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Abstract

This paper aims to evaluate Myanmar's exports of manufacturing products by using a gravity trade model for emerging ASEAN economies. The main focus of this study is whether Myanmar's manufacturing exports have recovered towards the gravity-trade-standard of the other emerging ASEAN countries for the post-sanction period of 2013-2018. The main findings from the gravity trade model estimation are summarized as follows. First, the Myanmar's manufacturing exports for the post-sanction period have been still significantly below the level of the gravity-trade-standard. Second, the downward deviation from the standard could be explained by the two Myanmar-specific factors, i.e., the low institutional quality and the Dutch Disease effect in the Myanmar's exports to western countries, but not fully in those to Asian countries. The additional factor for the deviation against Asian countries might come from Myanmar's sluggish participation in the international production networks.

Key words: Myanmar's manufacturing exports, lifting economic sanctions, gravity trade model, in-sample and out-of-sample estimations, institutional quality, Dutch Disease, international production networks

JEL Classification: F14, O53

1. Introduction

Myanmar has entered into a new regime of market-based economy with open-door policies since March 2011, under the civilian government led by President Thein Sein and the subsequent government headed by State Counsellor, Aung San Suu Kyi. During the previous military-ruled regime before 2011, the Myanmar economy had suffered from the long-lasting stagnation under the control-oriented and inward-looking policies. In particular, the economic sanctions imposed by western countries due to the suppression of human rights under the military-ruled regime were a serious factor to have made the economy stay at a stagnant position. To be specific, The United States and Canada imposed general import bans from Myanmar in July 2003 and December 2007, respectively. The European Union also exercised import bans on specific products in February 2008. These economic sanctions were lifted under the new regime controlled by the civilian government since 2011: Canada suspended the sanctions in April 2012; the European Union lifted the general import ban in April 2013: and the United States eased the import ban in November 2012 and lifted it in September 2016.

In accordance with the regime transformation, the economic performances in Myanmar have showed remarkable improvements under the new regime. Through the economic growth process, Myanmar economy has promoted its economic status from "low income" to "middle income" since 2014, according to the World Bank Classifications[1]. Among economic indicators, the level and growth of exports are the most important one for Myanmar, since the exports of manufactured goods were seriously affected by the imposition and lifting of economic sanctions by western countries. Figure 1 illustrates the trends in the export values of Myanmar's total and manufacturing products, and indicates that the exports of manufacturing products have jumped up for the post-sanction period of 2013-2018 after their stagnation for the sanction period, while the total exports have shown an increasing trend through the periods. On the other hand, when the trend in manufacturing exports of Myanmar is compared with those of the other emerging ASEAN countries in terms of exports-GDP ratio in Figure 2, the level and growth of Myanmar's exports seems to be not necessarily high and robust even for the post-sanction period of 2013-2018 relative to those in Vietnam, Cambodia and Thailand.

This paper aims to evaluate Myanmar's exports of manufacturing products by using a gravity trade model for emerging ASEAN economies. The main focus of this study is whether Myanmar's manufacturing exports have recovered towards the gravity-trade-

[1] See the website: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519.

standard of the other emerging ASEAN countries for the post-sanction period of 2013-2018. It would be a relevant issue and timing to assess the current Myanmar manufacturing exports under the new open-door regime, in the sense that there have been a very limited number of quantitative studies on Myanmar trade under the new regime, and also that five or six years for the post-sanction period are rather enough to be analyzed quantitatively at a minimum level.

The rest of the paper is structured as follows. Section 2 reviews the literature related to the issue on a gravity trade model and Myanmar's trade. Section 3 conducts empirical analyses of Myanmar's manufacturing exports by applying a gravity trade model. Section 4 summarizes and concludes.

2. Literature Review and Contribution

This section reviews the literature related to the issue on a gravity trade model and its application to Myanmar's trade.

Regarding a gravity trade model, the model has been the most commonly used analytical framework in empirical studies of international trade flows. The model originated from Tinbergen (1962) and Pöyhönen (1963), which were the first to apply the "Newton's Law of Gravitation" to international trade flows. The original intent of the gravity trade equation was to explain bilateral trade flows by the economic size of two countries and the distance between them. Since Anderson (1979) assigned the model with theoretical underpinnings for the first time, the gravity trade model has been established as being consistent with trade theories based upon models of imperfect competition and with the Heckscher-Ohlin model (see, e.g. Helpman and Krugman, 1985; and Deardorff, 1998). Bergstrand (1989), extending the microeconomic foundations for the gravity equation to incorporate factor-endowment variables in the spirit of Heckscher-Ohlin model and taste variables in the spirit of Linder model[2], developed the augmented version of the gravity model by including per capita income levels for both exporters and importers as additional regressors[3].

The gravity trade model has often provided a useful instrument to assess the trade-integration effects of exogenous events and factors such as free trade agreements, cross-border infrastructure development, economic sanctions with import bans and policy changes in trade. Among a large volume of literature on trade analyses using a gravity

[2] Linder (1961) suggested that countries with similar per capita incomes will have similar demands.
[3] The augmented version of the gravity model has been widely used in empirical studies of international trade flows. See, e.g. Frankel et al. (1995) and Stack (2009).

trade model, there have been a very limited number of the studies targeting Myanmar trade. There are two kinds of approaches to evaluate the actual trade values in gravity trade analyses: "in-sample" and "out-of-sample" approaches. The former one is to contain the economy targeted for its evaluation with a dummy variable in estimating a gravity model, and to investigate the significance of the dummy variable with its interpretations. A negative or positive coefficient for the dummy with a conventional significance is regarded as evidence that the actual trade values of targeted economy are below or beyond a gravity-trade-standard for specific reasons. Nu Nu Lwin (2009), for instance, examined the impact of trade sanction against Myanmar using bilateral trade data of Myanmar with 27 partners over the period for 1998-2007, by employing a dummy variable for sanctioning country of the United States (US) in a gravity model. The study identified a significantly negative impact of the trade sanction on Myanmar-US trade by roughly 0.02 times of standardized bilateral trades.

