Applied Economics Letters
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rael20

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Published online: 03 Apr 2014.

To cite this article: Sherif Khalifa (2014): Direction of trade and wage inequality, Applied Economics Letters, DOI: 10.1080/13504851.2014.896976

To link to this article: http://dx.doi.org/10.1080/13504851.2014.896976

Applied Economics Letters, 2014
http://dx.doi.org/10.1080/13504851.2014.896976

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Direction of trade and wage inequality

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Contrary to the predictions of the 2 × 2 × 2 Heckscher–Ohlin model, empirical evidence shows that the skill premium increased in some developing countries and decreased in others after trade liberalization. Khalifa (2014) attempts to reconcile the empirical evidence with the theoretical predictions by introducing a theoretical set-up that includes the additional aspect of South–South trade. The model shows that South–South trade openness can cause the skill premium to increase in the Southern country that is relatively more skill abundant, and to decrease in the Southern country that is relatively less skill abundant. This article introduces an empirical analysis to test the theoretical predictions of Khalifa (2014) using threshold estimation techniques introduced by Hansen (1999). The results suggest the presence of a statistically significant skill abundance threshold, below which the estimate of the coefficient of the relationship between South–South trade openness and wage inequality is negative, and above which the point estimate is positive.

Keywords: trade liberalization; wage inequality

JEL Classification: F16; J31; O34

I. Introduction

The 2 × 2 × 2 Heckscher–Ohlin model predicts that trade openness induces countries to export the good that intensively uses the relatively abundant factor of production, and import the good that intensively uses the relatively scarce factor of production. Accordingly, skill abundant developed countries are expected to export the good that intensively uses skilled workers. This contributes to an increase in the relative price of the skilled-intensive good, a rise in the relative demand for skilled workers and consequently an increase in the skill premium. While skill scarce developing countries are expected to export the good that intensively uses unskilled workers. This contributes to an increase in the relative price of the unskilled-intensive good, a rise in the relative demand for unskilled workers and consequently a decrease in the skill premium. Theoretical predictions, however, are not supported by empirical evidence. Some developing countries experienced an increase in the skill premium, while others witnessed a decline after trade liberalization. The evidence is documented by Freeman and Oostendorp (2000), Hanson and Harrison (1995), Robbins (1996), Wood (1997) and Goldberg and Pavcnik (2004).

Khalifa (2014) attempts to reconcile the empirical evidence with the theoretical predictions by introducing a model where the direction of trade can produce the observed patterns of skill premia in the South. The theoretical set-up developed includes the additional aspect of South–South trade. The paper shows that South–South trade openness can cause the skill premium to increase in the Southern country that is relatively more skill abundant, and to decrease in the Southern country that is relatively less skill abundant.

This article introduces an empirical analysis to test the theoretical predictions of Khalifa (2014) using threshold estimation techniques introduced by Hansen (1999). The results suggest the presence of a statistically significant skill abundance threshold, below which the estimate of the coefficient of the relationship between South–South trade openness and wage inequality is negative, and above which the point estimate is positive. This implies that South countries with a relatively low level of skill abundance experience a decrease in the skill premium after trade openness with other South countries, while South countries with a relatively high level of skill abundance experience an increase in the skill premium after trade openness with other South countries. Thus, the empirical analysis provides evidence that supports the theoretical conclusion.

The remainder of the article is organized as follows: Section II includes the data description, Section III includes the empirical estimation and Section IV concludes. References, tables and figures are included thereafter.

II. Data

The estimation uses a balanced panel of annual data that covers the period from 1980 to 2000 for 25 developing countries, namely Algeria, Bangladesh, Bolivia, Cameroon, Chile, Colombia, Cyprus, Ecuador, Hong Kong, Hungary, India, Indonesia, Israel, Jordan, Korea, Malawi, Malaysia, Mauritius, Philippines, Poland, Senegal, Singapore, Sri Lanka, Uruguay and Zimbabwe. The variables used in the estimation are the skill premium, skill abundance, real GDP per capita and trade.

The skill premium or wage inequality data set used is compiled by the University of Texas Inequality Project. The original data comes from United Nations Industrial Development Organization (UNIDO) statistics, which provide average manufacturing pay by industry. From these average industrial wages, a Theil index of inequality is calculated and used in this analysis as a measure of wage inequality. Detailed definition of this variable is included in Galbraith and Kum (2005).

As a proxy for the relative supply of skilled labour, we follow Forbes (2001) in using the average years of total education in the population aged over 15 years, as reported in Barro and Lee International Data on Educational Attainment. As the data is available only for the years 1980, 1985, 1990, 1995 and 2000, we use linear interpolation to derive the years-in-between.

