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The Determinants of Non-Tariff Barriers in Malaysia's Agricultural Sector

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Abstract

The successive rounds of multilateral trade negotiations have resulted in significant tariff reductions in many countries. Malaysia is no exception as the applied most-favoured-nation tariff rate in her agricultural sector in 2009 is relatively low, averaging at 2.8 percent. Despite the reduction in tariff barrier, the incidence of non-tariff barriers (NTBs) in the sector over the 1978 – 2007 period has generally increased even though efforts at dismantling these barriers have long been initiated. Thus, the paper seeks to identify factors that influence the level of NTBs in the agricultural sector. Using the autoregressive distributed lag (ARDL) approach to cointegration, we find imports, average tariff, sectoral competitiveness level, and employment growth to be significant determinants of NTBs in the agricultural sector. The findings provide a greater understanding of the reasons behind agricultural trade protectionism.

Keywords: *Non-tariff barriers (NTBs), Autoregressive distributed lag (ARDL), Agricultural*

1. INTRODUCTION

The successive rounds of multilateral trade negotiations have resulted in relatively low tariff levels in both developed and developing countries. With this low tariff environment, the role of non-tariff barriers, henceforth NTBs, as a protectionist and regulatory trade policy tool has become more evident. For instance, Fugazza and Maur (2006) report that the average number of tariff lines per country that is subjected to any type of NTB in 2004 had increased to 5,620 from 1,880 in 1994. More recently, the number of new trade-related measures notified to the World Trade Organization (WTO) has also increased by as many as 119 (ICTSD, 2009). In addition, many low and middle-income countries seem to have relatively high ad valorem equivalent of core NTBs. Malaysia has also been found to have high level of NTBs in her agricultural sector (Kee, Nicita and Olarreaga, 2006)[1]. NTBs are generally regarded as restrictions to trade other than the traditional customs duties. Specifically, they are a form of measures other than tariff that hampers the importation of goods directly into a country and are considered discriminatory, as they do not apply equally to domestic production or distribution (Hillman, as cited in Beghin and Bureau, 2001: 132). Thus, the rise in NTBs as a protectionist tool is a cause for concern. This is because the gains from trade, due to lower tariffs may be curtailed by the presence of NTBs. Furthermore, relative to tariff, these barriers lead to greater welfare loss in terms of trade deterioration effect (Ching, Wong, and Zhang, 2004). They also increase the operating costs of firms and hamper firms' access to markets. As NTBs are potentially import-reducing and could adversely affect the trade liberalization gains that are achieved via tariff reductions, increased efforts to dismantle these barriers have been undertaken by the WTO and the many preferential trade groupings. Despite these efforts, the removal of such barriers is not easy due to the limited knowledge about NTBs. This limitation stems from the fact that there is a myriad of non-tariff related measures that may or may not be obstacles to trade. There is also insufficient

[1] Kee et al. (2006) have measured the manufacturing and agricultural trade protection levels for various developed and developing economies, one of which is Malaysia.

data recording the presence of NTBs. Due to this, there is a lack of empirical research pertaining to NTBs especially in developing countries. Moreover, there are several shortcomings in the methods used to quantify NTBs.

On the above premise, it is imperative that the incidence of NTBs in Malaysia's agricultural sector is explored. This would allow us to identify the types of NTBs imposed on imports. There is also a need to understand why such barriers exist despite the calls for their elimination. Thus, the objective of the paper is twofold. First, it seeks to identify imports that are subjected to NTBs in the country's agricultural sector. Second, it attempts to determine the factors that influence the level of NTBs in the sector. Findings from the study would provide a better picture of the prevalence of NTBs in the country's agricultural sector. This knowledge would assist the government in designing appropriate trade policy and in helping agricultural producers face the impending removal of NTBs due to the advent of globalization.The paper is organized as follows: The next section briefly discusses the incidence of NTBs in the country's agricultural sector to be followed by Section 3 that discusses the current state of knowledge with regard to the determinants of NTBs. Section 4 provides the theoretical basis for the determinants of NTBs. Meanwhile, Section 5 focuses on the empirical model and data used in the study. Section 6 presents the findings while section 7 concludes the paper.