The other approach is "out-of-sample" one. This approach is to estimate a gravity model by excluding a targeted economy, and to calculate the counterfactual trade values of the targeted economy by using the estimated parameters of the estimated model. The serious gap between the counterfactual trade values and the actual ones implies the existence of specific events and factors to make the trade of the targeted economy below or beyond the gravity-trade-standard. The gap by which the counterfactual values exceed the actual ones could also be interpreted as an unexhausted trade potential in the targeted economy. Oh and Thant (2016) examined ASEAN members' trade pattern by using a gravity model with a panel dataset encompassing ASEAN countries and their 85 trading partners for a 15-year time period for 1994-2008. Based on the estimated model, they simulated Myanmar's gravity-based counterfactual trade flows, and found that Myanmar's trade has been distorted due to political factors including economic sanctions. Ferrarini (2013) estimated a gravity trade model using export data of six ASEAN members with their 35 major trade partners for the period of 2000-2010. By using the parameters of the estimated model, the study projected Myanmar's counterfactual export value, and showed that it was four times greater than her actual export in 2010. Kubo (2014) also studied Myanmar's export potential using the out-of-sample gravity model approach with the sample of the ten countries' exports to 157 countries and regions during the period of 2004-2011. The study employed non-resource exports as the dependent variable in order to take into account the effects of natural resource exports on non-resource exports, namely, the Dutch Disease effect. The finding was that the counterfactual predicted non-resource exports were lower than the actual exports with the consideration of the effects of natural resource exports, whereas the predicted exports

were more than five times than the actual one without counting natural resource effects, thereby implying the existence of the Dutch Disease.

The previous studies of applying a gravity trade model to Myanmar's trade, as described above, have commonly demonstrated negative trade effects and unexhausted trade potentials during the sanction period under the military-ruled regime before 2011. Then the academic contributions of this paper to the reviewed literature above could be demonstrated as follows. First, this paper targets the post-sanction period of 2013-2018 unlike the previous studies, aiming to evaluate whether Myanmar's manufacturing exports have recovered from their stagnated trend under the sanctions towards the gravity-trade-standard of the other emerging ASEAN countries under the post-sanctions. The paper also investigates the factors such as the Dutch Disease effects and institutional quality to explain the current trend in Myanmar's manufacturing exports. The evaluation would be in a relevant timing, because five or six years have passed since the lifting of the sanctions and there have been few empirical studies for the quantitative evaluation targeting the post-sanction period.

Second, this paper applies both of in-sample and out-of-sample approaches to gravity model estimation, so that the consistency of both approaches can be checked and the robustness of the estimation outcomes can be ensured. To be specific, this study includes Myanmar as the estimation sample with a dummy variable and examines its significance in the in-sample approach. At the same time, the study excludes Myanmar from the estimation, and examines the gap between the counterfactual values and the real ones in the out-of-sample approach.

3. Empirical Analysis

This section conducts empirical analyses of Myanmar's manufacturing exports by applying a gravity trade model. This study focuses on manufacturing exports, not total exports, as in Kubo (2014), to take the Dutch Disease effect into account. The section first observes simply the flow of manufacturing exports of emerging ASEAN countries (including Myanmar) with their major trading partners, then clarifies the methodology of a gravity trade model, represents the estimation outcomes and discuss them.

3.1 Overview of Export Flows in Emerging ASEAN Economies

Table 1 indicates the structure of manufacturing exports of Myanmar and the other emerging ASEAN countries with their major trading partners in terms of US dollar base

in 2018. The share of intra-ASEAN exports relative to the exports to the world ranges from 3.08 percent in Cambodia to 48.34 percent in Lao PDR with the average of ASEAN countries being 15.90 percent; the share of ASEAN exports to Asian countries including intra-ASEAN countries ranges from 20.63 percent in Cambodia to 64.81 percent in Lao PDR with the average being 41.90 percent; and the share of ASEAN exports to western countries ranges from 22.89 percent in Thailand to 66.33 percent in Cambodia with the average being 34.75 percent. It should be noted that the share of Myanmar exports to intra-ASEAN countries is 5.97 percent, the second lowest among ASEAN countries.

Compared with the structure of emerging ASEAN manufacturing exports in 2000, the drastic changes are found as follows: for all emerging ASEAN countries except Vietnam, the share of intra-ASEAN exports increases from 10.00 to 15.90 percent on ASEAN average; the share of ASEAN exports to Asian countries also rises from 23.79 to 41.90 percent; on the other hand, the share to western countries sharply declines from 54.28 to 34.75 percent. This changes suggest that the international production networks, characterized by the fragmentation of production processes and the international dispersion of tasks and activities have been prevailed in East Asia since the 2000s, as demonstrated by Kimura (2006). The extension of the international production networks have usually involved active back-and-forth international transactions of intermediate goods such as processed goods, parts and components, thereby being consistent with the rapid growth of ASEAN manufacturing exports to Asian countries including intra-ASEAN countries since the 2000s. Under this trend, however, Myanmar economy seems to have been lagging behind the participation in the international production networks as shown in the low share of its exports to intra-ASEAN countries.

3.2 Specification of Gravity Trade Model Estimation

This section clarifies the methodology of a gravity trade model estimation to evaluate Myanmar's manufacturing exports among those of emerging ASEAN economies. For the estimation, as was stated in Section 2, this study applies both of the in-sample approach including Myanmar and the out-of-sample one excluding Myanmar. Then this section starts with the in-sample estimation followed by the out-of-sample one.

