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FACTORS DETERMINING GOVERNMENT TO INTRODUCE NATIONAL ECO-LABEL SCHEME: Case Study of Pakistan Trade Partners 1994-2014

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Abstract

The impressive environmental performance of the Blue Angle as a national eco-label scheme of Germany motivated other countries to introduce their own national eco-label schemes. However, there are various factors which determine a country's government to introduce a national eco-label scheme. This paper investigates factors which compel government to introduce a national eco-label scheme. Panel logit regression is conducted using data from 53 countries that are Pakistan's trade partners from 1994 to 2014. The main findings indicate that the probability for a government to introduce a national eco-label scheme is positively related to the economic growth, government integrity, population, R&D expenses, high technology exports, manufacturing tariff, number of type I and type II eco-labels, and per capita CO_2 emissions. Whereas the probability for a government to introduces a national eco-label scheme is negatively related to economic freedom, export performance, and net trade.

Keywords: National Eco-Labels, Environmentally Friendly Products, Government, Pakistan, Trade Partners, Panel Logit Regression.
JEL Classification: Q560, Q580.

I. Introduction

Eco-labels are seals of approval assigned to environmentally friendly products. These are the ISO provided schemes assigned to environment friendly products which meet the criteria satisfied by the eco-label awarding authority [UNOPS (2009)]. A wide range of eco-labels is being used around the World. Currently, 463 eco-label schemes in 25 types of industry sectors exists in 199 countries of the World [Big Room Inc (2016)]. There are three types of eco-labels such as; Type I, Type II, and Type III. Type I eco-labels [ISO-(14024)] are voluntary, multiple cri-

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teria based, government supported, and third-party schemes that award a license to authorizes the use of environmental labels on products indicating the overall environmental performance of a product within a particular product category based on life-cycle considerations. Type II eco-labels [ISO (14021)] consisting of one-sided informative environmental claims made by manufacturers, importers or distributors and refer to specific attributes of products. Type III eco-labels [ISO (14025)] are voluntary schemes that use pre-set indices and give quantified information about products based on independent verification, based on life cycle assessment and verified by qualified third-party organizations [International Organization for Standardization (2016)].

Type I eco-labels are generally known as national eco-labels. Germany was the first country in the world to launch the national eco-label scheme 'Blue Angels' in the year 1978. With the passage of time, the demand for Blue Angels certified products has been growing. In Germany, there were fewer than 100 products labeled by Blue Angel in 1979, but in 1994 there were 4,271 labeled products and currently there are about 12,000 Blue Angel products [Prieto-Sandoval, et al. (2016)]. The impressive environmental performance of the Blue Angle as a national eco-label scheme of Germany forced other countries to introduce their own national eco-label schemes. Consequently, several developed and developing countries such as, Nordic countries, European Union Countries, United States, United Kingdom, Canada, Japan, India, China and Thailand established their national eco-label schemes [Grolleau and El Harbi (2008)]. As a result, the number of national eco-label schemes has also increased over time. Currently, out of 463 eco-label schemes in the international markets, 81 eco-label schemes are national eco-label schemes[1] [Big Room Inc. (2016)].

However, the debates on the benefits of the government intervention into the eco-label schemes still continue. The governments with its regulatory structure identify the requirements for awarding an eco-label. It builds up and enforces the criteria for an eco-label and it sets up the third party, including on experts to measure the features of the products and decide whether such products comply with the criteria of a certain eco-label or not. Therefore, the government is considered an essential participant in the eco-label schemes. The government participation in eco-label schemes improves the scheme's economic stability, legal protection, transparency and credibility. The reliable financial and long-run resource owning position of the government reduced the risk of failure of an eco-label scheme. Therefore, different manufacturers allow government participation in eco-label schemes [Van, (2004)]. Moreover, the government intervention into the eco-label scheme ensure fair competition among firms, increase the consumers access to the information regarding the environmental performance of a product, reduce risks to human and animal safety

[1] The information of national eco-label schemes in the trade partner countries of Pakistan is given in Appendix, Table A-1.

and health, improve the natural environment, resolve the international trade problems and protect domestic industries from unfair competition [Elise, et al. (2000)].

