

EFFECTS OF TRADE OPENNESS ON UNEMPLOYMENT RATE: EVIDENCE FROM SELECTED LEAST DEVELOPED COUNTRIES (LDCS)

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Abstract

Trade openness may create new jobs or reduce the existing ones. Hence, the effects of trade openness on unemployment rate are obvious but the nature and strength of the effects are found to be different in literature. In this study, we aim to unveil the effects of trade openness on unemployment rate in 12 Least Developed Countries (LDCs) for a period of 1995 to 2016 by following the Least Squares Dummy Variable Corrected (LSDVC) panel estimation method which corrects the probable bias of using small cross-sectional units. Some economic indicators like inflation, real interest rate, government stability and two labor market indicators namely labor market regulation and labor freedom index are also taken into account. Trade openness is found to increase the unemployment rate which prevails true when alternative measures are used. Also, previous year's unemployment rate increases current unemployment rate. Inflation and real interest rate are found to have insignificant impacts. But labor market regulation and labor freedom significantly influence unemployment rate while the former increases and the later decreases the rate of unemployment. Moreover, the interactive effects of trade openness and labor freedom imply that trade openness may reduce the unemployment rate at higher level of labor freedom. Hence, LDCs should adopt more flexible labor market regulations and improved labor freedom to get the beneficial effects of trade openness on unemployment.

Keywords : *Least Developed Countries (LDCs), LSDVC Method, Trade Openness, Unemployment Rate.*

1. INTRODUCTION

International trade is advantageous as it brings welfare gains for the countries involved in trade. Because of scale economics, international trade leads to the concentration of production in one place. International trade, therefore, ensures efficiency gains through international specialization (Krugman, 1980). Gains from trade arise from many different channels and economies can benefit differently because of their diversity. Higher economic integration through increased international trade exposure has implication for the labor market too. It is commonly believed that trade leads to the destruction of traditional jobs and thereby give rise to significant unemployment. Empirical research find that trade openness affects the equilibrium rate of unemployment; but the conclusions are inconclusive as the sign of the

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relationship differs. According to Bernard et al. (2007), trade openness may increase job turnover in the short run by reallocating labor from shrinking to expanding sectors. While evidence suggests temporal rise of frictional unemployment at the aggregate level due to trade liberalization (Trefler, 2004), how the trade liberalization affects the equilibrium rate of unemployment in the long-run is less clear. Most of the theoretical studies in this area have provided different explanations for international trade. The analytical framework of the theoretical models is mostly based on comparative advantage model and product differentiation model (Felbermayr, 2011a). By incorporating minimum wages into Heckscher-Ohlin models, Brecher (1974) and Davis (1998) find that trade liberalization has an exacerbating effect on unemployment. In contrast, Davidson et al. (1988, 1999) introduce frictional unemployment in the comparative advantage models. Their analysis reveals that the sign of the relationship between trade openness and unemployment level depends on the capital-labor endowments of the countries. Dutt et al. (2009) in their study find strong and robust evidence of the negative association between unemployment and trade openness. On the other hand, Egger and Kreickemeier (2009) assert that trade liberalization can increase unemployment based on a model in which fair wages was introduced with increasing returns to scale. An unemployment reducing effect of trade openness is revealed by Felbermayr et al. (2011b) in which they incorporate search frictions into a similar trade model. Again, Helpman and Itskhoki (2010) in a study find that globalization can increase unemployment. As such, the extant literature does not provide any conclusive result about the impact of trade openness on unemployment. Rather, the effects of trade openness on unemployment are found to vary in both magnitude and direction across individual countries, regional or income group of countries. It justifies the need for further investigation on the nature of relationship between trade openness and the unemployment rate. Moreover, there is dearth of study focusing the impact of trade openness on unemployment in least developed countries (LDCs).

Given the backdrop, this study focuses on Least Developed Countries (LDCs) which are structurally most handicapped group of economies and are plagued with several problems. These countries together account for 13.24 percent of world population-where unemployment is considered as a serious problem for a significant portion of the population. Although LDCs constitute only a meager share of global merchandise trade (1.4 percent), increasing global effort (through various packages offered through negotiation round in WTO for LDCs) is observed to promote the participation of least developed countries in the world trade. Over the years, the economies in LDCs have become more liberalized in terms of trade. This study aims to investigate whether trade openness increases or decreases unemployment for a group of 12 LDCs using data over the period of 1995-2016.