3.2.1 In-sample Estimation

This study, as in the previous studies such as Kubo (2014), applies the augmented version of gravity model by including per capita income levels for both exporters and

importers as additional regressors, but modifies it in accordance with our analytical interests. The equation for estimation is specified as follows.

$$\begin{aligned}\ln(EXt) = \text{const.} &+ \alpha_1*\ln(YEt*YMt) + \alpha_2*\ln(YPCEt*YPCMt) + \alpha_3*\ln(DIS) \\ &+ \alpha_4*\ln(REXt) + \alpha_5*NRRt + \alpha_6*GEFt + \alpha_7*DS\_WEST + \alpha_8*DS\_ASIA \\ &+ \alpha_9*DPS13\_WEST + \alpha_{10}*DPS16\_WEST \\ &+ \alpha_{11}*DPS13\_ASIA + \alpha_{12}*DPS16\_ASIA + \alpha_{13}*Dt + \varepsilon t \qquad (1)\end{aligned}$$

where EXt denotes manufacturing exports of emerging ASEAN economies including Myanmar to their major trading partners in year t; YEt and YMt are an economic size represented by Gross Domestic Product (GDP) of an exporter and an importer respectively; YPCEt and YPCMt are a per capita GDP of an exporter and an importer respectively; DIS is a geographical distance between the capital city of an exporter and that of importer; REXt is a bilateral real exchange rate of an exporter against an importer; NRRt is a natural resources rent of an exporter; GEFt is an indicator of government effectiveness; DS_WEST and DS_ASIA are dummy variables for economic sanctions on Myanmar for 2004-2012 against western countries and Asian countries respectively; DSP13_WEST, DSP16_WEST, DSP13_ASIA and DSP16_ ASIA are dummy variables for post-economic sanctions of 2013-2018 and 2016-2018 on Myanmar against western countries and Asian countries respectively; Dt is a time dummy in year t; εt is an error term; and $\alpha_1 \ldots \alpha_{13}$ are coefficients of explanatory variables. All the variables are listed in Table 2.

The following points should be taken into account in the specification of the estimation model (1). First, the greatest concern in the estimation is to assess the Myanmar's manufacturing exports during the sanction and post-sanction periods. Then the in-sample estimation model including Myanmar as a sample equips six dummy variables related to the economic sanctions on Myanmar with three different periods and two different trading partners. The dummy variable takes a value 1 if Myanmar exports belong to the targeted period and the trading partner, and 0 otherwise. Regarding the three different periods for setting the dummies, they are composed of the sanction period of 2004-2012 (DS), and the post-sanction periods of 2013-2018 (DPS13) and of 2016-2018 (DPS16). The sanction period of 2004-2012 covers the periods of general import bans imposed by the United States, Canada and the European Union. The reasons for setting two different post-sanction periods of 2013-2018 and 2016-2018 are as follows: to materialize the two-step liftings of the sanction by the United States (easing the import ban in November 2012 and lifting it in September 2016); and to take into account the time

lag taken from the lifting of the sanctions to the recovery of the production capacities in Myanmar economy. As for the two different trading partners for the dummies, they are divided into two groups: western countries (_WEST) and Asian countries (_ASIA). It is the United States, Canada and the European Union, belonging to western countries, that imposed the sanctions on Myanmar. These sanctions might, however, affect Myanmar's exports to Asian countries, in such an indirect way that Myanmar's exports might decline due to their synchronized actions with western countries, or that Myanmar's exports might increase towards the other Asian countries as alternative trading partners.

Second, additional regressors to the gravity model, i.e., a natural resources rent of an exporter (NRRt) and an indicator of government effectiveness (GEFt), are the factors that are supposed to cause deviations from the gravity-trade-standard. The NRR is an indicator of natural resource development, and the purpose of its inclusion is to examine whether an exporter's natural resource development has crowded out its manufacturing exports. This negative effect is called the Dutch Disease, and its theoretical framework was originally described by Corden and Neary (1982). The GEF, representing institutional quality and governance, also matters in enhancing manufacturing activities and alleviating the Dutch Disease effect at the early stage of an economy's development, as a significant number of empirical studies have examined the effects of institutional qualities on economic development in general (e.g., North 1990, Rodrik et al. 2002, Lee and Kim 2009, Vaal and Ebben 2011 and Flachaire et al. 2014).

Third, a bilateral real exchange rate of an exporter against an importer (REX) is introduced as a multilateral time-varying price resistance term. The gravity trade model proposed by recent theoretical developments requires the inclusion of the multilateral price term in the model. Anderson and van Wincoop (2003) suggested the use of country-specific fixed effects as the method to account for the multilateral price term in the cross-section. In a panel setting, however, the multilateral price term would be time varying. One way to control for price changes is to introduce, similarly to Rose (2000) and Vandenbussche and Zanardi (2010), the bilateral real exchange rate that varies over time and tracks price changes.

Based on the description of the variables above, the sign of each variable's coefficient could be expected to be as follows (see Table 2 again). If the estimation follow the augmented version of gravity trade model, the coefficient' signs of the products of GDP (YEt*YMt) and per capita GDP (YPCEt*YPCMt), α_1 and α_2, are expected to be positive, and that of geographical distance (DIS), α_3, is expected to be negative; the coefficient of bilateral real exchange rate of an exporter against an importer (REXt), α_4, should have a negative sign; and the coefficient of natural resources rent (NRRt) and that of government

effectiveness (GEFt), α_5 and α_6, should have a negative sign and a positive one respectively. Regarding the dummy variables related to the economic sanction on Myanmar, the coefficient's sign of the sanction dummy against western countries (DS_WEST) is naturally supposed to be negative. The other sanction-related dummies might, however, have ambiguous signs in their coefficients for the following reasons. First, the coefficient of the sanction dummy against Asian countries (DS_ASIA) might depend on the side-effects of the sanctions by western countries on Myanmar's exports to Asian countries: synchronized effects or alternative ones. Second, the coefficients of the post-sanction dummies (DSP13 and DSP16) might depends on the degree and speed of the recovery of Myanmar' exports after the lifting of the sanctions. The post-sanction dummies that are significantly negative bring the discussion to the factors to push down Myanmar's exports from the gravity-trade-standard of emerging ASEAN countries even after the lifting of the sanctions on Myanmar.