In existing literature Grolleau and El Harbi (2008), Monteiro (2010) identified the factors which motivate a country's government to introduce an eco-label scheme by employing various datasets and different empirical models. However, these studies used a limited number of factors which motivate the government to introduce an eco-label scheme. Therefore, in this study, we address the question; 'What factors might motivate a government to pursue a national eco-label scheme'? The main aim of this study is to identify the factors which motivate the government to introduce a national eco-label scheme. We address this research objective using panel data of 53 countries that are Pakistan's trade partners.[2] The findings of this study will help policy makers in examining the benefits of existing national eco-labeling schemes in its trade partner countries, introducing and implementing policy measures which in turn enable them to introduce a national eco-label scheme for the country.

After the introduction Section I, the rest of the paper is presented as follows. The Literature review is laid in Section II; data and its source is enlightened in Section III. Section IV presents the model and estimation methods, while result and discussion of the study are developed and interpreted in Section V and finally, the paper ends up with conclusion in Section VI.

II. Literature Review

Voluntary environmental initiatives are growing as an effective environmental tool for corporate environmental self-regulation in the global economic system. Christmann and Taylor (2002) analyzed the motivations behind the emergence of voluntary environmental initiatives. The main determinants of emergence of voluntary environmental initiatives include pressure from non-governmental public organizations and from the government and environmental regulations. Jordan, et al. (2003) extended the analysis from voluntary environmental initiatives to new environmental policy instruments and examined the motivations behind the extensive use of new environmental policy instruments such as eco-tax, voluntary environmental agreement, and eco-labels in the European Union. By utilizing three different theoretical approaches, they concluded that both ideas of the actors and markets and organizations pressures are the main motivation behind the use of new environmental policy instruments. In the same year, they also found that the new environmental policy instruments are the best option for environmental governance and government can improve the performance of new environmental policy instruments with the help of its regulatory structure.

2 Names of these countries are given in the Appendix, Table A-2.

Grolleau, et al. (2004) restricted their analysis to eco-labeling and analyzed the government intervention into the eco-labeling schemes. They concluded that the government intervention into eco-labeling schemes benefits the environment directly/indirectly by influencing private purchasers. Grolleau and El Harbi (2008) used a panel of 116 countries in order to examine the determinants of the adoption of eco-labeling schemes among countries. The results of the panel logit model showed that economic and political freedoms, innovation capacities and experience with other environmental voluntary initiatives play the main role in the diffusion of national eco-labeling schemes. Similarly, Monteiro (2010) analyzed the factors which influence the government decided to introduce an eco-labeling scheme by using a heteroskedastic Bayesian spatial probit model and cross-section data of 141 countries. The results of the study identified economic development, innovation, experience, and potential scale effects as important determinants of the adoption of an eco-label scheme.

Elise, et al. (2000) extended the issue to food labeling and evaluated the economic theory behind food labeling and presented three case studies in which the government has intervened in food labeling program. The study found significant positive impacts of government intervention into the food labeling program and hence, proposed the government intervention into two other food labeling programs.

From the review of the above studies, it is concluded that for the success and effectiveness of voluntary environmental initiatives/new environmental policy instruments and government intervention is necessary. Furthermore, some of the above studies identified a limited number of factors which motivate a country's government to introduce an eco-label scheme by employing various data sets and different empirical models. In this study, we identify a wide range of factors which motivate a country's government to introduce a national eco-label scheme.

III. Data Sources

For the identification of motives behind introducing a national eco-label scheme by a country's government, we use the panel data set of 53 trading partners of Pakistan from 1994 to 2014. Since the data on most of the variables used in this study for various countries are available till 2014, therefore we construct our dataset from 1994 to 2014. The required data is collected from; The World Bank (2016), The Heritage Organization (2016), and Big Room Inc (2016).We compiled information about the real per capita GDP (Constant 2005 US$), population, manufacturing tariff, research and development expenditures, export value index, high technology export, net trade, and per capita CO_2 emissions from The World Bank (2016). The data on type I, type II, and type III eco-labels are taken from the Big Room Inc (2016). The Heritage Organization (2016) provides information on the economic freedom index and government integrity index.