The rest of the paper is organized as follows. The next section reviews the existing literature about the impact of trade on unemployment followed by the econometric model, data and estimation methodology adopted in this study. Findings and analysis are represented in section 4. Finally, the paper ends with a concluding remark.

2. LITERATURE REVIEW

Extant literature discusses several theoretical models that explain the effect of trade on aggregate unemployment. Nevertheless, researchers did not reach to any consensus whether an increase in trade will lead to a higher or lower aggregate unemployment rate. Numerous empirical evidences demonstrate that trade contributes to the reduction of unemployment by improving the economy-wide value of the marginal product of labor. Dutt et al. (2009) investigate the relationship between unemployment and trade openness for a group of developing countries for a period of 1985-2004 and find that unemployment and trade openness are negatively related across those countries (cross-section analysis) as well as within the countries (panel analysis). They reasoned that trade openness contributes to the reduction of unemployment by creating more jobs and job search. In line with that, Felbermayr et al. (2011b) conduct their analysis on the search-unemployment model with heterogeneous firms as outlined by Dutt et al. (2009) and assert that unemployment may reduce as a result of trade liberalization provided that trade liberalization improves aggregate productivity. This may happen due to the crowding-out of the least productive firms and labor reallocation into more productive firms. Matusz (1996) argue that trade results in a greater division of labor due to an increase in the variety of available intermediates. This fact leads to the reduction of unemployment rate through the improvement in the economy-wide productivity.

Felbermayr et al. (2011a) perform panel data regressions for 20 OECD countries for a period of 1983-2003 and cross-section regressions for 62 countries for a period of 1990-2007, using openness as a trade measure. After controlling for the endogeneity of the trade measures, business cycle effects, and a host of institutional and geographical setting, they document a robust empirical regularity: higher trade openness results a lower structural rate of unemployment in the long run. They assert that the decline in unemployment is largely driven by lower unemployment among skilled workers. Using a panel regression for 20 OECD countries over the period 1983-2003, with 5-year averages to mitigate business cycle concerns, and a real measure of openness, they find that a 10-percentage point increase in total trade openness reduces aggregate unemployment by about 0.76 percentage point. With a larger set of cross-sectional data in 62 countries, using averages of variables over 1990-2006 to control for the business cycle and for lower quality of data, they find that a 10-percentage point increase in trade openness reduces unemployment by 1 percentage point. Extending their analysis for a large sample panel regression, Felbermayr et al. (2011a) further finds that an increase of trade openness by 10 percentage points lowers unemployment by 0.78 percentage points. Using a more reliable Sys-GMM method, they find support in favor of their earlier findings: in the short-run , an increase of 10 percentage points of the trade openness results in the reduction in equilibrium unemployment by 0.55 percentage points, whereas increase in trade openness by 10 percentage point leads to a 0.8 percentage point decrease in unemployment in the long run. Hence, these findings are robust to the choice of sample or the estimation strategy.

Again, investigating 10 Arab countries for a period of 1991-2012, Awad and Yussof (2016) find that trade liberalization contributes to the reduction of unemployment only in the long run, whereas it worsens unemployment in the short run. Using labor force survey data from India, Hasan et al. (2012) analyze the relationship between trade liberalization (using trade protection data) and unemployment both at a state and industry level. State-level analysis finds that overall unemployment on average does not have any relationship with average protection over time and across states. However, they find that trade liberalization contributes to the decline in urban unemployment in states with flexible labor markets and high employment shares in the net export sectors. On the other hand, in their analysis based on industry level protection, they did not find any evidence that workers in industries are likely to be unemployed due to the larger reduction in protection. Based on their findings, Hasan et al. (2012) support for trade liberalization along with necessary reforms in domestic policy. The full benefits of trade liberalization can only be reaped if domestic labor market is adequately reformed. Bernard et al. (2007) also find that trade liberalization increases labor turnover in the short run by reallocating labor from shrinking to the expanding sector. It thereby increases productivity in the economy and generates higher income.

