

**INTERNATIONAL TRADE, STRUCTURAL TRANSFORMATION
AND ECONOMIC CATCH-UP:
AN ANALYSIS OF THE ASEAN EXPERIENCES***

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Association of South East Asian Nations (ASEAN) features a mix of high- and low-income countries, thus, the success of ASEAN economic integration can be assessed by examining whether low-income countries catch up with the high-income countries of the ASEAN in terms of economic growth and development. To achieve sustainable growth, the lower income countries must transform from being agriculture dominant economy to being more industry-and services-oriented economy as economic convergence is tightly linked with convergence in economic structures. Extant studies have shown that countries that open to international trade experience rapid structural transformation. This study tries to empirically examine the role of trade in structural transformation across the ASEAN countries during 2000-2018 and whether it has also led to structural convergence. Augmented Chenery-Syrquin model for structural transformation in panel data framework is adopted for analysis. The results reveal that there is evidence of structural convergence, with trade acting as a significant driver. However, the process convergence is still incomplete as the lower income countries have not been able to take full advantage of trade openness, owing to their heavy dependence on agricultural sector. The decline in share of agriculture due to trade is greater for high-income countries as compared to that of low-income countries. Also, for the low-income countries, impact of trade in industrial sector is negligible.

Keywords: ASEAN, Trade, Structural Transformation, Chenery-Syrquin Model, Panel Data, Cross Section Dependence, Driscoll Kraay Regression
JEL Classification: F0, F1, F6, O1, O4

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1. INTRODUCTION

Economic growth and development are essentially evolutionary processes where an economy moves away from a state of primary specialization to secondary, and, eventually to tertiary orientation (Duarte and Restuccia, 2010; Caselli and Coleman, 2001; Hnatkowska and Lahiri, 2014). Such process of structural transformation is characterized by reallocation of productive resources, essentially, from the primary agricultural sector to the industrial and service sectors (Fisher, 1939; Clark, 1940; Lewis, 1954 and Kuznets, 1966). The general pattern of the structural transformation process was quantitatively demonstrated by Chenery (1960), Chenery and Taylor (1968) and Chenery and Syrquin (1975, 1989) among many others. Studies have demonstrated that interregional or international convergence or divergence in incomes is closely linked to convergence or divergence in economic structure (Kuznets, Miller and Easterlin, 1960; Williamson, 1965; Kim, 1998; Krugman, 1991a, 1991b; Krugman and Venables, 1995). These studies also discuss the extent to which openness changes the results about structural transformation. The forces of international trade expedite the process of structural transformation in a much more vigorous manner (Matsuyama, 1992, 2009; Coleman II, 2007; Deardorff and Park, 2010; Sposi, 2015; Betts et al., 2017; Teignier, 2018; Fajgelbaum and Redding, 2018; Federico and Tena-Janguito, 2019) by inducing a shift of resources towards the production of exportables. Within this ambient, the focus of this paper is to examine the relationship among trade openness, structural change and convergence across countries that form a free trade area.

Using a simple theoretical model, Barua and Chakraborty (2010) established, how trade can lead to growth in relatively backward regions via its impact on structural transformation. The authors assumed a country to be having two regions viz., the periphery which is relatively unskilled labor- and land- abundant, and the metropolis, which is relatively skilled labor- and capital- abundant. While labour is assumed to be immobile, capital is assumed to be mobile within the region. The periphery produces agricultural good which is relatively land intensive and it also produces one type of manufactured goods, which uses unskilled labor intensively. In contrast, the metropolis produces machinery which is capital intensive, and the service good which is relatively skilled labor intensive. The machinery produced in the metropolis is used as an intermediate good in the production of consumer goods in the periphery. The trade between the metropolis and the periphery was allowed to be determined by relative production advantage in their model. Another assumption of the model is that both agriculture and services are internationally nontraded goods for this country. When the country is exposed to trade with the rest of the world, the country takes the world price as given. In the given situation, if the world relative price of machinery is cheaper than the consumer goods prices, the country specializes in the consumer goods which it will export to the world and import machinery from the rest of the world. Since the periphery has abundant cheap unskilled labor, therefore, capital will move from the metropolis to the periphery, and as a consequence the machinery sector will decline in the metropolis.

On the other hand, the consumer goods sector in the periphery will expand without having much impact on agriculture. The reason for this is that land is used exclusively in the agricultural sector. However, as the unskilled labor is drawn from agriculture to the consumer goods sector, agriculture becomes more mechanized as its capital intensity will rise. As the machinery sector declines, in the metropolis, it will release both capital and skilled labor. Since skilled labor is assumed to be immobile, it will be absorbed in the service sector. The metropolis may experience an increase in the service sector since the expansion of the periphery may create more demand for the services. Consequently, the periphery will experience a relatively higher increase in the share of manufacturing in their GDP than the metropolis and thereby an increase the per capita income following the Chenery-Syrquin (1988) hypothesis.

The objective of this paper is to study the role of trade in convergence via its impact on structural transformation in the Association of Southeast Asian Nations (ASEAN) for the recent time period, 2000-2018¹. The ASEAN was established on August 8, 1967, in Bangkok, Thailand, with the signing of the ASEAN Declaration by the five original member countries of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore and Thailand. Later it was joined by Lao PDR, Myanmar, Cambodia and Brunei-Darussalam and Vietnam forming the 10-nation ASEAN. The most striking feature of the ASEAN region is its great diversity in terms of income per capita. Reduction of regional economic inequality is prime among its integration agenda (ASEAN Vision, 2020²). However, ASEAN's economic diversity has become conspicuous-especially following the inclusion of Cambodia, Lao People's Democratic Republic, Myanmar, and Vietnam (collectively known as CLMV countries). Hence, the success of ASEAN economic integration necessitates catching up of CLMV countries with the more advanced ASEAN-6 countries, i.e., Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore and Thailand.