IV. Model and Estimation Methods

This section presents a model that permits an empirical examination of the factors that induce a country's government to introduce a national eco-label scheme. It is assumed that the main motive of the country *j* is to maximize the expected value of long term gains. Therefore, the government of the country *j* introduces a national eco-label scheme if and only if the expected value of the long term gains with a national eco-label scheme (π_e^j) is higher than expected value long term gains without a national eco-label scheme (π_o^j). The expected value of the long term gains is also known as latent variables because they are not observed by the researchers. Lets assume that the expected long term gains in country *j* is the linear function of latent variables. The expected long term gains in country *j* in both the cases are given in Equation (1) and (2).

$$\pi_e^j = X\beta_e^j + \mu_e^j \tag{1}$$

and

$$\pi_o^j = X\beta_o^j + \mu_o^j \tag{2}$$

where X represents a matrix of explanatory variables capturing the factors that may affect a government to introduce the national eco-label scheme, β_e^j and β_o^j are the coefficients matrix of X and μ_e^j and μ_o^j are the error terms. The government of the country *j* introduces a national eco-label scheme ($Y=1$) or not introduces a national eco-label scheme ($Y=0$) is based on the following criteria:

$$Y=\begin{cases}1 \text{ if } \pi_e^j > \pi_o^j \\ 0 \text{ if } \pi_e^j \leq \pi_o^j\end{cases} \tag{3}$$

The outcome of eco-label introduction is driven by random elements in the expected value of long-term gains. Following Greene (2012), the outcome probability is given as:

$$Prob\,[Y=1 \mid X] = Prob\,[\pi_e^j > \pi_o^j] \tag{4}$$

$$Prob\,[Y=1 \mid X] = Prob\,[X\beta_e^j + \mu_e^j > X\beta_o^j + \mu_o^j] \tag{5}$$

$$Prob\,[Y=1 \mid X] = Prob\,[X\beta + \mu > 0] \tag{6}$$

where $\beta \equiv \beta_e^j - \beta_o^j$ and $\mu \equiv \mu_e^j - \mu_o^j$. If μ is normally distributed[3] term with mean 0 and variance σ^2, Equation (6) can be written as:

$$Prob\,[Y=1 \mid X] = \text{prob}\,[\mu < X\beta] \tag{7}$$

$$Prob\,[Y=1 \mid X] = F\,[X\beta] \tag{8}$$

where F is the cumulative standard logistic distribution function (CDF) of μ. We assume the logistic CDF to represent the outcome probability. Thus, Equation (8) can be written as the logit regression model:

$$Prob\ [Y=1 \mid X] = [\exp(X\beta) / 1 + \exp(X\beta)] \quad (9)$$

To find the influencing factors which induce a government to introduce a national eco-label scheme, we estimate the above model using panel logit regression by maximum log-likelihood estimation method. We follow Grolleau and El Harbi (2008) to specify the empirical model. In our model, the dependent variable (Y) is a binary variable, which is equal to 1 if the government introduced a national eco-label scheme and 0 otherwise, as defined above. The explanatory variables include indicators of the economy's stages of development, population, relative production cost advantage, and strategic interaction with trade competitor, which are discussed below:

1. Economy's stages of development: The environmental Kuznets curve shows that countries with higher income provide more attention to environmental improvement as compared to underdeveloping countries. This suggests that the economy on the top stage of development would be more sensitive for the improvement of its natural environment as compared to the economy on the lower or medium stages of development [Magnani (2000)]. Therefore, the economy's stages of development have the ability to influence the government to introduce a national eco-label scheme. We include three variable to measure the economy's stages of development namely: real per capita GDP, economic freedom [Grolleau and El Harbi (2008)] and government integrity [Monteiro (2010)].

2. Population effect: A country with a huge population size but less environmental regulations put the lives of more people at risk. Moreover, an increase in the number of environmentally conscious consumers with an increase in population may induce a government to introduce a national eco-label scheme. The existence of eco-consumers generates a significant amount of green premium for eco-label products. Again, the producer collects a significant premium from the market, which has favorable effects on his firm economies of scale. In this study, we use the population size [Monteiro (2010)] to capture the population effect on the government interest to introduce a national eco-label scheme.