2. NTBs IN THE AGRICULTURAL SECTOR

Malaysia's imports that are imposed with non-tariff measures are classified into four different schedules of the Customs (Prohibition of Import) Order of the Royal Malaysian Customs. The first schedule contains a list of goods whose imports are completely banned due to national, religious, security, and health reasons. The second schedule covers goods whose imports are allowed if accompanied with import licenses. These goods are mainly controlled for health, sanitary, security, environmental protection or intellectual property reasons. The third schedule lists goods that may not be imported except with import licenses due to protective reasons. The fourth schedule is specific for products whose imports are allowed only if certain requirements are met. For example, imports are permitted only when accompanied with import permits issued by certain departments or after obtaining specific certifications. According to Alavi (1996: 60), the objectives of the first and fourth schedules are non-protective whereas those of the second and third are protective. The discussion of the incidence of NTBs in the paper only includes those in the second, third and fourth schedules. Agricultural goods listed in the second schedule requiring import licenses from as early as 1978 are star anise, rice, eggs, poultry, plants, fruits, soil and pests, sugar, and wood in the rough. In the 1980s, more goods were brought into the schedule such as beef, mutton, uncooked pasta, edible products of animal origins, un-worked diamonds and several mineral products[2]. In 1993, the import license requirement was imposed on un-manufactured tobacco and tobacco refuse. In general, Malaysia is perceived to impose hefty control on un-manufactured tobacco imports. The U.S. Department of State raised concern that this measure has affected the U.S. cigarette manufacturers that had to purchase the lower quality local tobacco (U.S. Department of State, 1994). The licensing requirement imposed on the imports of sugar and food is also seen as a trade restricting measure.

[2] Examples of the mineral products are barytes, tin ores, slags and concentrates, natural sands, vermiculite, perlite, chlorites, kieserite, epsomite, earth colors, natural micaceous inoxides and others. These items, including un-worked diamonds from the stones product group are classified as agricultural products as they fall within the SITC groups of 0, 1, 2 and 4 based on Bora, Kuwahara and Laird (2002) classification.

In 1996, some of the products from the second schedule were shifted into the fourth schedule whereby imports were allowed only if specific criteria were met. These products were rice, poultry, eggs, beef and mutton. The imports of poultry, eggs and egg products, beef, and mutton require import permit which are only issued after the plants have been inspected by the country's Department of Veterinary Services. The relevant Malaysian authority seldom conducts the re-inspection of plants or slaughterhouses. This is perceived as a trade barrier as it prevents the Australian and the U.S. companies from re-applying for certification or rectifying problems found in the initial inspection (Warr, Rodriguez, and Penm, 2008). Meanwhile, the import of rice does not only require a license but must also be imported through BERNAS[3]. This monopoly of rice import by BERNAS is viewed as a barrier too as it has brought certain disadvantage to the U.S. rice suppliers.

Meanwhile, imports listed in the third schedule are imposed with licensing requirements so that temporary protection to local manufacturers can be granted. In 1978 the listed goods were butter, cabbages, cereal flour, rice vermicelli, rice bran, other brans, sharps and residues, mushrooms in airtight containers, natural yeast, ice, and sweetened forage. This requirement was gradually removed in the 1980s[4]. New additions into the schedule were also made comprising un-roasted coffee, milk, cream, and sterilized flavored milk. By 2007, products that are still subjected to import license are round cabbages[5], cereal flour, milk and cream, and sterilized flavored milk. Goods listed in the fourth schedule are beverages, milk and fish. Imported beverages such as whisky and brandy must be accompanied with certificate from the country of origin. In addition, milk and milk products must obtain import permit from Malaysia's Department of Veterinary Services of the Ministry of Agriculture. Imports of fish and plants should also obtain permits or phyto-sanitary certificates from various agencies. Whisky and brandy imports have been listed in this schedule as early as 1978. In 1987, there was a significant review in the number of products that were listed. By 2004, many more tariff lines from the product groups comprising lacs, gums, and resins; sugar and sugar confectionary; preparations of vegetables, fruits, nuts, etc; miscellaneous edible preparations; and beverages, spirits and vinegar were added to the schedule. In addition, the *halal* requirement[6] imposed on food imports particularly on the imports of meat, meat products and poultry in this schedule is perceived as non-transparent, confusing and relatively strict compared to other countries'[7] (Warr et al, 2008). The nutritional labeling requirement for food imports is also viewed as a burden as the process of labeling according to specific conditions is labor intensive and costly[8].

