stated in our third hypothesis in section 2.2, an abundance of labor indeed might have deteriorating effect on the TOT as labor union strength declines.

5. Conclusions

Prebisch (1950) and Singer (1950) argues that primary producing LDCs will suffer from a structural deterioration in their TOT over time. In part this is due to the fact that as LDC’s often have large abundances of labor as well as weak labor unions, the technological
achievements and productivity increases made within the country will convey into lowering prices for the consumers (i.e. the North) instead of raising the income of the producers (i.e. the South). Performing OLS-regressions with fixed effects using a sample from 74 LDCs over a period of 31 years (1980 – 2010) the study finds some evidence indicating that an abundance of labor and weak unions in LDCs indeed can have a negative effect on the TOT.

The estimates indicate that the direct effect of stronger unions (measured as percentage increases in the number of members) correlates with about a 7 to 9 point higher TOT. In other words it appears as if stronger unions will generate more beneficial terms for trade for the LDC’s since the ratio between their import and export prices (i.e the TOT) will move in their favor. This relationship seems to mainly be valid for LDC’s where the productivity in the agricultural sector is low.

Furthermore, the study finds no conclusive evidence that an abundance of labor (measured as unemployment rates) have any significant direct effect on the TOT of the LDCs. However, in interaction with union strength it appears as if the TOT is to a great extent negatively affected by a large abundance of labor, and as labor unions grow weaker the negative effect seems to increase. The marginal effect of an abundance of labor when union strength (again as measured by the number of members) increases by one percent is estimated to have a large negative effect on the TOT by about 25.989 – 18.885 points. However as unions become stronger this effect seems to diminish by about 2.091 to 1.525 for every percentage increase.

As in any quantitative study however, the availability of data is crucial in order to produce credible results and it’s apparent that this issue is especially prevailing in the study of LDCs. Due to the severe scarcity of data we have reason to believe that the study may lack external validity to all LDCs. This since full observations only was available for about 5 percent of the “population” and therefore the sample couldn’t be fully randomized. Moreover, since the data most likely isn’t missing at random, but are correlated with the error term, sample selection bias might be of a concern as well as possible errors in variable bias, due to for example false reporting. This might cause an attenuation bias and create a downward bias in our estimates. The conclusions furthermore somewhat hinges on the assumption that the data on union membership represents an accurate composition of the unionization in the agricultural sector and not only represents the unionized workers in the manufacturing sector. Unfortunately, we have no way of knowing if that is the case.

In order to fully confirm the PS-hypothesis that an abundance of labor and weak labor unions will cause deterioration in the TOT, the direction of the causality must be fully established since principally it could be the case that lower TOT triggers the economic conditions to worsen
and the unemployment to raise and labor unions to weaken. The study can’t however fully exclude the possibility of reversed causality and I believe that there indeed most likely is some simulations causality present regarding the relationship between TOT, the abundance of labor and union strength. This simulations causality bias may however be able to avoid in future research using regressions with instrumental variables.

Nonetheless, our main results indicate a negative correlation between a low TOT-index and large abundances of labor as well as weak labor unions. There lies however a methodological concern in how possible serial correlation should be properly dealt with. This study’s methodological strategy has been approaching this by using entity FEs without clustering the standard errors since we don’t know how big of a problem serial correlation might be. This methodological issue needs however to be further addressed in future research in order produce reliable results.8

It’s apparent that a major concern in the research of LDCs is the severe scarcity of data. To not be able to acquire data on such crucial economic indicators such as unemployment for these countries makes it of course explicitly difficult to study the economic conditions and reality they are facing. It is therefore of vital importance for enabling future research that the collection of data of economic indicators of the LDCs improves. Here lies a great responsibility in such public institutions as the World Bank, IMF, ILO etcetera. Not until these obstacles are overcome can we expect to accurately measure and describe the real problems facing the LDCs.

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8Models with clustered standard errors are included in Appendix III.
References

Printed Sources


Data sources
International Labour Office (2011a), Social Dialogue Indicators

International Labour Office (2011b),

International Labour Office (2011c),
http://laborsta.ilo.org/STP/guest

World Bank (2011a),
http://data.worldbank.org/indicator/TT.PRI.MRCH.XD.WD

World Bank (2011b),
http://databank.worldbank.org/databank/download/WDIandGDF_excel.zip
### Appendix I – Summary of variables

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<th>Variable</th>
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<th>Mean</th>
<th>Std. Dev.</th>
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<th>Max</th>
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### Appendix II – Samples

**Sample 1**

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<td>Syrian Arab Republic</td>
<td>5</td>
<td>LMIC</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>99</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Sample 2**