3. Relative production cost advantage: The opponents of the eco-labeling such as Verbruggen, et al. (1995), Bonsi, et al. (2008), and Rotherham (2010) argue that the

[3] We put the normality assumption for μ, which means that we treat the eco-labeling decision of all the countries homogeneously. This assumption enables us to estimate the logit regression for all the countries in the sample. If we violate normality assumption for μ or treat the countries heterogeneously in eco-labeling decision, in such a case we will estimate separate logit regression for each country which is impossible in the present study because our dependent variable is binary which is equal to 1 if the country's government introduced a national eco-label scheme (till 1994 and in practice till 2016) and 0 otherwise.

existing eco-labeling schemes reduced the export opportunities of developing countries. Most of the developing countries heavily dependent on exports, so to maintain the volume of their exports these countries may introduce a national eco-label scheme. If the country is a net exporter then, it will easily restore the cost of eco-labeling. This improves the relative production while the cost advantage of an economy depends heavily on exports. In addition, introducing an eco-label to the economy with comparative cost advantage leads to the diffusion of innovations among private firms, which ultimately enhances the R&D activities of the firms. Again the diffusion of eco-innovations eventually improves the relative production cost advantage of an economy in producing different products [Monteiro (2010), Porter and Van der Linde (1995)]. In this study, we use the export value index as a proxy for export performance. The R&D investment data for most of the developing countries are not available; therefore, we use the education expenditure as a proxy for R&D activities.

4. Strategic interaction with trade competitor: Various researchers such as Grolleau, et al. (2004), Grolleau and El Harbi (2008), and Monteiro (2010) considered national eco-labeling as a strategic environmental policy instrument. Thus, they suggest a negative link between the government's interests to introduce a national eco-label with the number of eco-labels schemes in other states. Moreover, the increasing interdependence among the nation's economies due to eco-labeling schemes strengthens their economic relationships and reduced their trade cost. In addition, if a country wants to increase its export share in the international market, it would be more interested to introduce an eco-labeling scheme [Piotrowski and Kratz (2005)]. While the eco-label schemes are designed with the aim to reduce global environmental problems, such that; to reduce CO_2 emissions and provide safety to biodiversity. These environmental features affect a country's government to introduce an eco-labeling scheme [Daniel and Peter (2005)]. A domestic national eco-label scheme will be effective when in the market few countries are having the same standard requiring eco-labeling schemes. When the number of eco-labels similar to domestic eco-labels increase, then the domestic eco-label lose its value. In this situation, the government may decide to abandon the idea of an eco-label scheme [Monteiro (2010)]. To analyze the impact of the number of eco-labels on the government decided to introduce a national eco-label scheme, we use the number of type I and type II eco-label schemes persist in all trade partner countries as an explanatory variable.

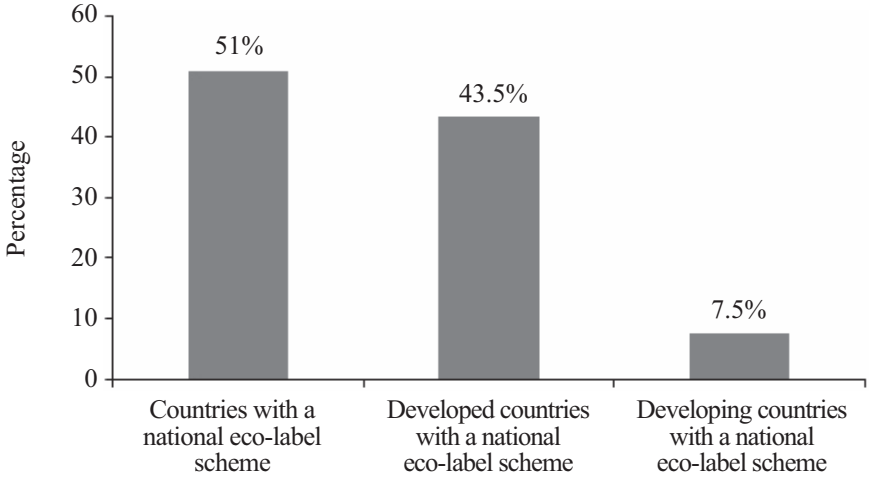
Moreover, we use high technology exports as a proxy for exports. In addition, there are two processes through which a country can improve its economic relations with the rest of the world namely the trade and foreign investment. In this study, we consider only the trade variable and use net trade in goods and services as a proxy for this variable. The economist treats manufacturing tariff as a non-tariff trade barrier. Referable to the importance of manufacturing tariff, we employ it as a proxy for trade cost. Lastly, for valuing the effects of environmental characteristics on the government's interest in eco-labeling, we use the per capita CO_2 emission as an explanatory variable.