3.2.1 Out-of-sample Estimation

The out-of-sample approach adopts the same specification for gravity model estimation as that of the in-sample approach, except that the estimation excludes Myanmar's exports from the sample, thereby removing the dummy variables related to the economic sanctions on Myanmar from Equation (1). The equation for estimation is, therefore, specified as follows.

$$\ln(EXt) = \text{const.} + \beta_1 * \ln(YEt * YMt) + \beta_2 * \ln(YPCEt * YPCMt) + \beta_3 * \ln(DIS) + \beta_4 * \ln(REXt) + \beta_5 * NRRt + \beta_6 * GEFt \quad (2)$$

Where the variables have the same denotation as Equation (1), and $\beta_1 \ldots \beta_6$ are coefficients of explanatory variables in the out-of-sample estimation. The counterfactual Myanmar's exports are calculated by using the coefficients of the constant term and $\beta_1 \ldots \beta_6$. The serious gap between counterfactual values and the real ones leads to the investigation of the factors to make downward deviations of Myanmar's exports from the gravity-trade-standard of the other emerging ASEAN countries.

3.3 Sample Data and Estimation Method

The sample period is the one from 1998 to 2018, in which the data are available for the estimation variables and cover the sanction period of 2004-2012. The sample

economies are 16 countries/region: eight of ASEAN emerging-market countries (Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand and Vietnam)[4], and eight of their major trading partners outside of ASEAN (Japan, China, Korea, India, the United States, Canada, the United Kingdom and Euro Area). Table 1 again shows that the manufacturing exports of the sampled emerging ASEAN countries to the sampled trading partners covers 60-90 percent out of their total exports to the world as shown in the last line of the table. The study then constructs panel data for 1998-2018 with the export combinations between emerging ASEAN countries and their sampled trade partners (8 * 15 = 120) for the in-sample estimation, and Myanmar's exports are excluded from this panel data in the out-of-sample estimation.

Regarding the sources of the sampled data (see the last column and notes of Table 1), the data of manufacturing exports (EXt) are retrieved from UNCTAD Stat, by the series of the "Manufactured goods (SITC 5 to 8 less 667 and 68)" of "Merchandise trade matrix"; GDP and per capita GDP of an exporter and an importer (YEt, YMt, YPCEt and YPCMt) are from the World Economic Outlook (WEO) Database (October 2019) of the International Monetary Fund (IMF), by the series of "current prices U.S. dollars"; the distance between capital cities of an exporter and an importer (DIS) are measured by the Great Circle Distance Between Cities on Map (Fromto); the natural resources rent (NRRt), expressed by a percentage of GDP, comes from the World Development Indicators (WDI) of the World Bank; and the government effectiveness index (GEFt) is from the Worldwide Governance Indicators (WGI) of the World Bank, which takes the number ranging from approximately -2.5 (weak) to 2.5 (strong). Lastly, the bilateral real exchange rate of an exporter against an importer (REXt) is computed by using consumer prices (CPI) and bilateral nominal exchange rates (ER), which are retrieved from the WEO, as follows.

$$(CPI_{\text{exporter}} / ER_{\text{exporter currency per US Dollar}}) / (CP_{\text{importer}} / ER_{\text{importer currency per US Dollar}})$$

The EXt, YEt, YMt, YPCEt, YPCMt, DIS and REXt are set in logarithm to avoid scaling issues.

Finally, the estimation method this study applies is a pooled censored regression model (Tobit model) to avoid the problem of sample selection bias in the panel data. The Ordinary Least Square supposes that a dependent variable be observed as a continuous and unrestricted scale. The export values as a dependent variable that this study samples, however, are only partially observed at positive or zero values. Thus, we adopt the Tobit

[4] Brunei Darussalam and Singapore are excluded here, since this study focuses on emerging-market economies.

model with a dependent variable left-censored at zero and with the logistic distribution for the error term.

3.4 Estimation Outcomes

This section presents the outcomes of the in-sample and the out-of-sample estimations of gravity trade model. The section starts with the in-sample estimation outcomes followed by the out-of-sample ones.

3.4.1 In-sample Estimation Outcomes

The column from (1) to (4) in Table 3 reports the in-sample estimation outcomes. The outcomes contain four estimation cases: the case (1) of the simple augmented version of gravity model with a multilateral time-varying price resistance term, the case (2) including the sanction dummies on Myanmar in the gravity model, the case (3) including both the sanction and post-sanction dummies on Myanmar, and the case (4) with the sanction-related dummies and additional variables (natural resources rent and government effective index) for explaining the deviations from the gravity-trade-standard.

Regarding the case (1), the coefficients of all the explanatory variables have expected signs: the coefficients of products of GDP (YE*YM) and per capita GDP (YPCE*YPCM) are significantly positive; the coefficient of geographical distance (DIS) is significantly negative; and that of bilateral real exchange rate (REX) is negative though it is not significant[5]. The result of case (1) estimation thus implies the validity of gravity trade model.

The case (2) adding the sanction dummies on Myanmar (DS) has their significantly negative coefficients: the sanction dummy against western countries (DS_WEST) has expectedly a negative coefficient (exp.(-3.003) = 0.050) as a direct sanction effect; and the dummy against Asian countries (DS_ASIA) has reasonably smaller size of a negative coefficient (exp.(-2.271) = 0.103), which suggests an indirect “synchronized” effect of the sanctions.

The case (3) adding further the post-sanction dummies on Myanmar (DPS) against western and Asian countries has two different coefficients with opposite signs between DPS13 (2013-2018 dummy) and DPS16 (2016-2018 dummy). The negative coefficients of DPS13_WEST (exp.(-3.265) = 0.038) and DPS13_ASIA (exp. (-3.202) = 0.041) turn

[5] The insignificance in the REX’s coefficient implies the premature markets as in Myanmar economy where the mechanism of prices including exchange rates has not perfectly been working.

into the positive ones of DPS16_WEST (exp. (2.168) = 8.741) and DPS16_ASIA (exp. (1.337) = 3.808), respectively. This changes in their coefficients' signs are considered to reflect the two-step sanction liftings by the United States and the recovery lag of Myanmar's production capacities during the post-sanction period. It should also be noted, however, that the recovering and regaining degrees of Myanmar's manufacturing exports have still been insufficient to reach the gravity-trade-standard, since the sums of the coefficients with opposite signs in the post-sanction dummies are still negative in DPS_WEST (exp. (-1.097 (= a + b)) = 0.334) and in DPS_ASIA (exp. (-1.865 (= c + d)) = 0.155), as shown at the bottom part of Table 3.