[3] Padiberas Nasional Berhad (BERNAS) main activities involve the importation of rice, distribution of rice, investment holding, maintenance of the rice stockpile, distribution of paddy price subsidies to farmers on behalf of the government, management of the Bumiputera Rice Millers Scheme, and buyer of last resort at the Guaranteed Minimum Price of paddy (BERNAS, 2008).

[4] The requirement for butter was lifted in 1979. In 1980, rice vermicelli, natural yeast, ice, rice bran, other brans, sharps and other residues, and sweetened forage did not have to obtain import license anymore. Meanwhile, import license for mushrooms in airtight container was removed in 1984.

[5] Since 1986, import quota was imposed for the import of round cabbages. This was intended to protect local farmers in Cameron Highlands who cannot compete with the lower-priced cabbages imported from China. Nevertheless, the quota on import will be eliminated by 2010.

[6] *Halal* means permissible or lawful. The term is usually used in connection with *halal* meat which means meat that has been slaughtered in the manner prescribed by the shari'a

[7] According to Warr et al (2008), Australian exports have been badly affected by the ban in the use of mechanical or pneumatic stunning in the slaughtering of cattle.

[8] The nutrition labelling requirement was proposed in March 2003 which requires certain format for nutritional information to be labelled on the package for cereals, breads, milk, canned meat and fish, canned fruits, canned vegetables, fruit juices, soft drinks, and salad dressings. The U.S. food suppliers were in shortage of time to use up their existing stocks before complying with the new requirement. By 2005, import of more than 50 food products is to have nutrition contents on the labels.

3. DETERMINANTS OF NTBs

Discussions on the determinants of trade protection usually revolve around the political and economic aspects of trade. Studies in this realm have looked at the political and economic factors that influence the level of trade protection. Nevertheless, these studies have mainly focused on the determinants of NTBs in the U.S' manufacturing industries. Such studies found seller concentration, seller number of firms, buyer concentration, buyer number of firms, scale economies, capital stock, comparative disadvantage position, and ad valorem transportation charges to be important determinants of NTBs (Trefler, 1993; Ray, 1981a and 1981b; Clark and Bruce, 2006). Other studies found that certain industries are more inclined to get protection from imports in the form of NTBs. In the U.S., these industries are those that manufacture tobacco, paper, leather products and primary metal. According to Metcalfe and Goodwin (1999) industries that are geographically concentrated, provide lower skilled employment and wages, have low export share and high extent of value added processing are usually more likely to receive protection. In addition, Lee and Swagel (1997) discover that in 41 countries they analyzed, industries that are weak, declining, threatened by imports and large tend to get greater trade protection.

Meanwhile, studies on developing countries including Malaysia are scarce due to the lack of data for NTBs. To our knowledge, the only existing study on Malaysia is that of Lee (as cited in Amelung, 1989) who examined the determinants of effective and nominal rates of protection in Malaysia's manufacturing sector. In this study, Lee found that trade protection increases with a rise in firm concentration index and the number of employees. For other developing countries such as South Africa and Mexico, Drope (2007) recently identified the size of industry, geographical dispersion, changes in output-import ratio and the steel industry to be important factors that shape trade policy. The continuous decline in average tariff rates and the corresponding increase in NTB protection may also suggest that both tariff and NTBs are associated. According to Mansfield and Busch (1995), pre-existing tariff levels do influence society's demand for additional protection and the willingness of officials to meet them. Bhagwati (1988: 53) also coined the "law of constant protection" where another form of trade protection is apt to appear elsewhere if the existing one is reduced. This implies that tariff and NTBs can be substitutes. However, evidence from several single-country studies, one of which is Ray (1981b), suggests that both variables complement each other.

4. THEORETICAL MODEL FOR THE DETERMINANTS OF NTBs

Gawande and Krishna (2003: 214) recently surveyed several hypotheses pertaining to the determinants of trade policy. Apparently, these hypotheses could be grouped into various models. Among these models are the interest group model, the adding machine model, the status quo model, the social justice or equity model, the comparative cost model, and the foreign policy model. In the interest group model, industries that are adversely affected by imports would lobby governments for trade protection. The model claims that an increase in employment and output growths, both favorable conditions in an industry would necessarily lead to lesser demand for protection. On the other hand, increases in imports would lead to greater demand for protection to safeguard the potential real return to specific factors. The adding machine model meanwhile looks at the number of employees in an industry to influence the level of NTB protection granted. A large number of workers would maximize the government's chance for re-election. Thus, an increase in the number of workers entails an increase in trade protection provided to the industry concerned.In the status quo model, policy makers would be concerned about the effects of changes in trade policy to workers in an industry. Thus, governments would try to minimize or delay the adjustment costs of

changes in trade protection level. Current protection level is then associated with its past level. The social justice model on the other hand hypothesizes the government to be committed to lowering income inequality and improving the standard of living of the poor. As such, industries with large number of unskilled workers receiving low wages would receive greater protection level.