The motivation for this study stems from two compelling reasons. *First*, extant literature on income convergence in the ASEAN (Jayanthakumaran and Lee, 2009, 2013; Sperlich and Sperlich, 2012; Mu, 2012; Solarin, 2014, Guglar and Vanoli, 2017; Fumitaka, 2019; Zia and Mahmood, 2019 etc.) are based on traditional concepts of *beta* and *sigma* convergence (Barro Sala-i-Martin, 1992), which is derived from single sector growth model of Solow-Swan (1956). However, economic growth is an evolutionary process where an economy transforms from an agricultural specialization to industries to

¹ Data prior to 2000 will reflect confounding impact of trade and other factors of per capita income convergence as the impact of East Asian Crisis of 1997 will overshadow the impact of these factors considered for the study. After the East Asian Financial Crisis of 1997, a revival of the Malaysian proposal called for better integration of the economies of ASEAN. The full import of The ASEAN Free Trade Area, established on 28 January 1992, will be reflected in post 2000 data. Since 2007, ASEAN countries have gradually lowered their import duties to member nations. The Jakarta Charter, 2008 turned ASEAN into a legal entity and aimed to create a single free-trade area.

² https://asean.org/?static_post=asean-vision-2020

services and how such evolution contributes to income convergence is unexplained by the single sector growth model. Thus, this study adopts a multi-sectoral analytical framework, that captures structural transformation of the economies. Secondly, empirical analysis on the linkages between trade, structural transformation and convergence in the context of ASEAN has not received much academic attention. To the best of our knowledge, only one study by Sarma et al. (2017) examined the role of international trade in structural transformation. The authors noted that Vietnam has experienced sustained and rapid economic growth since the *Doi Moi* economic reforms of 1986. The authors find that structural transformation occurred across all income quantiles, but the shift from agriculture to manufacturing was more prominent for those at the centre of the income distribution.

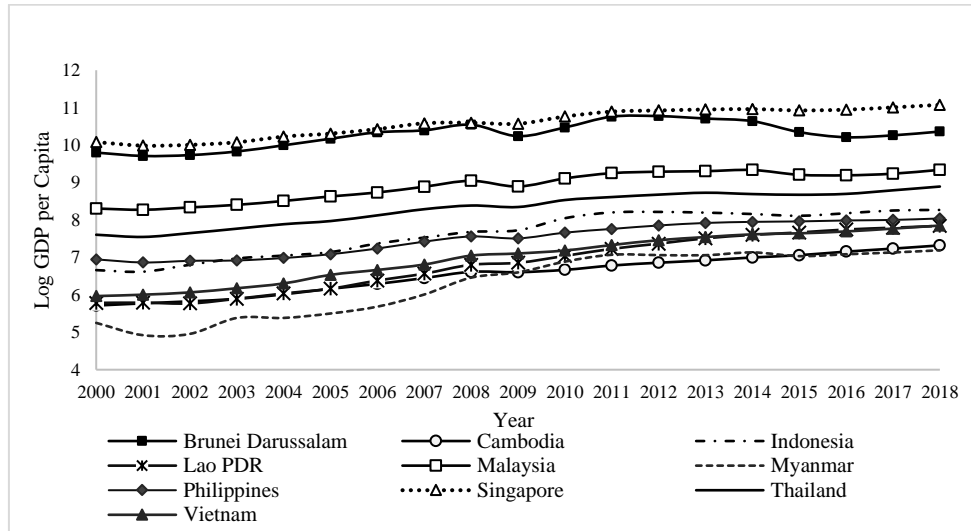
This paper uses the Chenery-Syrquin model (1975) according to which the income share of each sector depends on per capita income as well as the size of the population. While Chenery and Syrquin (1979) noted that extent of such relationship between sectoral shares and income and population will depend on the overall macroeconomic and sector specific policies of the concerned country or region, their model didn't account for trade openness as one of the important macroeconomic policies influencing structural transformation. This study makes a contribution in the literature of structural transformation by taking into account the differential impact of trade on structural transformation within ASEAN in Chenery-Syrquin framework. Employing panel data analysis, the study reveals that trade propels the catching-up of economic structures across the ASEAN countries, although a full-fledged convergence has not yet been achieved.

The paper is structured as follows. Section 2 provides the stylized facts on the structural transformation and convergence in economic structures across the ASEAN countries. An extensive discussion on the methodology based on Chenery-Syrquin model is given in Section 3. Section 4 discusses the data sources used in the study. Section 5 and 6 elaborates on the panel diagnostic tests and the presents the estimation results, respectively. Section 7 concludes the paper with policy directions.

2. STRUCTURAL TRANSFORMATION IN ASEAN: STYLIZED FACTS

This section presents some stylized facts on the structural transformation in the ASEAN to get a preliminary idea on the process to catching up in terms of economic structure.