This results lead to another estimation in the case (4) for investigating the deviation factors from the gravity-trade-standard. In this case, as is expected in Section 3.2.1, the coefficient of natural resources rent (NRR) is significantly negative, thereby implying the existence of the Dutch Disease effect, and that of government effective index (GEF) is significantly positive, thus suggesting the positive role of institutional quality in promoting manufacturing exports.[6] What should be noted is that adding these regressors contributes to compressing the negative sizes of the coefficients of the post-sanction dummies towards -0.245 in DPS_WEST (exp. (-0.245) = 0.783) and -0.855 in DPS_ASIA (exp. (-0.855) = 0.425). This means that some parts of the negative deviations of Myanmar' manufacturing exports from the gravity-trade-standard during the post-sanction period could be explained by the higher natural resources rent (the Dutch Disease effect) and the lower government effective index of Myanmar than those of the other emerging ASEAN countries. In fact, according to the sample data in 2017, the natural resources rent of Myanmar is 7.14 as a percentage of her GDP, whereas that of the other emerging ASEAN countries on the average is 3.92; and the government effective index in Myanmar is -1.052, while that of the other emerging ASEAN countries is 0.025. The critical remaining point is that, even after taking two factors above into account, there is still a large negative gap between Myanmar exports to Asian countries and the gravity-trade-standard, represented by the coefficient of DPS_ASIA (exp. (-0.855) = 0.425), while the gap on Myanmar exports to western countries is almost alleviated as shown in the coefficient of DPS_WEST (exp. (-0.245) = 0.783). Another possible factor to push down Myanmar exports to Asian countries will be discussed in the later section.

3.4.2 Out-of-sample Estimation Outcomes

[6] In the case (4), the bilateral real exchange rate (REX) has a significantly positive coefficient unexpectedly. It might come from multicollinearity problem in the sense that the Dutch Disease effect by adding natural resources rent (NRR) accompanies the appreciation of real exchange rate.

The column from (5) to (6) in Table 3 again reports the out-of-sample estimation outcomes: the case (5) of the simple augmented version of gravity model and the case (6) including additional variables (natural resources rent and government effective index) for explaining the deviations from the gravity-trade-standard.

The case (5), as in the case (1) of the in-sample estimation, has positive coefficients of YE*YM and YPCE*YPCM and negative ones of DIS and REX at their significant levels respectively. It supports the validity of gravity trade model even in the out-of-sample estimation excluding Myanmar's exports. The case (6) also shows almost the same result as that of the in-sample estimation: the negative coefficient of natural resources rent (NRR) implies the existence of the Dutch Disease effect, and the positive coefficient of government effective index (GEF) suggests the active role of institutional quality in promoting manufacturing exports, both of which are significant factors to deviate manufacturing exports from the gravity-trade standard.

The study now calculates the counterfactual Myanmar's manufacturing exports by using the coefficients estimated in the case (6), and compares those with the actual Myanmar's exports. Figure 3 displays three kinds of the counterfactual values as well as the actual value in logarithm terms for Myanmar's manufacturing exports to western countries and to Asian countries: 1) the gravity-trade-standard (GTS), using the constant term and the coefficients of YE*YM, YPCE*YPCM, DIS and REX), 2) the GTS adding the coefficient of NRR, and 3) the GTS adding the coefficients of both NRR and GEF.

It is observed that there are large gaps between actual value and the counterfactual GTS values for Myanmar's manufacturing exports to both western countries and Asian countries. In particular, the largest gap is found in 2010-2011 to western countries, during which the import bans were imposed on Myanmar by not only the United States but also Canada and the European Union. Focusing on the post-sanction period after 2013, however, there is a difference in the gap of the actual and the counterfactual values on between the exports to western countries and those to Asian ones. While in Myanmar exports to western countries the gap is getting filled up toward 2017 by taking NRR and GEF into account, in those to Asian countries the gap still remains even including the two variables. This means that the negative deviation of Myanmar' exports to western countries from the gravity-trade-standard during the post-sanction period could be explained by the low institutional quality and the Dutch Disease effect in Myanmar, and the negative deviation to Asian countries requires the explanation of another possible factor to create it. This outcome of the out-of-sample estimation is consistent with that of the previous in-sample estimation.

3.5 Discussions

Both of the in-sample and the out-of-sample estimation could identify the validity of the expected gravity trade model in emerging ASEAN manufacturing exports, and the economic-sanction effect to compress Myanmar's manufacturing exports, particularly, to western countries. Both estimations also revealed that even after the economic sanctions was lifted, Myanmar's exports have been deviated from the gravity-trade-standard of the other ASEAN economies, and that the deviation could be explained by the two Myanmar-specific factors, i.e., the low institutional quality and the Dutch Disease effect in the exports to western countries but not fully in those to Asian countries.

The remaining issue is to investigate another factor to push down Myanmar manufacturing exports to Asian countries from the gravity-trade-standard for the post-sanction period. The factor might come from the fact that Myanmar economy has been less integrated with the international production networks than the other ASEAN economies. As was discussed in Section 3.1, the intra-ASEAN manufacturing exports have recently risen, reflecting active back-and-forth international transactions of intermediate goods such as processed goods, parts and components under the prevailing international production networks in that area. The low share of Myanmar's intra-ASEAN exports, however, implies that her economy has been lagging behind the participation in the international production networks.