V. Results and Discussion

1. Descriptive Statistics

The profile of the national eco-label schemes in the countries included in this study is given in figure 1. It is observed that out of 53 countries in the sample, 51 per cent established their own national eco-label schemes. Of these, 43.5 are developed countries and 7.5 per cent are developing countries.

Table 1 presents the descriptive statistics and definitions of the important variables used in this study. It is observed that the mean value of real per capita GDP of the countries with national eco-label schemes (27023.23) is much higher than that of countries without national eco-label schemes (19621.89). We also found that the mean value



Source: Estimated by authors based on panel data from 53 trading partners of Pakistan.

FIGURE 1

Countries with and without a National Eco-Label Scheme

of economic freedom and government integrity indices of the countries with national eco-label schemes are also higher than that of the countries without national eco-label schemes. We find that the mean population of the countries with national eco-label schemes (128.472) is much higher than that of the countries without national eco-label schemes (29.7). Comparing the relative production cost advantage variables, it is observed that the mean value of R&D expenses of the countries with national eco-label schemes (59535.8) is much higher than that of countries without national eco-label schemes (4230), while the mean value of export value index of the countries with national eco-label schemes (183.486) is much lower than that of countries without national eco-label schemes (307.141).

TABLE 1

Descriptive Statistics

Variables	Definitions	Countries with a national eco-label scheme	Countries without a national eco-label scheme	Overall mean
Dependent		Mean & SD	Mean & SD	Mean & SD
National eco-label scheme introduced	1 if the government introduced a national eco-label scheme, 0 otherwise	1 (0)	0 (0)	0.509 (0.500)
Explanatory				
Economy's stages of development				
Real per capita GDP	Real GDP divided by the total population of the country (Constant 2005 US$).	27023.23 (15690.9)	19621.89 (79923.37)	23408.96 (57427.5)
Economic Freedom index	This index measures economic freedom in a country.	67.659 (8.162)	60.192 (10.832)	63.996 (10.539)
Government Integrity index	This index measure government integrity in a country.	66.864 (22.469)	41.157 (23.774)	54.253 (26.444)
Population effect				
Population	The number of peoples living in the country (Million).	128.472 (312.166)	29.7 (33.1)	80 (229)
Relative production cost advantage				
R&D expenses	Research & Development expenses (current US$ million).	59535.8 (117957.3)	4230 (7540)	32440 (8700)
Export value index	This index measure the country's exports performance (2000=100).	183.486 (135.629)	307.141 (977.315)	224.147 (693.765)
Strategic interaction with trade competitors				
High technology exports	Exports of products with high R&D intensity (Current US$ million).	41509.9 (69395.1)	4230 (14200)	23200 (53800)
Net trade	The difference between exports and imports (BOP, current US$ million).	1898.5 (105742.3)	8740 (27300)	3340 (78000)
Manufacturing tariff	Manufacturing tariff rate (%).	3.766 (4.392)	9.346 (7.981)	6.503 (6.987)
Number of eco-labels	Number of type II and III eco-labels in a country.	30.377 (23.141)	7.826 (8.224)	19.314 (20.807)
Per capita CO_2 emissions	Ratio of total CO_2 emissions to total population (Metric tons).	11.118 (12.628)	7.786 (12.425)	9.483 (12.634)

Source: Estimated by authors based on panel data from 53 trading partners of Pakistan.
Note: SD represents Standard Deviation given in the parenthesis.

It is observed that the mean value of high technology export of the countries with national eco-label schemes (41509.9) is much higher than those of countries without national eco-label schemes (4230). We also observed that the mean value of net trade and manufacturing tariff of the countries with national eco-label schemes is lower than those of the countries without national eco-label schemes. We observed that the mean number of private and third-party eco-label schemes of the countries with national eco-label schemes (30.377) is much higher as compared to the countries without national eco-label schemes (7.826). We also observed that the mean per capita CO_2 emissions of the countries with national eco-label schemes (11.118) are higher than those of the countries without national eco-label schemes (7.786).