Additionally, the comparative cost model predicts that industries facing high import penetration would need high import protection level. In the foreign policy model, countries with investment interests in other countries would impose less trade barriers on imports from the host economies. The outcomes of trade policy would also depend on the strength of a country's bargaining power and involvement in trade negotiations. Based on these models, early estimation of factors that determine the level of trade protection or trade policy had taken a reduced form approach. Nevertheless, Grossman and Helpman (1994) have developed a model that is able to link existing empirical work and the underlying theory. Goldberg and Maggi (1999) have simplified the Grossman-Helpman model. In their version, NTB coverage ratio is used as the dependent variable to depict the trade protection level. The independent variables are comprised of import elasticity, import penetration ratio and whether or not the industry concerned is politically organized. The model was also extended to include variables from the various models mentioned earlier to improve its fit. Goldberg and Maggi (1999) found that employment related regressors such as unemployment rates and employment size would improve the model.

The model by Goldberg and Maggi (1999) is adopted in this study as the theoretical basis for the determinants of NTBs in Malaysia's agricultural sector. Data constraints however limit the exact model from being fully applied. Instead, other regressors used previously by Trefler (1993), Ray (1981a, 1981b) and Lee and Swagel (1997) among several others are included in the NTB function. For example, employment variable is included to examine the role of adding machine or interest group models in influencing the level of NTBs. The sectoral share of value added as used by Lee and Swagel is also included in the function as proxy for the sector's political importance. In addition, labor productivity in the agricultural sector is chosen as proxy for sectoral competitiveness, a factor based on the interest group model. Variables in the adding machine and interest group models are empirically tested in the present study as Amelung (1989) found these models to be relevant for developing economies. Tariff function is also included in the NTB function to ascertain whether tariff and NTBs are substitutes or complements. Meanwhile, the import elasticity variable is dropped from the function, as the reliability of its estimate is questionable[9]. Thus, the NTB function is formulated as follows:

$$N = f(t, I, LP, VA, EG) \quad (1)$$

where N is the NTB coverage ratio in the agricultural sector, t is the average tariff rate in the sector, I is agricultural import penetration ratio, LP is the agricultural sector's labor productivity level, VA is the sectoral share of value added, and EG is the sector's employment growth rate. We expect all the regressors to be significantly related to NTBs. Tariff could exert a positive or negative effect on NTBs depending on whether these variables are substitutes or complements. Import penetration and political importance are expected to exert a positive effect on NTBs. Sectoral competitiveness and employment growth should be negatively related to NTBs.

[9] Holden and Casale (2002) also left out the import elasticity variable from the theoretical equation used in their estimation of the Grossman-Helpman model. Moreover, Goldberg and Maggi (1999) mentioned that import elasticity estimates are 'noisy' data.

5. EMPIRICAL MODEL AND DATA

The NTB function in the preceding section is then estimated in a log-linear form as follows:

$$\log N_t = \beta_0 + \beta_1 \log T_t + \beta_2 \log I_t + \beta_3 \log LP_t + \beta_4 \log VA_t + \beta_5 EG_t + \varepsilon_t \quad (2)$$

where N_t is non-tariff barrier i.e. NTB coverage ratio in the agricultural sector at time *t*, T_t is agricultural sector's average ad valorem tariff rate at time *t*, LP_t is agricultural labor productivity at time *t*, VA_t is agricultural sector's share of value-added at time *t*, EG_t is employment growth[10] in the sector at time *t,* and I_t is import penetration ratio in the agricultural sector at time *t*. ε_t represents the residuals in the NTB function.