Myanmar's sluggish participation in the international production networks has been pointed out by the other previous studies such as Taguchi and Ni Lar (2015) and Taguchi and Tripetch (2014). Taguchi and Ni Lar (2015) assessed the existing production networks in Mekong region by applying fragmentation theory, through examining the trade of machinery parts and components between Thailand and the other Mekong countries. They found that the machinery trade has been less-integrated between Thailand with Myanmar, which was explained by the higher service-link costs, namely, the poorer logistic performances in Myanmar side. Taguchi and Tripetch (2014) also argued that although Myanmar's border areas with Thailand could be the gateways for production networks to extend across the national borders, the areas have still been underdeveloped due to the lack in logistical frameworks such as so-called Special Economic Zone.

The additional factor to deviate Myanmar manufacturing exports to Asian countries from the gravity-trade-standard might, therefore, be Myanmar's sluggish participation in the international production networks.

4. Concluding Remarks

This paper aims to evaluate Myanmar's exports of manufacturing products by using a gravity trade model for emerging ASEAN economies. The main focus of this study is whether Myanmar's manufacturing exports have recovered towards the gravity-trade-standard of the other emerging ASEAN countries for the post-sanction period of 2013-2018. This paper contributes to the literature by targeting the post-sanction period unlike the previous studies, and by applying both of the in-sample and the out-of-sample estimation methods to ensure the consistency and robustness of their results.

The main findings are summarized as follows. First, both of the in-sample and the out-of-sample estimation could identify the validity of the expected gravity trade mode in emerging ASEAN manufacturing exports, and the economic-sanction effect to compress Myanmar's manufacturing exports, particularly, to western countries. Second, both estimations also revealed that even after the economic sanction was lifted, Myanmar's exports have been deviated from the gravity-trade-standard of the other ASEAN economies, and that the deviation could be explained by the two Myanmar-specific factors, i.e., the low institutional quality and the Dutch Disease effect in the exports to western countries but not fully in those to Asian countries. The additional factor to deviate Myanmar manufacturing exports to Asian countries from the gravity-trade-standard might come from Myanmar's sluggish participation in the international production networks.

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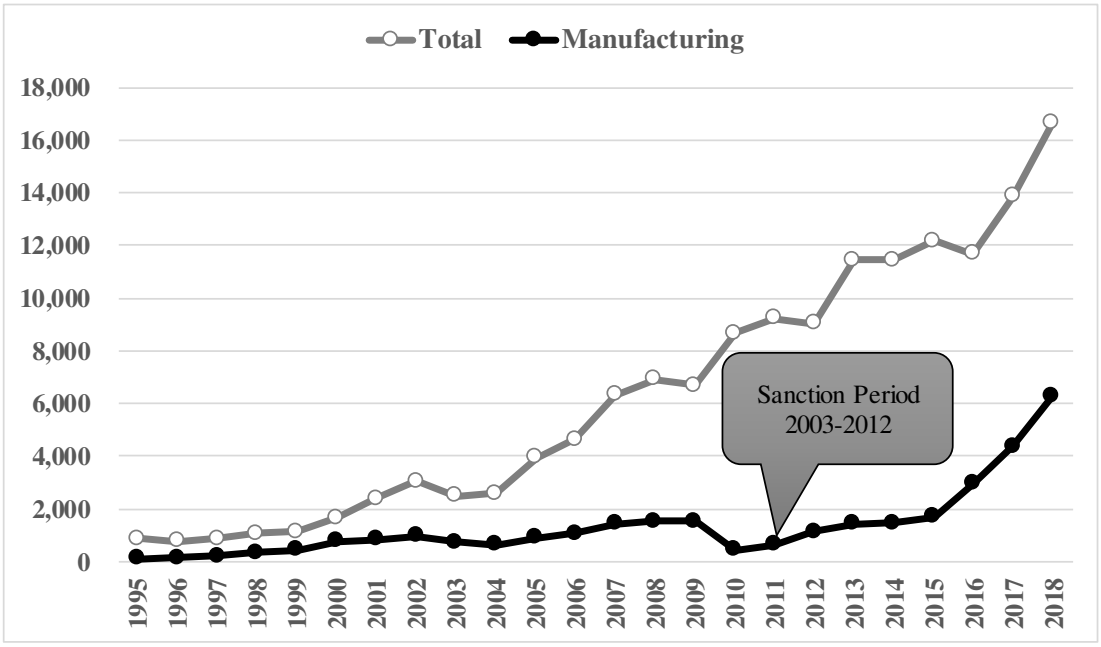
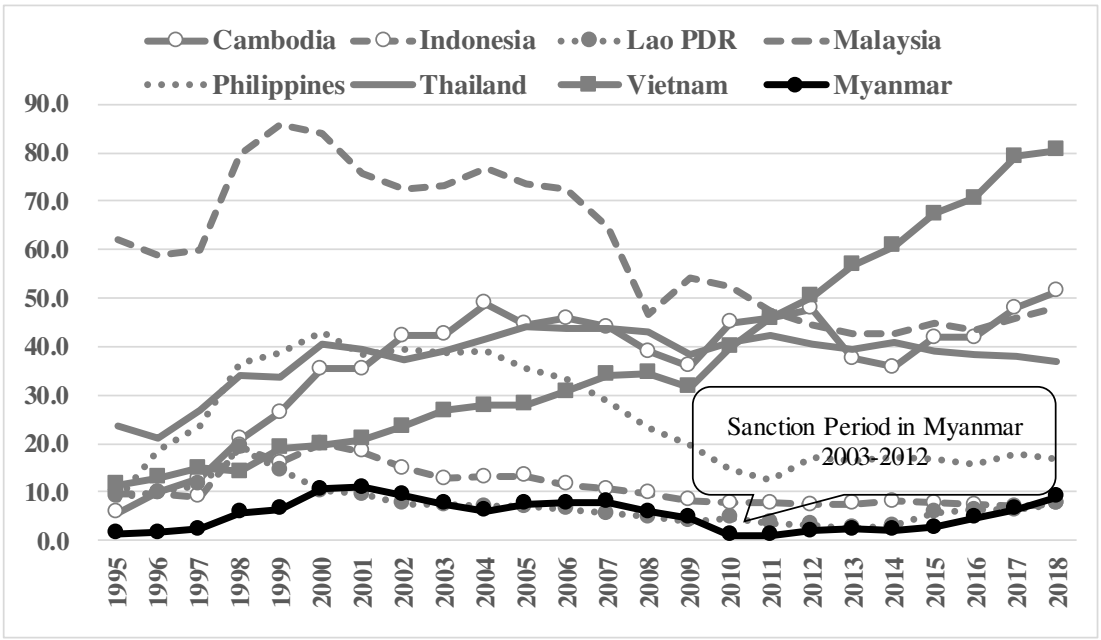
Figure 1 Myanmar's Exports (mil. $)