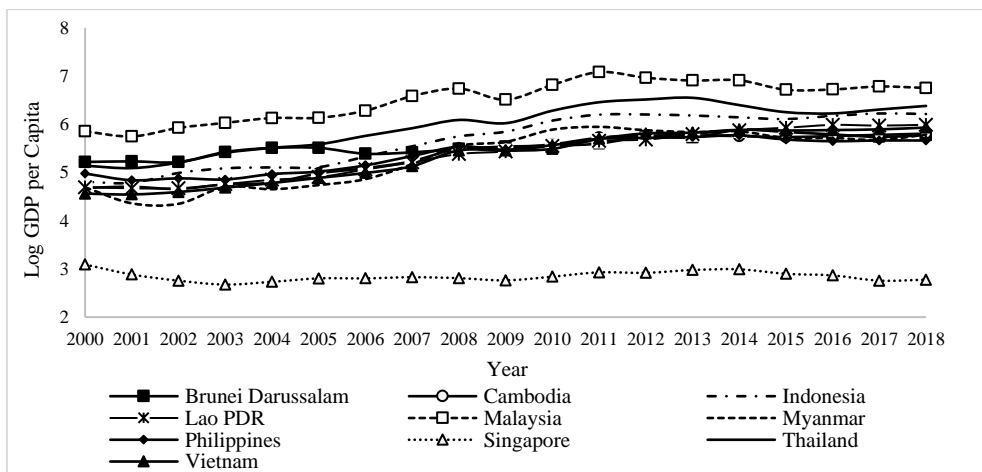
In general, it can be deciphered from Figure 1 that all member countries of the ASEAN experienced increasing trend in their incomes per capita during 2000-2018, except for Brunei Darussalam, which experienced a small decreasing trend post-2014. Nonetheless, the income gap between the CLMV countries and the ASEAN-6 countries still remains.



Source: Author's calculation; data collected from World Development Indicators, World Bank.

Figure 1. Income per capita

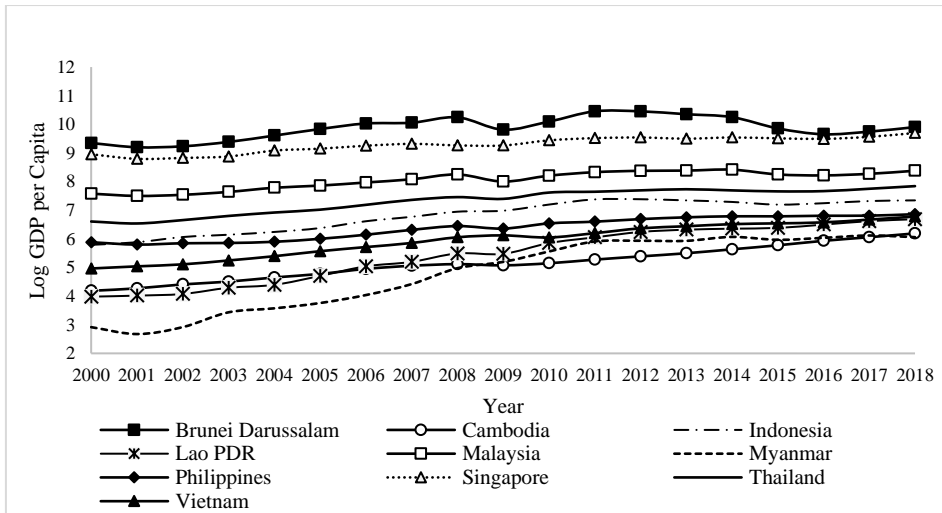
Performance with respect to income per capita at the sectoral levels for each ASEAN country are represented in Figures 2, 3 and 4. It can be observed that Malaysia is the highest contributor of income per capita in the agricultural sector, followed by Thailand and Indonesia.



Source: Author's calculation; data collected from World Development Indicators, World Bank.

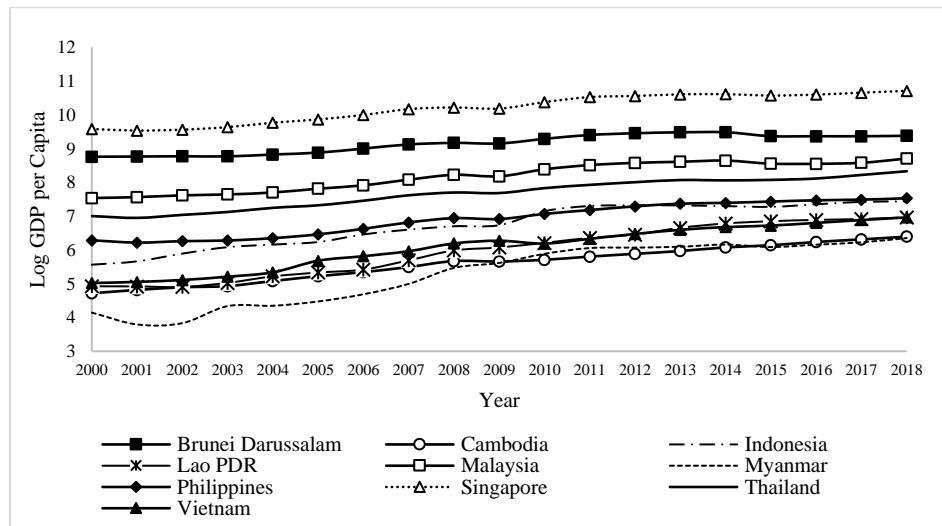
Figure 2. Income per capita in Agricultural Sector

While Brunei Darussalam is the highest contributor of income per capita in the industrial sector, followed by Singapore; Singapore is the highest contributor of income per capita in the services sector, followed by Brunei Darussalam.



Source: Author’s calculation; data collected from World Development Indicators, World Bank.

Figure 3. Income per capita in Industrial Sector



Source: Author’s calculation; data collected from World Development Indicators, World Bank.