The autoregressive distributed lag (ARDL) cointegration approach (Pesaran and Pesaran, 1997; Pesaran, Shin and Smith, 2001) is used to estimate the NTB function[11]. Before we proceed with the estimation, the variables in equation (2) would be tested for the presence of unit root using the Augmented Dickey-Fuller and Phillips-Perron tests. A variable that has a unit root is non-stationary[12] and regressions involving such time series would erroneously imply the presence of a meaningful causal economic relationship (Harris, 1995). The study uses annual data from 1978 to 2007. Import penetration ratio is calculated as the ratio of import to domestic demand[13]. The annual tariff rate in the agricultural sector is derived by way of simple average ad valorem tariff measurement. Data for labor productivity is calculated as the ratio of value added to total employment in the sector. Data for value added and employment growth are the percentage share of value added and the percentage change of total employment in the agricultural sector respectively. The aggregate level of NTBs in the sector is derived based on the compilation of NTBs over the thirty-year period and calculated using the NTB coverage ratio method of measurement[14].

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[10] Employment growth is not transformed into logarithm due to the presence of negative growths in employment in several years.

[11] This technique is chosen as it has several advantages. First, the technique does not require pre-testing of the order of integration of the variables in the function. It can be applied regardless of whether the explanatory variables are purely I(0), purely I(1) or mutually co-integrated. Second, the unrestricted error correction model associated with this technique provides better statistical properties as it does not push the short-run dynamics into the residual term (Tang, 2005). Third, unlike the Johansen-Juselius cointegration technique that is more suitable for large sample sizes typically involving 100 observations, the ARDL technique can accommodate cases where there is a small finite sample.

[12] A time series is considered non-stationary if the mean, variance and auto-covariance are not time invariant (Gujarati, 1995). In other words, non-stationary time series have a different mean at different points in time and its variance and sample size are positively related.

[13] Domestic demand is calculated as agricultural production less agricultural exports plus agricultural import.

[14] This method is more feasible at this level of aggregation as we are only concerned with the overall level of protection in the agricultural sector. Using any other method would require an extensive amount of data and information in calculating the protection level, which would be insurmountable given that there are thousands of tariff lines in the sector. The method requires information on the import weight of products affected by NTBs and a binary indicator that indicates the presence or absence of NTBs in the sector. As in past studies, the ratio will be calculated by the following equation:

$$NTB_i = \sum_{j=1}^{l} n_j \left(\frac{m_j}{\sum_j m_j} \right) \qquad j = 1,2,\ldots..,l$$

where *i* represents the agricultural sector, *j* represents the disaggregated products in the sector, *n* is the binary indicator for the presence (*n* = 1) or absence (*n* = 0) of NTBs, and *m* refers to the value of gross imports of each disaggregated product. As mentioned before, the record of imports subjected

6. FINDINGS ON THE DETERMINANTS OF AGRICULTURAL NTBs

Results from the unit root tests show that all the variables are I(1) except for import penetration ratio and employment growth as they are stationary at level. Thus, the use of the ARDL method of estimation is deemed appropriate due to the mixture of I(0) and I(1) series in the function. To estimate the long run relationship between NTBs and their determinants in the agricultural sector, equation (2) is modified to incorporate the long-run multipliers and short-run dynamic coefficients in a conditional vector equilibrium correction model such as below:

$$\Delta \log N_t = c_0 + \delta_1 \log N_{t-1} + \delta_2 \log T_{t-1} + \delta_3 \log I_{t-1} + \delta_4 \log LP_{t-1} + \delta_5 \log VA_{t-1} + \delta_6 EG_{t-1} + \sum_{i=1}^{p_1} \phi_i \Delta \log N_{t-i} +$$
$$\sum_{j=0}^{q_1} \varpi_j \Delta \log T_{t-j} + \sum_{k=0}^{q_2} \varphi_k \Delta \log I_{t-k} + \sum_{l=0}^{q_3} \gamma_l \Delta \log LP_{t-l} + \sum_{m=0}^{q_4} \eta_m \Delta \log VA_{t-m} + \sum_{r=0}^{q_5} \varsigma_r \Delta EG_{t-r} + \psi D8_t + \zeta D9_t + \varepsilon_t \quad (3)$$

where c_0 is the intercept or constant, ε_t are white noise errors and δ_t are the long run coefficients. $D8_t$ and $D9_t$ are included to represent dummy variables for the economic crisis periods in the 1980s i.e. 1985 and 1986 and in the 1990s i.e. 1998 and 1999. As EG is not expressed in log due to the presence of negative values in the series, its estimated effect on NTBs is only obtained after the coefficient estimate is multiplied with its mean value.