On the contrary, Helpman and Itskhoki (2010) argue that trade openness, through lower trade barriers, increases unemployment. This is because reduced trade barriers improve the profitability of exporting firms, thus leading to an expansion of the trading sector. Unemployment will increase when workers reallocate towards the exporting sector, if the exporting sector is characterized by labor market frictions to a larger extent. Again, Janiak (2006) shows that higher trade exposure is associated with a higher level of equilibrium unemployment. It can be attributed to the fact that job destruction by the exit of small low-productivity firms exceeds job creation by large high-productivity firms.

Empirical research provides support to the theoretical framework too. Investigating in Nigeria, Nwaka et al. (2015) found that trade openness policy induced unemployment during the period under investigation. The authors recognize weak institutions, low level of infrastructure and occasional crisis as the responsible factors which put adverse effect on resource utilization in Nigeria. These factors in turn hamper economic activity and dampen output productivity in Nigeria, thereby failing to generate ample scope for employment. Revenga (1992) examining the employment effects of trade liberalization for a panel of 38 manufacturing industries reveals that a 1 percent decline in import prices contributes to an employment loss of a magnitude between 0.24 percent and 0.39 percent. Similarly, many other country-specific empirical studies uphold the negative impacts of trade openness on unemployment (see for example, Attanasio et al., 2004; Menezes-Filho & Muendler, 2007).

The effect of trade on aggregate unemployment has been found to be ambiguous (see e.g., Sener, 2001; Moore & Ranjan, 2005). While few researchers argue that demand for skilled labor will increase, at the same time, few others argue that due to trade

liberalization, the frictional unemployment rate of unskilled workers will increase. In reflection to that, Moore and Ranjan (2005) conclude that aggregate unemployment is likely to decrease in a skilled-labor abundant country and increase in an unskilled-labor abundant country.

Again, Cahuc and Zylberberg (2014) point to the fact that the impact of trade on unemployment may be less clear-cut when labor markets differ across trading partners. Labor market institutions often vary significantly among countries. Also, frictions in the labor market can impede a rapid adjustment of employment. These facts made it hard to resolve the trade model with asymmetric countries. Kim and Sun (2009) examine the effects of changes in trade policy initiated by the North American Free Trade Agreement (NAFTA) on labor market churning by using two econometric methods. Using Ordinary Least Square regression method, where tariff and non-tariff barriers are used as a proxy for trade openness, they find that there is significant effect on labor market churning in automotive, chemicals and apparel industries due to the introduction of NAFTA. This is surprising as tariffs and non-trade barrier increased churning in some industries in one hand, but on the other hand tariffs and non-trade barrier reduced churning in others. While using difference-in-difference methodology, they find no evidence of increased churning in the labor market.

Also, the size of the countries matters in explaining the influence of labor market frictions in relation to trade. Felbermayr et al. (2013) show that economies that are relatively large and open to international trade are harmed more by their own labor market frictions. On the other hand, smaller and more open economies are hit relatively harder by foreign labor market frictions and less by their own. This is because of an income effect: when a country's domestic demand falls due to high unemployment (i.e., larger labor market frictions), so must its demand for foreign goods. The larger the country (and the lower the trade barriers), the stronger the effect on trade partners. This is not the case for small, open economies whose labor market has little impact on trade partners, and hence on its ability to export.

Labor market regulations might influence the impact of international trade on unemployment (Helpman & Itskhoki, 2010; Kim, 2011; Felbermayr, 2013). Trade acts as a vehicle through which the labor market in one country can affect unemployment in its trading partners. When unemployment increases in one country, because of higher tax wedge on labor or other detrimental institutional settings, domestic income falls, and this also hurts trading partners.

In summary, it can be argued that while the existing economic literature discusses the effects of trade on employment through a large number of studies, messages emerge from those studies are somewhat conflicting. The only general conclusion that can be drawn from there is that the effects of trade openness on employment depend on a large number of country-specific factors. Moreover, a major limitation of the extant literature is that most studies of trade and employment refer to manufacturing employment, with little indication of whether their results can be generalized to agriculture or services, or anywhere outside the formal sector (Hoekman & Winters; 2005).

3. DATA AND METHODOLOGY OF THE STUDY

3.1 Variable Descriptions

3.1.1 Unemployment Rate

Unemployment rate is used as a dependent variable which is defined as total unemployment as percentage of total labor force. That is, it represents the share of total labor force that have no work but actively looking for work and data has been collected from International Labor Organization, ILOSTAT database.