Figure 4. Income per capita in Services Sector

The CLMV countries fall behind the high-income countries of the ASEAN in their contribution to per capita income in industrial and services sectors. Overall, CLMV countries have more income share in agricultural sector, even though they are not the lead contributors in this sector. Thus, higher income countries are more industrial and services sector oriented and the CLMV countries are agriculture sector oriented. Nevertheless, over time and in the later period, there has been a gradual rise in CLMV countries' income per capita in the industrial and services sectors, albeit not to the level of other ASEAN-6 countries (see Figures 3 and 4). This is in line with the observation made on aggregate income per capita of the countries of the ASEAN. Figures 5-14 demonstrates the change in sectoral shares of the ASEAN countries over time.

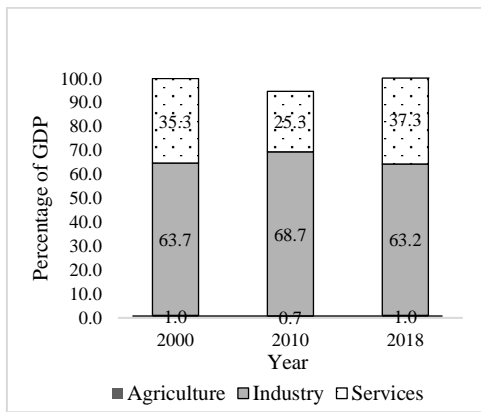


Figure 5. Brunei

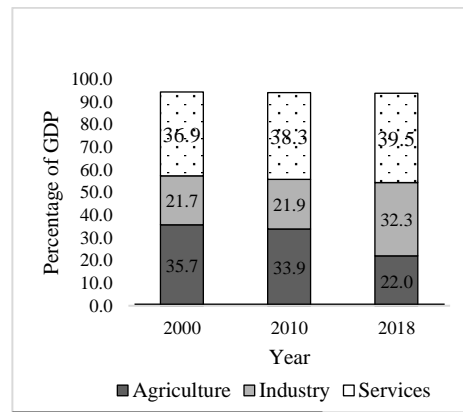


Figure 6. Cambodia

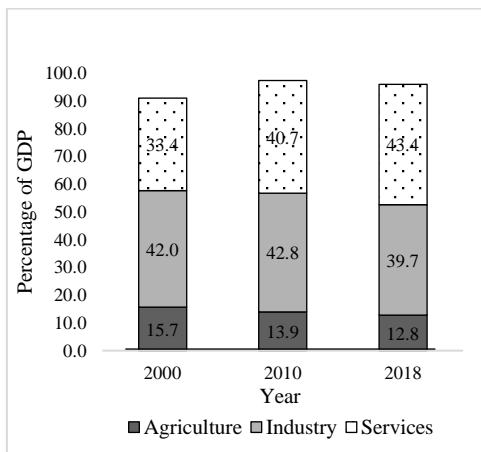


Figure 7. Indonesia

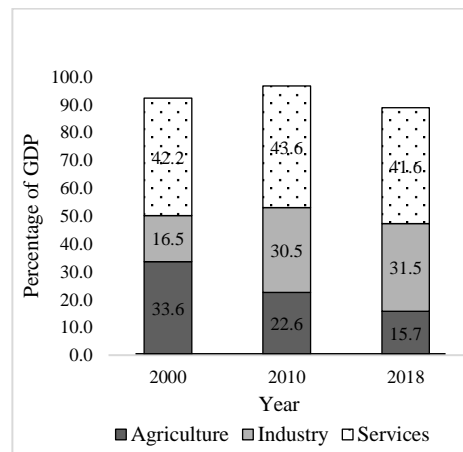


Figure 8. Lao PDR

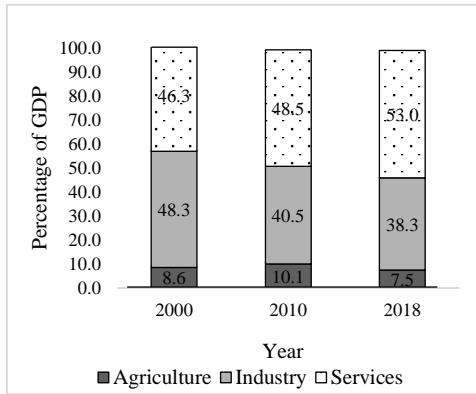


Figure 9. Malaysia

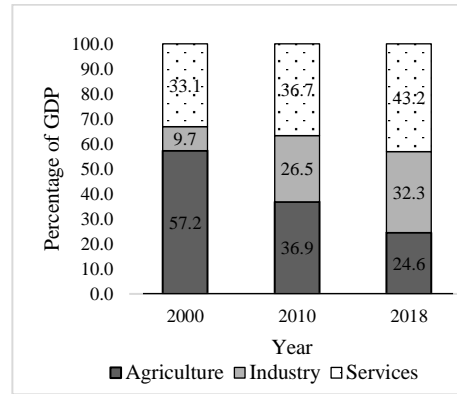


Figure 10. Cambodia

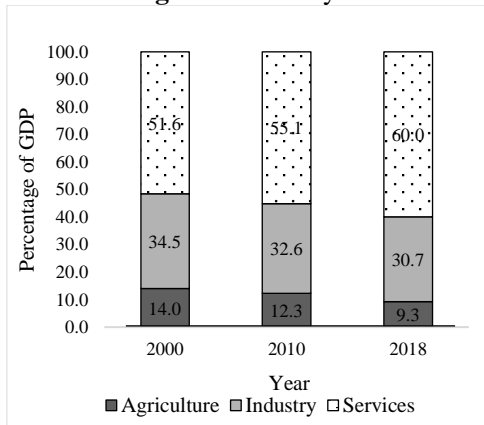


Figure 11. Philippines

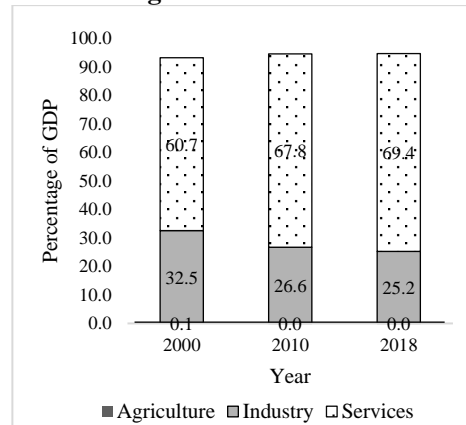


Figure 12. Singapore

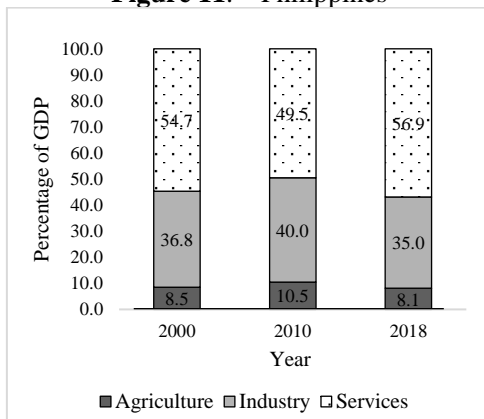


Figure 13. Thailand

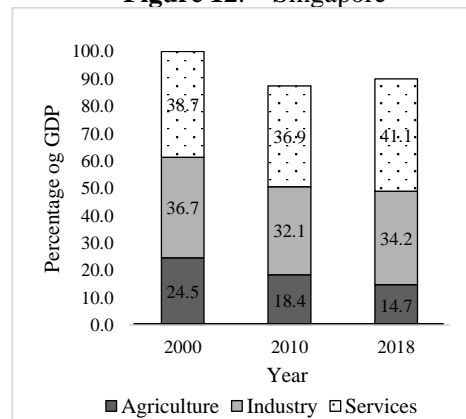


Figure 14. Vietnam

Source: Author's calculation; data collected from World Development Indicators, World Bank.

Singapore, Philippines and Thailand are undoubtedly services sector led as more than 50 per cent of their incomes come from this sector. Malaysia and Indonesia have shown increasing trend in the services sector post-2010. Brunei Darussalam leads in industrial sector as more than 60 per cent of its income comes from the industrial sector. CLMV economies are characterized by dominance of agriculture sector. But, the share of agriculture has declined over time and there has been a rise in the shares of industrial and services sector in Vietnam, Myanmar and Lao. The pace of such transformation is not so much apparent for Cambodia.

3. THEORETICAL UNDERPINNINGS AND METHODOLOGY:

CHENERY SYRQUIN EQUATION FOR STRUCTURAL TRANSFORMATION

The theoretical underpinnings dates back to traditional growth theories propounded by Lewis (1954) and Chenery (1960). These theories assert that economic development entails transformation of the economy from being agricultural-based to being industry-based and, in due course, the economy becoming dominated by the services sector. The model for this study is adopted from the principal specification of Chenery and Syrquin (1975) and Syrquin and Chenery (1989) for structural transformation:

$$\ln X_{it} = \beta_0 + \beta_1(\ln Y_{it}) + \beta_3(\ln N_{it}) + \varepsilon_{it}, \quad (1)$$