2. Regression Results

The result of panel logit regression to examine factors that induce a government to introduce a national eco-labeling scheme. Table 2 presents the coefficient estimates of the panel logit regression and its corresponding marginal effects. The results of the diagnostic tests of the regression are reported in the last panel of the Table 2. Results of the Wald chi-squared test confirm that the regression is overall significant at 1 per cent level.

Results of the regression show that the probability for a government to introduce a national eco-label scheme is positively related to the economic growth, government integrity, population, R&D expenses, high technology exports, manufacturing tariff, number of type I and type II eco-labels, and per capita CO_2 emissions. Whereas, the probability for a government to introduce a national eco-label scheme negatively related to economic freedom export performance and net trade.

Moreover, we find that if the country population increases by one million, the probability of introducing national eco-label scheme increases by 20.8 per cent points. Furthermore, we find that if the R&D expenses of the country increases by one per cent point the probability of the country's government to introduce a national eco-label scheme also increases by 10.1 per cent points. If the export performance of the country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme decreases by 19.1 per cent points.

Finally, we find that if the high technology exports of the country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme also increases by 4.9 per cent points. If the net trade of the country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme decreases by 11.7 per cent points. If the manufacturing tariff rate of the country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme also increases by 9 per cent points. If the number of type II and type III eco-labels in the country increases, the probability of introducing national eco-label scheme also increases by 30.6 per cent points. If the per capita CO_2 emission (pollution level) of the country increases by one

per cent point, the probability of the country's government to introduce national eco-label scheme also increases by 20.4 per cent points. We also estimate the model trough random effect logit regression. However, the random effect logit regression coefficients perform relatively poorly, most of the variables are insignificant; therefore, we are not interpreting these results. The estimated results of the random effect logit regression are presented in the Appendix, Table A-3.

TABLE 2

Results of Panel Logit Regression

Dependent variable: National eco-label scheme introduced (Yes=1, No=0)	Coefficients	Marginal effect
Economy's stages of development:		
Real per capita GDP (ln)	0.977***	0.239***
	(0.169)	(0.040)
Economic freedom index (ln)	-2.821***	-0.689**
	(1.089)	(0.267)
Government integrity index (ln)	0.753*	0.184*
	(0.412)	(0.101)
Population effect:		
Population (ln)	0.850***	0.208***
	(0.207)	(0.049)
Relative production cost advantage:		
R&D expenses (ln)	0.411**	0.101**
	(0.165)	(0.040)
Export value index (ln)	-0.781***	-0.191***
	(0.184)	(0.045)
Strategic interaction with trade competitors:		
High technology exports (ln)	0.204***	0.049***
	(0.0252)	(0.006)
Net trade (ln)	-0.480***	-0.117***
	(0.101)	(0.025)
Manufacturing tariff (ln)	0.370**	0.090**
	(0.164)	(0.040)
Number of eco-labels (ln)	1.251***	0.306***
	(0.196)	(0.049)
Per capita CO_2 emissions (ln)	0.833***	0.204***
	(0.198)	(0.047)
Constant	-17.73***	
	(4.990)	
Diagnostic test:		
Observations	1133	
Wald X^2 statistics	231.21***	
Log-likelihood	-290.26	

Source: Estimated by authors based on panel data from 53 trading partners of Pakistan.
Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (ln) represents natural log.

3. Regression Results for Developed and Developing Countries

For robustness checks, we separately present the results of the panel logit regression for developed trading partners and for developing trading partners of Pakistan. Table 3 presents the coefficients estimates of the panel logit regressions and their corresponding marginal effects. The results of the diagnostic tests of the two models are reported in the last section of Table 3. Results of Wald chi-squared test show that both the regressions are overall statistically significant at 1 per cent level. Results show that if the economic growth of the developed country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme also increases by 11.9 per cent point. If the economic freedom of the developed country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme decreases by 66.6 per cent points.