Results from the bounds test (Pesaran and Pesaran, 1997; Pesaran et al., 2001) conducted at lag 1 (based on Schwarz Bayesian Criterion) show that the F-statistic is 11.4642. When compared with the critical values tabulated by Narayan (2004) for Case II (restricted intercept and no trend), the F-statistic obtained clearly exceeds the upper bound critical values at both 5 and 10 percent significant levels, which are 4.193 and 3.517 respectively. This means that the null hypothesis of no cointegration can be rejected. As such, there is a long run relationship among variables in the model. We then estimated this relationship and derived the following equation:

$$\log N_t = \underset{(-2.828)^{**}}{-11.8243} + \underset{(2.234)^{**}}{0.4266 \log I_t} + \underset{(2.482)^{**}}{0.3205 \log T_t} + \underset{(3.795)^{***}}{1.3899 \log LP_t} + \underset{(0.135)}{0.0422 \log VA_t}$$
$$+ \underset{(2.674)^{**}}{0.0272 EG_t} - \underset{(-2.471)^{**}}{0.4748 D8_t} - \underset{(-0.719)}{0.1416 D9_t} \quad (4)$$

Note: Numbers in parentheses are the t-statistics associated with the coefficients. *** shows significance at 1 percent level and ** denotes significance at 5 percent level.

In equation (4), import penetration ratio is significant and positive. Thus, an increase in imports by 1 percent is expected to generate as much as 0.4 percent increase in NTB protection level. Tariff is also positive and significant at 5 percent level. A 1 percent increase in the average tariff rate would induce an approximately 0.3 percent increase in NTBs in the agricultural sector. The coefficient of labor productivity in the model is also positive and significant. It shows that a 1 percent rise in sectoral competitiveness leads to a 1.4 percent rise in NTB level. The political economy of trade protection theory postulates that an increase in the sector's competitiveness should entail less protection. Instead, the positive sign obtained indicates that more protection is granted to the agricultural sector. Even

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to at least one type of NTBs in each year between 1978 and 2007 is obtained from the Royal Malaysian Customs. The value of each affected imports are obtained from the Department of Statistics, Malaysia.

though the sign of the coefficient is unexpected, it is plausible for the agricultural sector of a developing country such as Malaysia to have such result. In addition, a 1 percent increase in employment growth generates an increase of approximately 0.03 percent in NTBs[15]. An improvement in employment growth signifies a growing industry, which should be expected to require less protection. Thus, the result from the study is not consistent with the interest group model of the political economy of trade protection theory. However, Clark and Bruce (2006) also found the variable to be positive in their study. If the variable is considered as indicative of a growing employment size, then the positive outcome obtained is consistent with the adding machine model of the political economy of trade protection theory.

The coefficient for the 1980s economic crisis dummy variable is significant, indicating that there is a change in the level of NTB coverage ratio during crisis and non-crisis time periods. The negative coefficient implies that the NTB coverage ratios decrease during the economic crisis period. Since fewer goods are imported during economic crises, the NTB coverage ratios could decline due to the reduction in the value of imports incurred during such periods[16]. Meanwhile, the insignificance of the share of value added means that political importance of the sector is not important in determining the protection granted to the agricultural sector. While this variable is theoretically expected to be important, the sector's declining contribution to the country's value added may explain for the variable's insignificance.

The model is further estimated to determine the short-run determinants of NTBs. Based on the results from the error correction model, the short–run NTB function can be depicted as follows:

$$\begin{aligned}\log\Delta N_t = {} & 0.0742 - 0.2825\log\Delta N_{t-1} + 0.5624\log\Delta I_t + 0.1956\log\Delta T_t + \\ & (1.112) \quad (-1.541) \qquad (2.902)^{***} \qquad (1.451) \\ & 0.1056\log\Delta LP_t - 0.2575\log\Delta VA_t + 0.0109\Delta EG_t - 0.2137D8_t - \\ & (0.098) \qquad (-0.597) \qquad (1.263) \qquad (-1.438) \\ & 0.1839D9_t - 0.5104ECT_{t-1} \\ & (-1.161) \quad (-2.005)^{*}\end{aligned} \tag{5}$$

Diagnostics:

Adjusted R^2	0.3454		
AR(2)	2.6409 [0.1021]	RESET(2)	2.4653 [0.1166]
Heteroscedasticity(1)	1.0787 [0.4231]	Normality(2)	12.5188 [0.0019]

Note: ( ) parentheses denote the t-statistics while p-values are in [ ] parentheses. Breusch-Godfrey, White, Ramsey RESET and Jarque Bera tests are used to test for the presence of serial correlation, heteroscedasticity, model mis-specification and residual non-normality in all models. *, **, and *** denote significance at 10 percent, 5 percent and 1 percent respectively.