The data for real GDP per capita (Laspeyres) is extracted from the Penn World Tables 6.3, which is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. The given year components are obtained by extrapolating the 1996 values in international dollars from the Geary aggregation using national growth rates.

The data for trade flows, and the direction of trade, is extracted from the UN COMTRADE which is the pseudonym for the United Nations Commodity Trade Statistics Database. Reporter countries provide the United Nations Statistics Division with their annual international trade statistics data detailed by commodities and partner countries. Commodity values are converted from national currency into US dollars using exchange rates supplied by the reporter countries. The data that we use are the Standard International Trade Classification (SITC) rev.2.

III. Estimation

In this section, the proposition that trade openness between developing countries at different levels of skill abundance can cause some countries to experience a decrease in the skill premium, while others to experience an increase in the skill premium is tested empirically using threshold estimation techniques developed in Hansen (1999). The threshold estimation allows for an endogenous classification between countries based on the differences in their skill abundance. The threshold estimation model is given by

$$\text{Premium}_{it} = \begin{cases} \mu_i + \beta_1 \text{SouthSouth}_{it} + \phi_1 \text{SouthNorth}_{it} + \phi_2 \text{RGDP}_{it} + \phi_3 \text{Abundance}_{it} + e_{it} \\ \qquad \text{if Abundance}_{it} \le \sigma \\ \mu_i + \beta_2 \text{SouthSouth}_{it} + \phi_1 \text{SouthNorth}_{it} + \phi_2 \text{RGDP}_{it} + \phi_3 \text{Abundance}_{it} + e_{it} \\ \qquad \text{if Abundance}_{it} > \sigma \end{cases} \quad (1)$$

where the subscript i indexes the country and the subscript t indexes time. The dependent variable Premium_{it} denotes the skill premium in country i in year t. The variable SouthSouth_{it} is the share of South–South trade out of total trade in country i in year t. The variable SouthNorth_{it} is the share of South–North trade out of total trade in country i in year t. The threshold variable Abundance_{it} is a measure of skill abundance in country i in year t. The variable RGDP_{it} denotes real GDP per capita in country i in year t and is added to control for macroeconomic developments which might impact

wage inequality. The trade data is used instead of tariff data, as the analysis distinguishes between South–South trade and South–North trade. This distinction is made clear with trade data, but not with tariff data. In this context, we follow Forbes (2001, p. 180) in using trade flow data rather than tariffs or price data 'due to the difficulty in obtaining accurate measures of prices across countries and time.'

In this context, the observations are divided into two regimes depending on whether the threshold variable Abundance_{it} is smaller or larger than the threshold σ. The regimes are distinguished by differing regression slopes, β_1 and β_2. Therefore, the threshold regression model allows the level of skill abundance to determine the existence and significance of a threshold level in the relationship between South–South trade and wage inequality rather than imposing a priori an arbitrary classification scheme. The threshold skill abundance determines whether the coefficient on South–South trade openness is positive or negative. According to the predictions of the model, the coefficient β_1 is expected to be negative, while the coefficient β_2 is expected to be positive. As in Hansen (1999), another way of writing the equation of interest is

$$\begin{aligned}\text{Premium}_{it} = {} & \mu_i + \beta_1 \text{SouthSouth}_{it} I(\text{Abundance}_{it} \le \sigma) \\ & + \beta_2 \text{SouthSouth}_{it} I(\text{Abundance}_{it} > \sigma) \\ & + \phi_1 \text{SouthNorth}_{it} + \phi_2 \text{RGDP}_{it} \\ & + \phi_3 \text{Abundance}_{it} + e_{it}\end{aligned} \tag{2}$$

where $I(.)$ is the indicator function. A balanced panel annual data is used for 25 developing countries and cover the period from 1980 to 2000. Summary statistics of the variables used in the estimation are provided in Table 1. To determine the number of thresholds, the model is estimated by least squares allowing for zero, one, two and three thresholds. There is evidence that there are two thresholds in the regression relationship. For the remainder of the analysis, we work with the double threshold model as follows

$$\begin{aligned}\text{Premium}_{it} = {} & \mu_i + \beta_1 \text{SouthSouth}_{it} I(\text{Abundance}_{it} \le \sigma_1) \\ & + \beta_2 \text{SouthSouth}_{it} I(\sigma_1 < \text{Abundance}_{it} \le \sigma_2) \\ & + \beta_3 \text{SouthSouth}_{it} I(\sigma_2 < \text{Abundance}_{it}) \\ & + \phi_1 \text{SouthNorth}_{it} + \phi_2 \text{RGDP}_{it} \\ & + \phi_3 \text{Abundance}_{it} + e_{it}\end{aligned} \tag{3}$$

The point estimates of the two thresholds are 3.311120 and 6.236180, and their asymptotic 99% confidence intervals