3.1.2 Trade Openness Measures

A widely used measure of the degree of trade liberalization is ‘trade openness’ (Coe & Helpman, 1995; Dinopoulos & Thompson, 2000; Alcalá & Ciccone, 2004) as it reflects the actual exposure of an economy to international trade and is easily measurable. Total exports, total imports or exports as percentage of GDP and imports as percentage of GDP have been often used as a measurement of trade openness. Also, total trade volume which is the summation of total exports and imports of goods and services is a good indicator of trade openness. Trade openness is often defined as nominal trade openness which is obtained by imports (current US \$) plus exports (current US \$) relative to nominal GDP (current US \$). World Development Bank use trade (% of GDP) as a measure of trade openness of a country which is the sum of exports and imports of goods and services measured as a share of gross domestic product. However, the Balassa-Samuelson effect distorts nominal price openness measure (Alcalá & Ciccone, 2004). In this context, they suggest to use real openness which helps to remove cross-country differences in the relative price of non-traded services from the nominal trade openness measure. Following Alcalá and Ciccone (2004), this study uses real trade openness to fulfill its objectives. Then real trade openness is calculated by dividing the sum of exports and imports of goods and services by GDP (constant 2011 US\$). Real trade openness data are obtained from World Bank (International Comparison Program Database).

3.1.3 Other Explanatory Variables

The equilibrium rate of unemployment in a country might be affected by many institutional variables. Omission of these variables may lead us to omitted variable bias. These institutional variables consist of employment laws that govern individual employment contract, and collective or industrial relations laws that regulate the bargaining, adoption, and enforcement of collective agreements, the organization of trade unions, and the industrial actions by workers and employments. We use the ‘labor market regulation index (LMR)’ provided by Economic Freedom of the World (2019). Labor Freedom Index is a measure of job flexibility, relaxation, adjustment etc. We include LFI as another control variable in our regression provided by the Economic Freedom of the World (2019). To represent the size of total available working people, we control for total labor force participation rate (LFPR) which is defined as total labor force participation rate as percentage of total population ages 15-64 (modeled ILO estimate). Data on LFPR is collected from WDI.

Political instability has been found to affect the economic growth of a country. As such, political stability may be considered responsible for the spread of unemployment. To capture the effects of political instability, this study employs an indicator for Government Stability (GOV) from the International Country Risk Guide (ICRG) group database. Also, inflation measure (INF)-consumer price index (CPI) and real interest rate are used as proxy to assess the performance of a given country in relation to economic management.

Although the relationship between Unemployment rate and GDP has been established by Okun's law, we did not include GDP or GDP growth as a separate variable. Because in computing trade openness we have divided total exports and imports by GDP and trade openness and GDP might be highly correlated leading the endogeneity problem.

3.2 Sample Size

Countries in least developed countries are heterogeneous with respect to their size and socio-economic characteristics. Therefore, the selection of homogeneous countries is very difficult. As well as there are lots of missing data for several variables among these country groups. Initially this study chooses to incorporate 28 developing countries as recognized by United Nations. But due to unavailability of data on some variables we had to drop 16 countries. Therefore, our sample consists of data for 12 least developed countries for the period of 1995-2016. In this study, we selected countries based on two criteria. First, we incorporate countries in our sample which are member of the WTO since membership in WTO may influence the implementation of the trade policies in the corresponding country. Second, in constructing our panel, we also considered the fact that the data representing trade policies, economic indicators, labor market indicators and others are available and sufficient.

Table 1 : Summary of the Descriptive Statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
Unemployment Rate	264	4.91	2.76	0.299	11.71
Trade Volume (Log)	264	21.67	1.34	18.46	25.15
Trade (% GDP)	264	58.11	17.01	26.08	118.1
Nominal Trade Openness	264	20.54	8.33	7.39	51.29
Real Trade Openness	264	18.91	8.84	5.51	53.19
Real Interest Rate	209	24.72	97.78	-29.22	1158.03
Inflation	237	6.93	9.91	-3.5	83.33
Government Stability	264	8.18	1.68	3	11.08
Labor Force Participation Rate	264	71.67	10.87	47.65	90.34
Labor Market Regulation Index	190	5.52	1.66	2.31	9.24
Labor Freedom Index	144	53.45	15.14	21.9	88.1

From the above Table 1, it is clear that still there are some missing values. Data for unemployment rate, trade openness measurements, government stability and labor force participation rate are available for whole study period only for 12 countries. There are some missing values in some countries for some years for some variables namely real interest rate, inflation, labor market regulation and labor freedom. Hence, we have an unbalanced panel data set where number of countries (N=12) is less than number of years (T=22).