<table>
<thead>
<tr>
<th>Country</th>
<th>Obs.</th>
<th>Income group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>7</td>
<td>LIC</td>
</tr>
<tr>
<td>Bolivia</td>
<td>5</td>
<td>LMIC</td>
</tr>
<tr>
<td>Cambodia</td>
<td>2</td>
<td>LIC</td>
</tr>
<tr>
<td>Egypt</td>
<td>18</td>
<td>LMIC</td>
</tr>
<tr>
<td>El Salvador</td>
<td>22</td>
<td>LMIC</td>
</tr>
<tr>
<td>Haiti</td>
<td>1</td>
<td>LIC</td>
</tr>
<tr>
<td>Honduras</td>
<td>2</td>
<td>LMIC</td>
</tr>
<tr>
<td>India</td>
<td>2</td>
<td>LMIC</td>
</tr>
<tr>
<td>Indonisea</td>
<td>8</td>
<td>LMIC</td>
</tr>
<tr>
<td>Morocco</td>
<td>12</td>
<td>LMIC</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>2</td>
<td>LMIC</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1</td>
<td>LMIC</td>
</tr>
<tr>
<td>Pakistan</td>
<td>17</td>
<td>LMIC</td>
</tr>
<tr>
<td>Philippines</td>
<td>29</td>
<td>LMIC</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>13</td>
<td>LMIC</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>141</strong></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix III

### Direct effect models with standard errors clustered at the country level

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment</td>
<td>-0.921</td>
<td>-1.102</td>
<td>-0.229</td>
<td>-0.368</td>
</tr>
<tr>
<td></td>
<td>(1.320)</td>
<td>(1.231)</td>
<td>(0.674)</td>
<td>(0.471)</td>
</tr>
<tr>
<td>Membership</td>
<td>7.911</td>
<td>9.937</td>
<td>5.510</td>
<td>7.750</td>
</tr>
<tr>
<td>Agemployment</td>
<td>-0.581</td>
<td>-0.731**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.360)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agesexport</td>
<td></td>
<td>1.880**</td>
<td>2.123***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.591)</td>
<td>(0.565)</td>
</tr>
</tbody>
</table>

(Variance*Membership)

| Constant | 13.87      | 15.15     | 18.34     | 20.53     |
|          | (88.41)    | (94.38)   | (80.53)   | (84.13)   |

| Entity FE | Yes       | Yes       | Yes       | Yes       |
| Time FE   | Yes       | Yes       | Yes       | Yes       |
| Observations | 99        | 99        | 99        | 99        |
| R-squared | 0.458     | 0.478     | 0.513     | 0.556     |
| Number of countries | 8         | 8         | 8         | 8         |

### Interaction models with standard errors clustered at the country level

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment</td>
<td>-28.08*</td>
<td>-26.62*</td>
<td>-23.73*</td>
<td>-20.41</td>
</tr>
<tr>
<td></td>
<td>(13.40)</td>
<td>(13.69)</td>
<td>(12.25)</td>
<td>(13.43)</td>
</tr>
<tr>
<td></td>
<td>(15.38)</td>
<td>(16.32)</td>
<td>(13.94)</td>
<td>(15.76)</td>
</tr>
<tr>
<td>Agemployment</td>
<td>-0.344</td>
<td></td>
<td>-0.489</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.384)</td>
<td></td>
<td>(0.379)</td>
<td></td>
</tr>
<tr>
<td>Agesexport</td>
<td></td>
<td>1.017</td>
<td>1.305</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.746)</td>
<td>(0.890)</td>
<td></td>
</tr>
<tr>
<td>(Unemployment*Membership)</td>
<td>2.091*</td>
<td>1.970</td>
<td>1.785*</td>
<td>1.525</td>
</tr>
<tr>
<td></td>
<td>(1.017)</td>
<td>(1.042)</td>
<td>(0.934)</td>
<td>(1.023)</td>
</tr>
<tr>
<td>Constant</td>
<td>321.7</td>
<td>304.6</td>
<td>279.0</td>
<td>242.6</td>
</tr>
<tr>
<td></td>
<td>(202.0)</td>
<td>(209.9)</td>
<td>(184.0)</td>
<td>(204.5)</td>
</tr>
</tbody>
</table>

| Entity FE | Yes       | Yes       | Yes       | Yes       |
| Time FE   | Yes       | Yes       | Yes       | Yes       |
| Observations | 99        | 99        | 99        | 99        |
| R-squared | 0.574     | 0.584     | 0.590     | 0.608     |
| Number of countries | 8         | 8         | 8         | 8         |

**Note:** Clustered standard errors are in parentheses. The level of significance is labeled *= 10-percent level, **= 5-percent level, ***= 1-percent level.