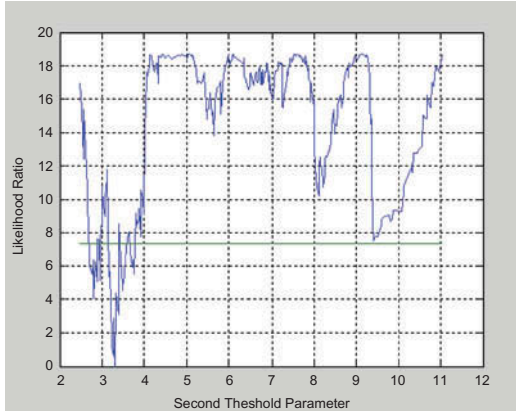

Fig. 1. Confidence interval construction in double threshold model (second threshold parameter)

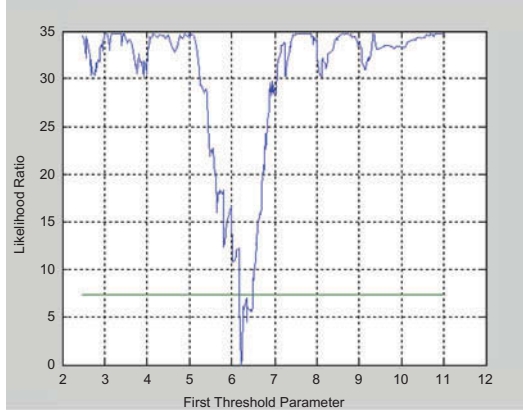

Fig. 2. Confidence interval construction in double threshold model (first threshold parameter)

Table 1. Summary statistics

	Minimum	25% quantile	Median	75% quantile	Maximum
Premium_{it}	0.003600	0.029700	0.049700	0.073700	0.278200
RGDP_{it}	824.165236	2668.607781	5178.874354	10432.726030	35 792.282790
SouthSouth_{it}	0.099401	0.277659	0.366735	0.502009	0.704429
Abundance_{it}	2.246700	4.768400	6.877080	8.293260	11.200600

Table 2. Regression estimates

Regressor	Coefficient estimate	OLS SE	White SE
$RGDP_{it}$	–0.000001	0.000000	0.000000
$Abundance_{it}$	0.013752	0.001809	0.002204
$SouthNorth_{it}$	–0.004883	0.000000	0.016087
$SouthSouth_{it}$ $I(Abundance_{it} \leq 3.311120)$	–0.002930	0.000000	0.009717
$SouthSouth_{it}$ $I(3.311120 < Abundance_{it} \leq 6.236180)$	0.041992	0.000000	0.005694
$SouthSouth_{it}$ $I(Abundance_{it} > 6.236180)$	–0.014648	0.000000	0.005524

are $[2.700200, 3.766260]$ and $[6.180420, 6.473540]$, respectively. More information can be learned from plots of the concentrated likelihood ratio function displayed in Figs 1 and 2. To examine the first-step likelihood ratio function, we see that the first-step threshold estimate is the point where the likelihood function equals zero, which occurs at $\sigma_1 = 3.311120$. Figure 2 shows the second threshold at $\sigma_2 = 6.236180$. The thresholds determine the average years of total education in the population aged over 15 years. This allows the comparison between countries below and above these threshold average years of education in terms of the response of their skill premium to trade openness.

The regression slope estimates, conventional OLS SEs and white-correlated SEs are reported in Table 2. All the coefficient estimates are strongly significant with conventional OLS and white SEs. Real GDP does not have a significant effect on wage inequality. Skill abundance has a positive impact on wage inequality with a coefficient of almost 0.013752. South–North trade has a negative impact on wage inequality, with a coefficient of -0.004883. The estimates of primary interest are those on South–South trade openness. South–South trade openness has a negative impact on wage inequality with a coefficient of -0.002930, if skill abundance is below the first threshold skill abundance. On the other hand, South–South trade openness has a positive impact on wage inequality if skill abundance is between the first and the second thresholds, with a coefficient of 0.041992. Above the second threshold skill abundance, the point estimate is insignificant. This can be explained as the countries with a high level of skill abundance are close to North countries in terms of educational attainment.

IV. Conclusion

This article introduces an empirical analysis to test the theoretical predictions of Khalifa (2014) using threshold estimation techniques introduced by Hansen (1999). The results suggest the presence of a statistically significant skill abundance threshold, below which the estimate of the coefficient of the relationship between South–South trade openness and wage inequality is negative, and above which the point estimate is positive. This implies that South countries with a relatively low level of skill abundance experience a decrease in the skill premium after trade openness with other South countries, while South countries with a relatively high level of skill abundance experience an increase in the skill premium after trade openness with other South countries.

Acknowledgement

I thank Firat Demir and Sherine El Hag. Remaining errors are my own.

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