3.3 Econometrics Models and Methodology

3.3.1 Econometrics Models

For the purpose of the study, the following dynamic panel regression model needed to be estimated:

$$Unem_{i,t} = \beta_1 Unem_{i,t-1} + \beta_2 Trade\ Openness_{i,t} + \beta_3 Interest\ Rate_{i,t} + \beta_4 Inflation_{i,t} + \beta_5 Gov\ Stability_{i,t} + \beta_6 LFP\ Rate_{i,t} + \beta_7 LMR\ Index_{i,t} + \beta_8 LF\ Index_{i,t} + v_i + v_t + \varepsilon_{i,t} \dots\dots\dots (1)$$

This is the benchmark equation (1) where, the dependent variable is the unemployment rate at time t in country i. The lagged value of dependent variable appears as independent variable which is denoted by $Unem_{i,t-1}$. Three groups of variables are added namely trade openness variables, macroeconomic variables and labor market related variables. $Trade\ Openness_{i,t}$ denotes the real trade openness and $Interest\ Rate_{i,t}$ denotes the real interest rate at time t in country i. $Inflation_{i,t}$ is measured by the consumer price index in country i at time t. $Gov\ Stability_{i,t}$ stands for Government Stability and $LFP\ Rate_{i,t}$ stands for Labor Force Participation at time t for country i. The labor freedom index at time t for country i is represented by the variable $LF\ Index_{i,t}$. Finally, v_i , v_t and $\varepsilon_{i,t}$ in equation (1) represent country fixed effects, time (year) effects and error term respectively.

Again, as a robustness check, we use three alternative trade openness measures namely trade volume, trade (% GDP) and nominal trade openness in regression equation (1) which will be estimated three more times to observe the effects of these alternative measures on unemployment rate by controlling the same set of explanatory variables.

In order to find the interactive effects of trade openness and labor market indicators, the following equation (2) will be estimated which has been found by extending equation (1),

$$Unem_{i,t} = \beta_1 Unem_{i,t-1} + \beta_2 Trade\ Openness_{i,t} + \beta_3 Interest\ Rate_{i,t} + \beta_4 Inflation_{i,t} + \beta_5 Gov\ Stability_{i,t} + \beta_6 LFP\ Rate_{i,t} + \beta_7 LMR\ Index_{i,t} + \beta_8 Trade\ Openness * LF\ Index_{i,t} + v_i + v_t + \varepsilon_{i,t} \dots (2)$$

All of the variables remain same except the last independent variables, which represent the interactive effects of trade openness and labor freedom at time t in country i. The $LF\ Index_{i,t}$ has been dropped in order to avoid endogeneity problem.

3.3.2 Methodology of the Study

The model includes lagged unemployment rate as one independent variable which might be correlated with disturbances terms. So, the simple panel data models namely Pooled OLS, Fixed Effect and Random Effect models are inappropriate here since they might estimate bias results known as “dynamic panel bias”. (Nickell 1981; Bond 2002). Increasing sample size or increasing independent regressors

would not work to reduce the bias and the severity of this bias rises error terms. A number of efficient and robust estimation methods could mitigate the endogeneity problem such as Anderson and Hsiao's (1982) Instrumental Variable (IV) method and the difference Generalized Methods of Moments (GMM) method proposed by Arellano and Bond (1991). Both of these methods use first difference approach. Also, the system GMM methods developed by Blundell and Bond (1998) in which lagged dependent variables and other endogenous variables are instrumented is also good dynamic panel data model. Both of these GMM estimators are better than IV estimators in the sense that later could not utilize all sampling information (Baltagi, 2005). According to Roodman (2009) the number of panel or cross-sectional units (N) should be greater than number of time periods (T) and lagged values of dependent variable should appear as one of separate regressors. The system GMM estimators are more efficient than difference estimators since the lag levels are instrumented in the later one while both lagged levels and lagged differences are instrumented in the former method (Blundell & Bond, 1998).