where, X_{it} is the dependent variable representing various sectoral shares. That is, X represents the shares of agriculture in Gross Domestic Product (GDP), share of industry in GDP and share of services in GDP of country i at time t , Y_{it} is the income level measured as per capita GDP of country i at time t , N_{it} is the population of country i at time t . The specification (1) is purported to explain that the output share of each sector depends on per capita income as well as the size of the population. The variable representing per capita income variable captures the income effect of demand and the operation of Engel's law. The variable representing the population size represents the extent of demand, which affects the size of production and economies of scale. Subsequently, this specification became the foundation for research on structural transformation of economies. For instance, Chenery and Taylor (1968) included quadratic term from income as it was evident that the income elasticities declined with rise in income. Later, Chenery and Syrquin (1989) adopted a more general specification, allowing for non-linear effects of both income and population. That specification is as follows:

$$X_{it} = \beta_0 + \beta_1(\ln Y_{it}) + \beta_2(\ln Y_{it})^2 + \beta_3(\ln N_{it}) + \beta_4(\ln N_{it})^2 + \varepsilon_{it}. \quad (2)$$

From the results obtained by recent standard cross-country results in literature (Ho,

2015; Barua et al., 2015; Mensah et al., 2016; Kanbur et al., 2017 etc.), it is expected that the estimated coefficients of both the variables pertaining to income per capita will take positive values for share of industries and services, implying that as income rises the demand for industrial and services output will rise following Engel's law and, therefore, it leads to a rise in the share of these sectors in GDP. Similarly, as the size of the population increases, the scale of production rises with associated effects of reduction of the cost of production. The latter effect also has an upward thrust on the share of industries and services. Hence, the estimated coefficients of both the variables pertaining to population are expected to be positive. As a corollary to this, we expect that both the share of agriculture and population; and share of agriculture and income to be inversely related to each other. According to Chenery and Syrquin (1979), such relationship between income and the proportion of supply and demand is impacted by overall macroeconomic policies as well as sector-specific policies. Although, Chenery and Syrquin (1979) didn't highlight that macroeconomic policy could also be related to trade policy, trade is an important determinant of growth and structural transformation in the times of globalization. Trade encourages high degree of specialization, expansion of market and allocation of economic activity across broad sectors across different countries of the regions. Therefore, trade openness will allow resources to be shifted away from primary agricultural sector to the industrial enterprises and eventually to services sector (Teignier, 2018; Fajgelbaum and Redding, 2018; Federico and Tena-Janguito, 2019). However, this structural transformation may increase or decrease income inequality depending on whether the impact on sectoral shares is unevenly or evenly spread out across the countries of the region.