Moreover, we find that if the country population increases by one million, the probability of introducing a national eco-label scheme of a developed country also increases by 8.7 per cent points and increases by 0.9 per cent points for a developing country. Furthermore, we find that if the R&D expenses of the developing country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme decreases by 1.1 per cent points. If the export performance of the developed country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme decreases by 4.2 per cent points.

Finally, we find that if the high technology exports of the developed country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme increases by 1.9 per cent points. If the net trade of the country increases by one per cent point, the probability of the country's government to introduce national eco-label scheme decreases by 2.5 per cent points for a developed country and by 0.2 per cent points for a developing country. If the manufacturing tariff rate of the country increases by one per cent point, the probability of the country's government to introduce national eco-label scheme also increases by 6.5 per cent points for a developed country and by 0.6 per cent points for a developing country. If the number of type II and type III eco-labels in the country increases, the probability of introducing national eco-label scheme increases by 6.9 per cent points for a developed country and by 3.8 per cent points for a developing country. If the per capita CO_2 emission (pollution level) of the developing country increases by one per cent point, the probability of the country's government to introduce a national eco-label scheme also increases by 0.4 per cent points.

VI. Conclusion and Recommendation

This study has identified the factors which motivate the government to introduce a national eco-label scheme by using panel data of 53 countries that are Pakistan's

trade partners from 1994 to 2014. Results from panel logit regression shows that the probability for a government to introduce a national eco-label scheme is positively related to the economic growth, government integrity, population, R&D expenses, high technology exports, manufacturing tariff, number of type I and type II eco-labels, and

TABLE 3

Results of Panel Logit Regression for Developed and Developing Countries

Dependent variable: National eco-label scheme introduced (Yes=1, No=0)	Developed countries		Developing countries	
	Coefficients	Marginal effect	Coefficients	Marginal effect
Economy's stages of development:				
Real per capita GDP (ln)	2.291***	0.119***	-0.687	-0.002
	(0.592)	(0.032)	(0.587)	(0.002)
Economic freedom index (ln)	-12.74***	-0.666***	1.891	0.006
	(2.082)	(0.174)	(5.157)	(0.016)
Government integrity index (ln)	0.119	0.006	-0.684	-0.002
	(1.044)	(0.055)	(1.199)	(0.004)
Population effect:				
Population (ln)	1.657***	0.087***	3.052***	0.009***
	(0.418)	(0.025)	(0.932)	(0.003)
Relative production cost advantage:				
R&D expenses (ln)	0.0785	0.004	-3.256***	-0.011***
	(0.278)	(0.015)	(0.978)	(0.004)
Export value index (ln)	-0.805**	-0.042**	-0.729	-0.002
	(0.346)	(0.018)	(0.910)	(0.003)
Strategic interaction with trade competitors:				
High technology exports (ln)	0.366***	0.019***	0.314	0.001
	(0.0479)	(0.004)	(0.205)	(0.001)
Net trade (ln)	-0.489***	-0.025***	-0.700**	-0.002**
	(0.163)	(0.011)	(0.346)	(0.001)
Manufacturing tariff (ln)	1.253***	0.065***	1.948**	0.006**
	(0.256)	(0.015)	(0.819)	(0.003)
Number of eco-labels (ln)	1.322***	0.069***	11.98***	0.038***
	(0.261)	(0.017)	(2.301)	(0.012)
Per capita CO_2 emissions (ln)	-0.422	-0.022	1.129***	0.004***
	(0.278)	(0.016)	(0.359)	(0.001)
Constant	7.853		-6.38	
	(8.561)		(18.66)	
Diagnostic test:				
Observations	652		461	
Wald X^2 statistics	116.16***		40.64***	
Log-likelihood	-140.84		-49.12	

Source: Estimated by authors based on panel data from 53 trading partners of Pakistan.
Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (ln) represents natural log.

per capita CO_2 emissions. Whereas the probability for a government to introduce a national eco-label scheme is negatively related to economic freedom, export performance, and net trade.

Findings of this study can help policy makers in examining the benefits of existing national eco-labeling schemes in its trade partner countries, and in introducing and implementing policy measures which in turn enable them to introduce a national eco-labeling scheme for the country. In this study, we focused on introducing a national eco-label scheme; however, we cannot discuss the implementation and success of a national eco-label scheme. Other researchers can investigate the implementation and success of a national eco-label scheme.