It seems that these two GMM methods are good candidates to serve the purpose of the current study. But the efficiency of estimators obtained through IV, difference GMM and system GMM methods depend on the validity of the underlying assumptions of these methods and Bruno (2005b) warned that serious bias might result by using these methods if the number of panel units are small. The more efficient estimators than the IV and GMM estimators could be estimated by applying least square dummy variable (LSDV) method and hence the 'bias corrected LSDV method (LSDVC) should be used (Judson & Owen, 1999; Kiviet, 1995, 1999). The proposed LSDVC technique by Kiviet (1999) and Bun and Kiviet (2003) is applicable for correcting bias for balanced panel data model. Bruno (2005a, 2005b) improves the LSDVC technique to correct bias approximation in unbalanced panel data framework. According to Bruno 2005a, "the bias approximations are accurate with a decreasing contribution to the bias of the higher order terms". The author also concluded that the bias approximation improved LSDVC for unbalanced panel data model and the findings remain similar to the findings of Bun and Kiviet (2003) and bias might be increased if T has been sacrificed to tackle the unbalanced data for any given period and units. By doing Monte Carlo experiments, Bruno (2005b) concluded that in case of unbalanced and small cross section units, LSDVC estimators are more efficient than estimators obtained through IV and GMM methods.

In this study, data has been collected for 12 Least Developed Countries over the period of 1995 to 2016. That is, the number of cross-sectional units (N) are 12 countries and number of time periods (T) are 22 years. As well as data for some variables such as Labor Freedom, Labor Market Regulation, Government stability and Real Interest Rate could not be found for all years for all countries. It means we are dealing with an unbalanced panel data. Therefore, this study decides to apply the LSDVC panel estimation method of Bruno (2005a, 2005b) since it generates efficient estimators, deals with the problems of autocorrelation and heteroskedasticity and reduces the biases due to small cross section units used in this study. Bruno (2005b) represented the initialization of correcting bias by using Instrumental Variable (IV) and the difference Generalized

Methods of Moments (GMM). The author also represented the use of bootstrapped standard error with 100 to 300 replications and correction order from one to three. In case of LSDVC initialized by Anderson and Hsiao's (1982) methods, the standard errors and p-values could not be computed. Because of these reasons and following the study by Gozor (2013), this study attempts to initialize the bias corrections using the Arellano and Bond's (1991) dynamic panel GMM methods; bootstrapped standard errors with replications; and correction order up to three. Since lagged values of dependent variable appear as separate explanatory variable while using Arellano and Bond's (1991) methods, it is normal to expect the first order autocorrelation among the error terms and instruments but there should not be any second order autocorrelation among them. Also, the assumptions of validity of overidentification restrictions should be ensured. Thus, we need to find AR (1) and AR (2) test for first and second order autocorrelation tests respectively and Sargan test for overidentification restrictions.

4. EMPIRICAL RESULTS AND ANALYSIS

4.1 Effects of Real Trade Openness

The regression equation (1) has been estimated by applying the LSDVC methods developed by Bruno (2005a, 2005b) and represented in the column (II) of Table-2. The p-value of AR (1) is 0.02 which indicates that there is first order autocorrelation. And the p-value of AR (2) is 0.21. As a result, we fail to reject the null hypothesis of no second order autocorrelation. Also, the null hypothesis of the validity of overidentifying restrictions could not be rejected since p-value of Sargan test is greater than 0.05. Therefore, the estimated estimators obtained through LSDVC of Bruno (2005a & 2005b) are not mis-specified and they are ready for interpretation.

Table 2 : LSDVC Dynamic Regression Results

(I)	(II)
Explanatory Variables	Dependent Variable: Unemployment Rate
Lagged Unemployment Rate	0.94 (0.000) ***
Real Trade Openness	0.03 (0.02) **
Inflation	0.004 (0.78)
Real Interest Rate	-0.07 (0.368)
Government Stability	-0.07 (0.201)
Labor Force Participation Rate	0.15 (0.017) **
Labor Market Regulation Index	0.29 (0.069) *
Labor Freedom Index	-0.05 (0.002) ***
Observations	116
Sargan Test (Prob > chi2)	0.83
AR (1) (Pr > z)	0.02
AR (2) (Pr > z)	0.21

Notes: the p-values are represented in parenthesis. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