Among the potential determinants of NTBs, import penetration ratio is the only significant factor which influences NTBs in the short run. NTBs are inelastic with respect to import penetration ratio with a magnitude of 0.6 percent for every 1 percent change in the latter.

[15] To obtain the effect of employment growth on NTBs, the coefficient estimate for the variable in Model 3 is multiplied with the mean value of employment growth i.e. 0.9766, given that employment growth is not specified in log.

[16] Recall that NTB coverage ratios are derived based on the value of imports that are subjected to NTBs.

The sign of the variable reflects that an increase in import penetration ratio leads to an increase in NTB protection in the short run. Other variables such as tariff, labor productivity and employment growth, which are statistically significant in the long run, are insignificant in the short run. The negative and significant lagged coefficient of the error correction term (ECM_{t-1}) in the model reflects that the adjustment of NTBs to shocks in the system is quite rapid as 51 percent of the disequilibrium is adjusted to achieve convergence in the long run. The model adequately explains the relationship among the economic variables as it passes all the diagnostic tests except for the normality test. Even though the null hypothesis of residual normality is rejected, the coefficient estimates are not affected as the non-normality is caused by excess kurtosis[17]. According to Paruolo (as cited in MacDonald and Ricci, 2003), in instances where normality is rejected due to excess kurtosis, the results from the regression are not affected. Thus, the model does not exhibit any autocorrelation, heteroscedasticity and model misspecification problems. The fit of the model is also satisfactory, showing that roughly 35 percent of the variations in NTBs are explained by the variations in the independent variables.

7. CONCLUSION

Analysis of NTBs in Malaysia's agricultural sector reveals that numerous non-tariff measures have been imposed on agricultural imports since the 1970s. These imports are subjected to non-tariff measures for reasons such as the protection of health, sanitary, security, environment and intellectual property. Nonetheless, some agricultural imports are also imposed with NTBs to protect domestic producers from import competition. Over the years, more and more agricultural imports have been imposed with some form of non-tariff measure. Thus, given the apparent rise in NTBs, the paper seeks to identify the incidence of NTBs and examines factors that influence the level of NTBs in the agricultural sector. Factors such as import penetration ratio, sectoral competitiveness level, employment growth and tariff are found to be important in influencing the long run level of NTBs in the sector.

From the findings, we conclude that any foreseeable "threat" on domestic agriculture from increased imports would herald an increase in the level of protection granted to the sector. Additionally, an increase in the sectoral average tariff rate would signal the impending rise in NTBs since both tariff and NTBs in the agricultural sector are complements. We also deduce that the importance of agriculture to the country's rural population may induce the government to increase its protection of the industry over the long run. Removing trade protection would create uncertainty as to whether or not workers in the sector can adjust to the changes. Thus, the concern about lowering income inequality and improving the standard of living of the poor may explain why protection is increased even when competitiveness of the agricultural sector improves. Food security, which relates to the availability of food in Malaysia and one's access to it, is another possible reason for the increase in NTB protection. Protecting the livelihood of workers in the sector by imposing import control will also bring more political mileage to the incumbent government. As workers in a particular sector are the electorates that will maximize the government's potential for re-election, this would give the incumbent government an incentive to protect the sector as the number of employees rises. The current relatively low tariff environment signals that further trade liberalization process would now involve the reduction or removal of NTBs. As such, the agricultural sector can no longer rely on NTBs for protection against import competition. Programs that allow domestic agricultural producers to successfully adjust to changes in the market condition and those that will not leave them marginalized in the trade liberalization process must be implemented beforehand. Ultimately, a cautious and

[17] The residual has a skewness of 0.8 and a kurtosis of 5.8. Individually, all the variables at level pass the Jarque Bera test of normality. The p-values for the Jarque Bera statistics for N, I, T, LP, VA and EG are 0.29, 0.24, 0.22, 0.61, 0.35 and 0.22 respectively.

gradual approach to trade liberalization is necessary for a developing country such as Malaysia.

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