In order to determine the structural change across the regions due to trade, the following augmented Chenery-Syrquin model, Equation (3), tailored to take into account the differential impact of trade on structural transformation within ASEAN is estimated. In equation (3), variable capturing trade openness (Barua et al., 2010) and a dummy variable "CLMV" capturing the capturing the structural orientation of lower income countries of the ASEAN, viz., Cambodia, Lao PDR, Myanmar and Vietnam are added:

$$X_{it} = \beta_0 + \beta_1(\ln Y_{it}) + \beta_2(\ln Y_{it})^2 + \beta_3(\ln N_{it}) + \beta_4(\ln N_{it})^2 + \beta_5 \ln TRADE_{it} + \beta_6 CLMV + \beta_7 CLMV * \ln TRADE + \epsilon_{it}. \quad (3)$$

$\ln TRADE_{it}$ is logarithm of total trade as percentage of GDP for country i at time t and $CLMV$ is "poor country" dummy variable³ which takes value 1 for countries -

³ A similar exercise was done by Barua et al, 2010 in the Indian context. However, their definition of "poor/special state status dummy" differs from the way we define "poor country dummy" in the contexts of the ASEAN countries respectively. Barua et al. 2010 have defined "special state status" as representing Indian states where the Indian government provides economic incentives to encourage manufacturing orientation in the state.

Cambodia, Lao PDR, Myanmar and Vietnam; and takes 0 for ASEAN-6 countries. Thus, $CLMV * \ln TRADE$ is the interaction term in the regression model that captures the impact of trade openness on sectoral shares in CLMV vis-à-vis ASEAN-6 countries.

4. DATA SOURCE

Annual data on all our variables of interest, viz., total population and gross domestic product (GDP), value added share of agriculture, industry and services in GDP and total trade has been sourced from World Development Indicators (WDI) Database of World Bank on January 26, 2020. Data on trade is expressed as the sum of exports and imports of goods and services measured as a share of gross domestic product, for all the countries of the ASEAN. The data period for the study is 2000-2018. The summary statistics is given in the following Table 1. The table reveals highest volatility in share of agriculture and lowest volatility in share of services.

Table 1. Summary Statistics of Variables

Variable	N	Mean	Std. Dev.	Min	Max
Ln (share of agriculture)	190	1.944	1.977	-3.695	4.047
Ln (share of industry)	190	3.527	0.356	2.271	4.306
ln (share of services)	190	3.792	0.221	3.229	4.259
ln (per capita income)	190	7.990	1.541	4.921	11.076
[ln (per capita income)] ²	190	66.205	25.619	24.218	122.671
ln (population)	190	16.913	1.799	12.716	19.405
[ln (population)] ²	190	289.254	58.073	161.707	376.563
ln (trade)	190	4.389	1.484	-1.787	6.081
CLMV	190	0.400	0.491	0.000	1.000
CLMV*ln (trade)	190	1.510	2.269	-1.787	5.339

As the analysis is centred around 10 countries for 19 years, we have a balanced long macro panel.

5. PANEL DIAGNOSTIC TESTS

The occurrence of cross-section dependence is common in macro panels, with higher time dimension, (Pesaran and Smith, 1995). Cross section dependence (CSD) arises due to either of the two factors, viz., spatial (Anselin, 2001) and global interdependence (Mosconne and Tosetti, 2010). The first takes into account the geographical distance between cross section units, i.e., countries whereas, the second factor captures whether the countries react in a same way to external shocks. If countries react in the same

manner to a given shock, then there will be correlation between them, independent of the geographical distance between them. This correlation captures the common, unobserved factors that may impact the countries' variables over time. The ASEAN countries share common borders as well as some socio-economic characteristics that may result in the presence of panel fixed effects.

In the presence of CSD, the estimates so obtained will be imprecise (Eberhardt and Bond, 2009) Cross section dependence in residuals may even lead to identification problems (Phillips and Sul, 2007; Eberhardt and Teal, 2011; Sarafidis and Wansbeek, 2012). Therefore, erroneously ignoring possible correlation of residuals over time and between cross sections can result in biased statistical inferences. Recent studies based on economic growth and structural transformation that use regression on panel data adjust the standard errors of the estimated coefficients to account for possible problems of heteroscedasticity and autocorrelation. But in such studies, the issue of cross-sectional dependence is still largely ignored. In the presence of cross-sectionally dependent disturbances in a panel model, the estimator proposed by Driscoll-Kraay (1998) produces heteroscedastic and autocorrelation consistent standard errors which are efficient and robust to cross sectional dependence.

To assess the presence of CSD, Pesaran (2004) cross-sectional dependence (CD) test is applied and the result is reported in Table 2.

Table 2. Test of Cross-Sectional Dependence

Variable	CD-test	Corr.	Abs. (Corr.)
ln (share of agriculture)	11.82***	0.40	0.53
ln (share of industry)	1.84	0.06	0.57
ln (share of services)	10.04***	0.34	0.36
ln (per capita income)	27.71***	0.95	0.95
[ln (per capita income)] ²	27.59***	0.94	0.94
ln (population)	29.04***	0.99	0.99
[ln (population)] ²	29.04***	0.99	0.99
Ln (trade)	0.82	0.03	0.45
CLMV	0.00	0.00	0.00
Interaction	1.31	0.04	0.05

Note: Under the null hypothesis of cross-section independence, $CD \sim N(0,1)$. ***denote significance at 1% level.