In column (2) of Table 2, the persistence of unemployment rate is observed. The lagged unemployment rate is positively related to current unemployment rate. Real trade openness is found to be significantly increasing the unemployment rate in selected 12 LDCs supporting the hypothesis depicted by Helpman and Itskhoki (2010). This might be due to the fact that LDCs are endowed with unskilled labor relative to skilled labor. And trade openness helps to decrease skilled unemployment but lead to increase in unskilled unemployment (Moore & Ranjan, 2005). In this era of globalization, it is neither expected from LDCs nor possible for these countries to restrict trade in order to reduce their unemployment rate. Rather, LDCs should emphasize on -(i) how trade openness could open more employment for unskilled workers; (ii) how unskilled workers can become more skilled and (iii) how trade openness accompanied with other policies could mitigate this unemployment exacerbating effects of trade. Inflation, real interest rate and government stability do not have any significant effects on Unemployment rate. Labor force participation rate is significantly increasing unemployment rate. The economic intuitions behind the positive association between labor force participation rate and unemployment rate are logical. Labor force participation rate is defined as percentage of total population willing to work and unemployment rate is percentage of total labor force who are actively looking for job but don't get any job. So, if percentage of people willing to work increases and very few or no new job have been created, it is likely that unemployment will also rise. Increased labor market regulation is found to increase unemployment rate at 10% level of significance. But increased level of labor freedom reduces unemployment rate and this result is highly statistically significant.

4.2 Robustness Analysis of the Results

In order to analyze the robustness of the estimated findings, alternative measures of trade openness have been taken into account. The regression equation (2) is estimated three times by using three alternative measures of trade openness such as total trade volume, trade as percentage of GDP (WDI measures) and nominal trade openness and results are shown in column (II), column (III) and in column (IV) of Table 3, respectively.

Table 3 : LSDVC Dynamic Regression Results for Robustness Test

(I)	(II)	(III)	(IV)
Explanatory Variables	Dependent Variable: Unemployment Rate		
Lagged Unemployment Rate	0.92 (0.00) ***	0.95 (0.00) ***	0.94 (0.00) ***
Trade Volume (ln)	0.63 (0.022) **		
Trade (% GDP)		0.01 (0.009) **	
Nominal Trade Openness			0.03 (0.018) **
Inflation	0.003 (0.839)	-0.01 (0.535)	0.004 (0.772)
Real Interest Rate	-0.005 (0.483)	-0.01 (0.24)	-0.007 (0.368)
Government Stability	-0.07 (0.259)	-0.07(0.262)	-0.08 (0.21)
Labor Force Participation Rate	0.13 (0.002) ***	0.16 (0.011) **	0.14 (0.022) **

Labor Market Regulation Index	0.28 (0.090) *	0.27 (0.090) *	0.29 (0.069) *
Labor Freedom Index	-0.05 (0.003) ***	-0.05 (0.002) ***	-0.05 (0.002) ***
Observations	116	116	116
Sargan Test (Prob > chi2)	0.81	0.86	0.84
AR (1) (Pr > z)	0.02	0.02	0.02
AR (2) (Pr > z)	0.21	0.22	0.21

Notes: the p-values are represented in parenthesis. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

In all cases we could observe that there are first order autocorrelation and no second order autocorrelation. As well as the p-value of Sargan test in all cases could not reject the validity of overidentifying restrictions. Therefore, all of these results are well specified. Looking at the column (II), the trade volume significantly increases the unemployment rate. Similarly, trade expressed as percentage of GDP is also found to be significantly increasing unemployment rate as shown in column (III). Finally, nominal trade openness which is measured at current prices are also increasing unemployment rate as shown in column (IV). All of these results are highly statistically significant. The sign or direction of the effects of trade openness on unemployment rate remain same in alternative measures of it but with different magnitudes.

4.3 Interactive Effects of Trade Openness and Labor Market Indicators

As mentioned in section 4.1, LDCs should focus on to identify how trade openness combined with other policies or variables could reduce its bad impacts on unemployment. Labor market indicators are good candidates to serve this purpose. The estimated regression equation (2) are represented in column (II) of the following Table 4.