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APPENDIX

TABLE A-1

National Eco-label Schemes in the Trade Partner Countries of Pakistan

Country	Eco-labeling scheme	Date of introduction
Germany	Blue Angel	1978
Canada	R-2000 Certificate	1981
United States	Texas Certified Organically Produced	1988
Denmark	Danish Ø-mark	1989
Finland	Nordic Ecolabel or Swan	1989
Japan	Eco Mark	1989
Norway	Nordic Ecolabel or Swan	1989
Sweden	Nordic Ecolabel or Swan	1989
Austria	Austrian Ecolabel	1991
India	Ecomark	1991
Australia	Energy Rating Programme: Australia	1992
Belgium	EU Ecolabel	1992
France	EU Ecolabel	1992
Greece	European Ecolabel	1992
Italy	EU Ecolabel	1992
Korea Republic of	Ecomark (Korean Eco-label)	1992
Netherlands	EU Ecolabel	1992
Poland	EU Ecolabel	1992
Portugal	EU Ecolabel	1992
Romania	EU Ecolabel	1992
Singapore	Green label Singapore	1992
United Kingdom	EU Ecolabel	1992
China	China Environmental Labeling	1993
Hungary	Hungarian Ecolabel	1993
Czech Republic	Environmentally Friendly Product	1994
Spain	Emblem of Guarantee of Environmental Quality	1994
Thailand	Thai Green Label	1994
New Zealand	Enviro-Mark	2001
Malta	ECO Certification	2002
Russian Federation	Eco Material	2010

Source: Big Room Inc. 2016.

TABLE A-2

Names of the Countries Included in this Study

S. No	Country Name	S. No	Country Name
1	Netherland	28	Sierra Leone
2	Australia	29	Switzerland
3	Austria	30	Philippines
4	Portugal	31	Malaysia
5	Japan	32	Tanzania
6	United States	33	Ghana
7	Spain	34	Malawi
8	Italy	35	Kenya
9	Norway	36	Hong Kong
10	Greece	37	Myanmar
11	Sweden	38	Saudi Arabia
12	Belgium	39	Turkey
13	Canada	40	Bahrain
14	Germany	41	Egypt
15	Finland	42	Kuwait
16	Denmark	43	Cameroon
17	United Kingdom	44	Oman
18	France	45	Algeria
19	Romania	46	Qatar
20	Hungary	47	Jordan
21	Poland	48	Yemen
22	Czech Republic	49	Iran
23	Thailand	50	United Arab Emirates
24	Singapore	51	Lebanon
25	Korea Republic	52	Bangladesh
26	China	53	Sri Lanka
27	India		

Source: Estimated by authors.

TABLE A-3

Results of the Random Effect Logit Regression

Dependent variable: National eco-label scheme introduced (Yes=1, No=0)	Coefficients	Marginal Effect
Economy's stages of development:		
Real per capita GDP (ln)	6.154*	6.154*
	(3.241)	(3.241)
Economic Freedom index (ln)	-6.898	-6.898
	(13.53)	(13.53)
Government Integrity index (ln)	1.894	1.894
	(6.098)	(6.098)
Population effect:		
Population (ln)	6.014	6.014
	(4.246)	(4.246)
Relative production cost advantage:		
R&D expenses (ln)	3.788*	3.788*
	(1.985)	(1.985)
Export value index (ln)	-7.683***	-7.683***
	(2.304)	(2.304)
Strategic interaction with trade competitors:		
High technology exports (ln)	1.295***	1.295***
	(0.449)	(0.449)
Net trade (ln)	-0.410	-0.410
	(0.886)	(0.886)
Manufacturing tariff (ln)	0.475	0.475
	(1.725)	(1.725)
Number of eco-labels (ln)	3.685*	3.685*
	(1.963)	(1.963)
Per capita CO_2 emissions (ln)	3.672	3.672
	(2.391)	(2.391)
Constant	-214.4**	
	(90.04)	
Diagnostic test:		
Observations	1113	
Number of id	53	
Wald X^2 statistics	40.00***	
Log-likelihood	-21.999	

Source: Estimated by authors based on panel data from 53 trading partners of Pakistan.
Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (ln) represents natural log.