The CSD test suggests that countries share common paths for all variables except for share of value added in industries, trade and CLMV. The absence of CSD for the variables trade and CLMV suggests that ASEAN countries react independently to trade openness and lower income countries have a different development trajectory from the rest of the ASEAN countries. Also, the countries follow separate evolution paths of industrial orientation as is evident from the absence of CSD for the variable for share of

industries. The result for Pesaran test for cross-sectional dependence for models as a whole is given in Table 3. The test results indicate that panel data model with shares of agriculture and services as dependent variables have CSD, but model with share of industries as dependent variable doesn't have CSD.

Table 3. Cross Sectional Dependence for Model

Model with Dependent Variables	Share of Agriculture	Share of Industry	Share of Services
Pesaran's test of cross-sectional independence	3.80***	-0.14	4.38***

Note: ***denotes significance as 1% level

Next, a battery of specification tests to check for heteroscedasticity and autocorrelation is implemented and presented in Table 4.

Table 4. Tests for Heteroscedasticity and Autocorrelation

Tests	Share of Agriculture	Share of Industry	Share of Services
Modified Wald test-statistic for group wise heteroscedasticity	848.94 (0.00)	3186.65 (0.00)	134.76 (0.00)
Wooldridge test statistic for autocorrelation	80.61 (0.00)	29.14 (0.00)	142.42 (0.00)

Note: p-values are given in parentheses

In case of all the three panel models with share of agriculture, industry and services as dependent variable, Wald test for group-wise heteroscedasticity indicates that the error variance varies across countries, meaning error terms for all these three models are heteroscedastic. In addition, Wooldridge test for autocorrelation for our panel data, for all the three models with three sectoral shares suggests presence of first order autocorrelation.

Thus, our model contains CSD, heteroscedasticity and autocorrelation. Therefore, we estimate the model for all the sectoral shares with Driscoll Kraay estimators (1998) which takes into account all these problems and corrects for them^{4,5}.

⁴ By relying on cross-sectional averages, standard errors estimated by the Driscoll- Kraay technique are consistent independently of the panel's cross-sectional dimension N. Driscoll and Kraay (1998) show that this non-parametric approach is flexible in the sense that it is consistent even for large time dimension. Furthermore, estimating the covariance matrix with this approach yields standard errors that are robust to general forms of cross-sectional and temporal dependence. For details, see Driscoll and Kraay (1998).

5. ESTIMATION RESULTS OF AUGMENTED CHENERY SYRQUIN MODEL

The regression results of Driscoll Kraay estimation are given in Table 5.

Table 5. Regression Results using Driscoll-Kraay Standard Errors Method

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
ln (per capita income)	3.504*** (0.611)	1.193*** (0.102)	-0.124 (0.105)
[ln (per capita income)] ²	-0.261*** (0.039)	-0.074*** (0.006)	0.010 (0.007)
ln (population)	2.882*** (0.757)	-2.583*** (0.131)	1.330*** (0.149)
[ln (population)] ²	-0.093*** (0.023)	0.078*** (0.004)	-0.039*** (0.004)
ln (trade)	-1.575*** (0.264)	0.266*** (0.028)	0.023 (0.047)
CLMV	-6.440*** (1.150)	1.037*** (0.133)	-0.220 (0.221)
Interaction	1.407*** (0.258)	-0.231*** (0.029)	-0.001 (0.047)
Constant	-23.354*** (3.673)	18.743*** (0.851)	-7.001* (0.837)
N	190	190	190
F-statistic	13675.920	541.690	18132.360
Prob. F-statistic	0.000	0.000	0.000
R ²	0.921	0.823	0.742
RMSE	0.568	0.153	0.1143

Note: ***Significant at 1%. Figures in parentheses are Driscoll- Kraay standard errors.

The results drawn from Driscoll Kraay regression analysis provide some interesting insights on the determinants of structural transformation in the ASEAN. While the share of agriculture and industries is significantly positively related to per capita income and

⁵ In addition, the results of Driscoll-Kraay estimation method were also compared and contrasted against the results obtained from Newey-West (1987) estimation method. The Newey-West (1987) estimation method accounts for heteroscedasticity and autocorrelation but doesn't control for CSD.

significantly negatively related to square of per capita income, the share of industries is negatively related to per capita income and significantly positively related to square of per capita income. Thus, both the agricultural share and industrial share follow an inverted U-shaped trajectory with respect to income. This finding resonates with analysis of Duarte and Restuccia (2010) on 29 high- and middle-income economies of European Union. Duarte and Restuccia (2010) show that developing economies tend to exhibit structural transformation characterized by inverted U-shaped agricultural and industrial orientation with respect to income. However, income is shown to have no significant impact on sectoral share of services. But their values suggest that the services sector's share of income rises with income and follows a U-shaped path.

This implies that with rise in income, ASEAN economy moves from being agriculture -oriented to industries-oriented (the estimated coefficients on income variables are higher for agricultural share as compared to that for industrial share) with income. This happens until a certain level of income, at which the shares attain the maximum, after which the role of income effect has been to diminish the shares of agriculture and industries; and the economy moves to become services oriented. Nonetheless, the transformation of the economy to become a services-oriented economy is not yet noteworthy during 2000-2018. The population variable is highly significant in explaining the shares of agriculture, services and industry, supporting the operation of economies of scale in structural transformation in the ASEAN. Also, the relationship between sectoral shares and the population is not linear, rather they are quadratic. To put it succinctly, the result of the present study validates the non-linear effects of both income and population on the sectoral shares as purported by Chenery and Syrquin (1989).