Source: UNCTAD STAT

Figure 2 Manufacturing Exports as a percentage of GDP in ASEAN



Source: UNCTAD STAT

Table 1 ASEAN Manufacturing Exports to Major Partners

Exports in 2018	Myanmar	Cambodia	Indonesia	Lao PDR	Malaysia	Philippines	Thailand	Vietnam
Total Values (mil. USD)	6,275	12,535	77,661	1,350	169,619	55,250	186,037	196,887
Ratio to the World (%)								
Myanmar	-	0.01	0.40	0.07	0.20	0.03	1.49	0.32
Cambodia	0.01	-	0.15	1.02	0.14	0.04	1.59	1.28
Indonesia	0.22	0.16	-	1.00	2.74	1.20	4.29	1.61
Lao PDR	0.00	0.02	0.01	-	0.01	0.00	1.21	0.19
Malaysia	0.64	0.57	4.10	0.30	-	2.85	4.57	1.44
Philippines	0.12	0.17	4.74	0.46	1.42	-	3.49	1.23
Thailand	3.73	1.85	4.54	41.45	6.13	3.90	-	2.06
Vietnam	1.25	0.30	3.49	4.04	2.70	1.44	4.82	-
ASEAN above	5.97	3.08	17.43	48.34	13.34	9.46	21.46	8.13
Average				15.90				
ASEAN above in 2000	1.42	0.92	8.00	32.24	6.59	7.61	10.53	12.69
Average				10.00				
Japan	20.89	9.02	9.96	7.03	5.75	13.49	10.23	7.93
China	7.48	6.73	10.11	8.45	13.38	11.39	10.16	14.01
Korea	6.35	1.67	3.77	0.87	2.95	3.22	1.72	7.99
India	1.75	0.13	3.13	0.12	2.07	0.66	3.23	2.35
Asia above	42.44	20.63	44.40	64.81	37.49	38.22	46.79	40.41
Average				41.90				
Asia above in 2000	6.61	6.27	26.99	33.34	23.43	25.41	29.86	38.42
Average				23.79				
US	7.33	22.89	15.65	7.79	12.27	16.88	12.67	21.96
Canada	1.18	6.85	0.80	3.33	0.44	0.75	0.51	1.30
UK	6.39	7.17	1.56	1.47	1.15	0.61	1.59	2.66
Euro	27.74	29.41	9.79	11.75	9.47	11.75	8.11	14.77
West above	42.63	66.33	27.80	24.34	23.32	29.99	22.89	40.70
Average				34.75				
West above in 2000	84.24	81.50	38.17	60.65	40.05	50.11	40.52	38.97
Average				54.28				
Total above	85.07	86.96	72.20	89.15	60.81	68.21	69.68	81.11

Source: UNCTAD STAT

Table 2 List of Variables for Estimation

Variables	Description	Exp. Sign	Source
Dependent Variable			
EXt	Manufacturing exports from emerging ASEAN countries to partners [USD, log term]		UNCTAD
Explanatory Variables			
YEt	Gross domestic product (GDP) of an exprter [USD, log term]	+	WEO
YMt	Gross domestic product (GDP) of an importer [USD, log term]	+	WEO
YPCEt	GDP per capita of an exporter [USD, log term]	+	WEO
YPCMt	GDP per capita of an importer [USD, log term]	+	WEO
DIS	Distance between capital cities of an exporter and an importer [km, log term]	-	Fromto
REXt	Bilateral real exchange rate of an exporter against an importer [1998=1, log term]	-	WEO
NRRt	Natural resources rent [% of GDP]	-	WDI
GEFt	Government effectiveness index [from -2.5 (weak) to 2.5 (strong)]	+	WGI
DS_WEST	Sanction dummy for Myanmar against western countries for 2004-2012	-	
DS_ASIA	Sanction dummy for Myanmar against Asian countries for 2004-2012	+/-	
DPS13_WEST	Post-sanction dummy for Myanmar against western countries for 2013-2018	+/-	
DPS16_WEST	Post-sanction dummy for Myanmar against western countries for 2016-2018	+/-	
DPS13_ASIA	Post-sanction dummy for Myanmar against Asian countries for 2013-2018	+/-	
DPS16_ASIA	Post-sanction dummy for Myanmar against Asian countries for 2016-2018	+/-	
Dt	Time dummy		