Table 4 : LSDVC Dynamic Regression Results Including Interactive Effects of Trade Openness and Labor Market Indicators

(I)	(II)
Explanatory Variables	Dependent Variable : Unemployment Rate
Lagged Unemployment Rate	0.96 (0.000) ***
Real Trade Openness	0.10 (0.000) ***
Inflation	0.002 (0.893)
Real Interest Rate	-0.01 (0.19)
Government Stability	0.06 (0.047) *
Labor Force Participation Rate	0.22 (0.001) ***
Labor Market Regulation Index	0.22 (0.186)
Real Trade Openness*Labor Freedom	-0.002 (0.002) ***
Observations	116

Sargan Test (Prob > chi2)	0.81
AR (1) (Pr > z)	0.03
AR (2) (Pr > z)	0.22

Notes: the p-values are represented in parenthesis. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Like previous cases, there are first order autocorrelation but no second order autocorrelation and overidentifying restrictions are proved as valid by the Sargan test.

In column (II) of Table 4, while the interaction variable of trade openness and labor freedom has been added, the direction and significance level of all variables remain more or less similar to previous case with little changes in the magnitude of effects. The main conclusion from column (III) is that, real trade openness significantly increases unemployment rate. This adverse effect of real trade openness could be mitigated if it is combined with greater labor freedom as represented by the coefficients (-0.002) and significance level (1%) of interactive variable of real trade openness*labor freedom. These findings are similar to the findings of Kim (2011) who asserted that trade openness could reduce unemployment when labor markets are flexible in 20 OECD countries. Also, Hasan et al. (2012) made similar conclusion for India. Since, economies engaging in more open trade could be harmed by their own labor market frictions (Felbermayr et al., 2013), trade openness needs to be accompanied by flexible labor market and more labor freedom.

5. CONCLUSION

Ongoing studies suggested that there are strong significant impacts of trade openness on unemployment rate. But the directions of effects are found to be different in different countries and regions. This study contributes to the existing literature by analyzing the effects of trade on the unemployment in least developed countries for a period of 1995 to 2016 while controlling for other economic and labor market indicators. The major findings of the study are that trade openness increases unemployment rate in LDCs. This result remains robust while alternative measures of trade openness are used. As well as the current unemployment rate is increasing due to the existence of its previous rate which reflects that LDCs are suffering from vicious circle of unemployment. Although economic indicators like inflation, real interest rate, government stability are found to have insignificant effect, labor market indicators especially higher level of labor freedom is associated with lower level of unemployment. Also, unemployment rate tends to increase with strict labor market regulation. Even, trade openness which increases unemployment rate could reduce it if it is combined with higher level of labor freedom. Hence, this study suggests that LDCs should focus reconstruction of their labor market situations especially make labor market regulations flexible and increase labor freedom from existing situation. Finally, this study is not flawless. The findings are specific to sample used and study period only. Increasing the sample size by incorporating more country to fill up the missing data would produce some better findings in future.

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Appendix

Table A1 : List of Selected Countries from LDCs

Bangladesh, Gambia, Guinea-Bissau, Madagascar, Malawi, Mali, Niger, Senegal, Sierra Leone, Togo, Uganda, Zimbabwe

Table A2 : Variable Description and Sources of Data

Variable Name	Detail Definition and Measurements	Sources of Data
Unemployment Rate	Unemployment, total (% of total labor force)	International Labor Organization, ILOSTAT database
Trade Volume (Log)	Exports plus Imports of goods and services (current US\$)	World Bank national accounts data, and OECD National Accounts data files.
Trade (% GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank national accounts data, and OECD National Accounts data files.
Nominal Trade Openness	Exports Plus Imports divided by GDP, PPP (current US Dollars)	World Bank, International Comparison Program database.
Real Trade Openness	Exports Plus Imports divided by GDP, Purchasing Power Parity PP (constant 2011 US\$)	World Bank, International Comparison Program database.
Real Interest Rate	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.	International Monetary Fund, International Financial Statistics and data files using World Bank data on the GDP deflator.

Variable Name	Detail Definition and Measurements	Sources of Data
Inflation	Inflation, consumer prices (annual %)	International Monetary Fund, International Financial Statistics and data files using World Bank data on the GDP deflator.
Government Stability	Government Stability Index	International Country Risk Guide
Labor Force Participation Rate	Labor force participation rate, total (% of total population ages 15-64) (modeled ILO estimate)	World Development Indicators (WDI)
Labor Market Regulation	Labor Market Regulation Index	Economic Freedom of the World (EFW) 2019
Labor Freedom	Labor Freedom Index	Economic Freedom of the World (EFW) 2019