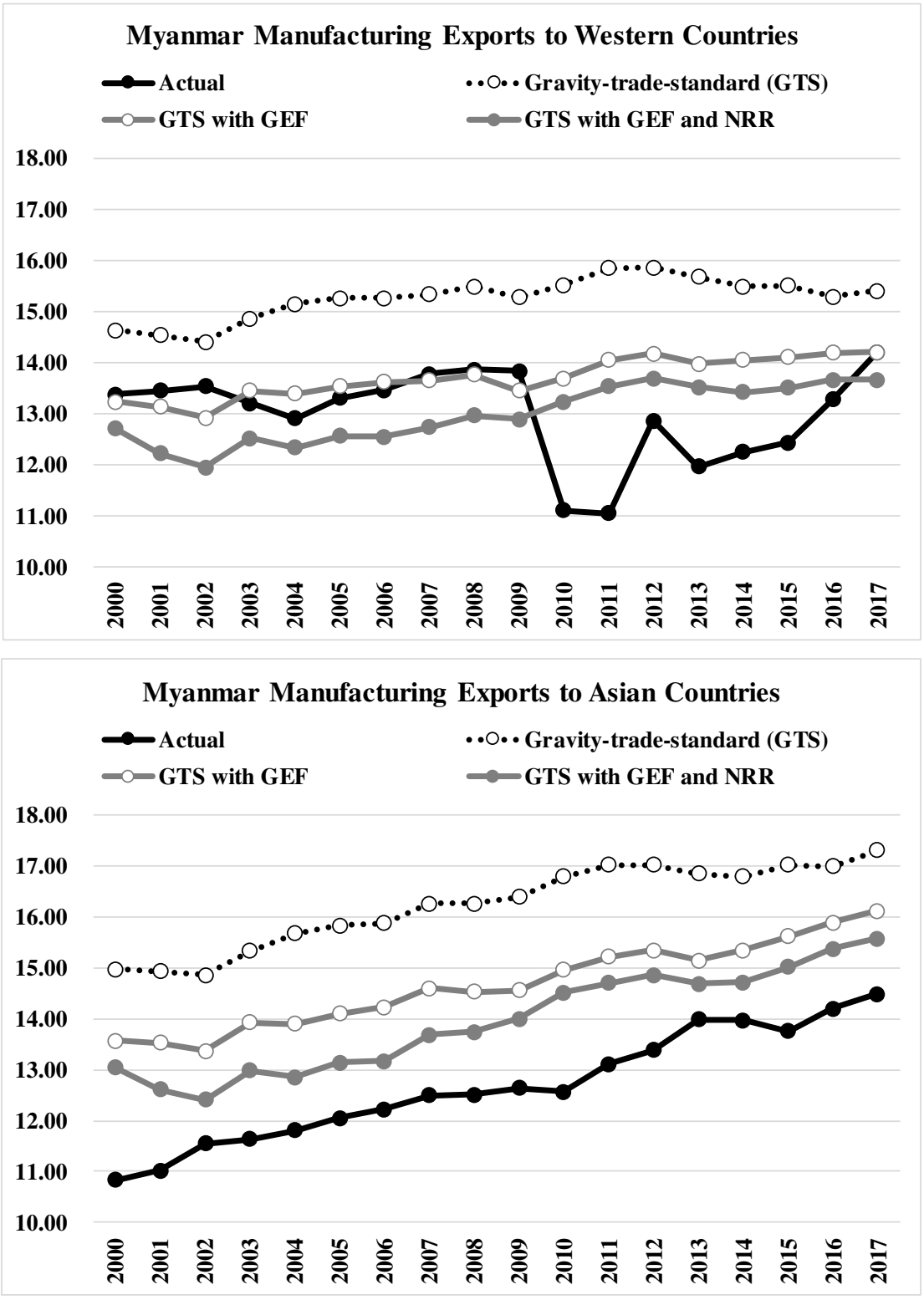
Note: The data sources are shown as follows:
UNCTAD: UNCTAD Stat, UNCTAD, https://unctadstat.unctad.org/EN/
WEO: World Economic Outlook Databases, International Monetary Fund, https://www.imf.org/en/Data
Fromto: Great Circle Distance Between Cities on Map, https://www.distancefromto.net/
WDI: World Development Indicators, World Bank, https://data.worldbank.org/
WGI: Worldwide Governance Indicators, World Bank, http://info.worldbank.org/governance/wgi/
Source: Author's description

Table 3 Estimation Outcomes of Gravity Trade Model

	In-sample Estimation				Out-of-sample Estimation	
	(1)	(2)	(3)	(4)	(5)	(6)
Const.	3.577 ***	4.125 ***	4.674 ***	6.444 ***	6.197 ***	7.625 ***
	(0.431)	(0.423)	(0.417)	(0.429)	(0.398)	(0.409)
ln(YE*YM)	1.083 ***	1.080 ***	1.077 ***	0.963 ***	1.132 ***	1.004 ***
	(0.023)	(0.022)	(0.021)	(0.022)	(0.021)	(0.022)
ln(YPCE*YPCM)	0.712 ***	0.651 ***	0.618 ***	0.429 ***	0.462 ***	0.325 ***
	(0.034)	(0.033)	(0.032)	(0.033)	(0.031)	(0.032)
ln(DIS)	-1.930 ***	-1.865 ***	-1.836 ***	-1.453 ***	-1.769 ***	-1.433 ***
	(0.062)	(0.061)	(0.060)	(0.062)	(0.058)	(0.060)
ln(REX)	-0.184	-0.059	0.191	0.783 ***	-0.255 **	0.514 ***
	(0.123)	(0.119)	(0.118)	(0.118)	(0.116)	(0.122)
NRR				-0.074 ***		-0.076 ***
				(0.009)		(0.009)
GEF				1.149 ***		1.132 ***
				(0.068)		(0.067)
DS_WEST		-3.003 ***	-3.036 ***	-1.351 ***		
		(0.434)	(0.423)	(0.407)		
DS_ASIA		-2.271 ***	-2.343 ***	-0.853 ***		
		(0.211)	(0.208)	(0.218)		
DPS13_WEST (a)			-3.265 ***	-1.861 ***		
			(0.570)	(0.529)		
DPS16_WEST (b)			2.168 ***	1.616 **		
			(0.765)	(0.764)		
DPS13_ASIA (c)			-3.202 ***	-1.847 ***		
			(0.353)	(0.343)		
DPS16_ASIA (d)			1.337 ***	0.992 **		
			(0.476)	(0.505)		
DPS_WEST (a) + (b)			-1.097	-0.245		
DPS_ASIA (c) + (d)			-1.865	-0,855		
Number of observations	2,520	2,520	2,520	2,370	2,184	2,080

Note: Standard errors are in parentheses. *** and ** denote statistical significance at 99 and 95 percent level, respectively.
Source: Author's estimation

Figure 3 Trends in Myanmar Manufacturing Exports: Counterfactual and Actual



Source: Author's estimation