As far as the role of trade in structural transformation is concerned, we note that the share of trade has significant effect on shares of agriculture and industry. Surprisingly, trade doesn't have significant impact on sectoral share in services. This could be due to the fact that the levels of trade openness of the services sector in ASEAN is still relatively low, even though ASEAN's trade in services grew over the last decade (ASEAN Services Report 2017). While trade has negative impact on agricultural share of the ASEAN, it has positive impact on industrial sector. Thus, it can readily be inferred that the overall agricultural orientation of the ASEAN has declined significantly, and the overall industrial orientation has heightened significantly due to trade openness.

Considering the differential impact trade openness had on the CLMV and ASEAN-6 countries, we focus on the estimated coefficients of "CLMV" dummy and the "Interaction" variable. Following inferences can be drawn. First, the CLMV countries of the ASEAN have experienced a decline in share in agricultural sector (the estimated coefficient of CLMV is negative and significant for share of agriculture). But the decline in share of agriculture due to trade is greater for higher income countries as compared to that of lower income countries in the ASEAN. This is because the trade elasticity of

share of agriculture is -1.575 while that for low-income countries is -0.168⁶. Second, CLMV countries experience a rise in industrial sector (the estimated coefficient of CLMV is positive and significant in share of industries). However, the CLMV countries failed to gain in terms of industrial orientation as a result of trade openness. Trade elasticity for industry-orientation for CLMV countries is low, placed at -0.005 as compared to trade elasticity for industry-orientation for higher income countries is placed at 0.266. Thus, it can be inferred that the gain in industry-orientation by the CLMV country has been partially offset due to trade, albeit the loss is non substantial. And finally, we find that CLMV country has seen a decline in the share of services, albeit it is insignificant.

Thus, trade has triggered the process of income convergence among the ASEAN nations by triggering the reallocation of productive resources from agricultural sector to industrial sector. There is also evidence such trade-induced structural transformation is bridging the economic gap across the ASEAN nations, as lower countries in the ASEAN have gained from trade by gradually moving out from the agricultural sector to industrial sector. However, the process of catching up is still an incomplete process as trade-induced shift from agriculture to manufacturing was more prominent for the higher income countries⁷.

To check the robustness of the regression estimates from Driscoll Kraay standard errors, Newey West standard errors regression method is also applied, and the results are summarized in Table 6. It can be seen that results are consistent with Driscoll- Kraay standard errors method.

6. CONCLUDING REMARKS AND POLICY DIRECTION

The primary aim of the ASEAN integration is economic growth and development of the region. At the core of economic growth and development process is the phenomenon of structural transformation. As the ASEAN strives to be a free-trade area, the main objective of this paper is to investigate whether trade has any role to play in the structural transformation of the ASEAN economy. The lower income countries, CLMV, joined this group with the expectation to catch- up the higher income nations of

⁶ The trade elasticity of share of agriculture for low-income countries is calculated by differentiating equation (3) with respect to “*TRADE*”, while taking the value of dummy variable, “*CLMV*” to be ‘1’. This gives us the responsiveness of agricultural sector orientation in the low-income countries (CLMV) of the ASEAN.

⁷ To check the robustness of the regression estimates from Driscoll Kraay standard errors, Newey West standard errors regression method was also applied, and the results were found to be consistent with those obtained using Driscoll- Kraay standard errors method. Results for the Newey West standard error regression is available on request.

ASEAN-6 by deriving benefits from the integration. Hence, income convergence is crucial for the success of ASEAN integration. As interregional convergence in incomes is tightly linked with convergence in economic structure, this paper also examines whether there is any evidence of sectoral convergence among the ASEAN countries.

Data suggests that the economies of higher income countries of ASEAN are mostly industrial and services sector oriented and CLMV economies are heavily agriculture-dependent. But, the share of agriculture has declined over time, during 2000-2018, and there has been a rise in the shares of industrial and services sector in Vietnam, Myanmar and Lao, but not so much in Cambodia. It is observed that all member countries of the ASEAN experienced increasing trend in their incomes per capita except for Brunei Darussalam. Nonetheless, the income gap between the CLMV countries and the ASEAN-6 countries still remains. Hence, the fact that there is tendency of convergence, though incomplete, is reflected both at aggregate and sectoral incomes.

In order to assess the role of trade in structural transformation of the ASEAN, the augmented-Chenery-Syrquin model of structural transformation in open economy framework is estimated using Driscoll-Kraay standard errors. Driscoll-Kraay estimators account for the issues such as CSD, heteroscedasticity and autocorrelation that arises in macropanel. The main findings can be summarized as follows. First, non-linear effects of both income and population on the sectoral shares were confirmed. However, income is shown to have no significant impact on sectoral share of services. Secondly, our results support that trade has facilitated structural transformation across the ASEAN economy. Trade has significantly enhanced industrial orientation in the ASEAN and has brought down the income shares of agriculture. But trade does not have significant impact on sectoral share in services. This is surprising because, services sector in ASEAN is continuously expanding and increasingly becoming important. Thus, our finding suggests that expansion of services sector in the ASEAN has not been trade centric. This could be because ASEAN countries currently remain protective of their services sectors. Finally, and most importantly, trade has had differential impact on lower and higher income countries of the ASEAN during 2000-2018. The decline in share of agriculture due to trade is greater for higher income countries as compared to that of lower income countries in the ASEAN. Also, while CLMV countries have not benefitted much from impact of trade on terms of industrial sector; trade elasticity for industry-orientation for lower income countries is negligible.

In a nutshell, data ascertains that there is convergence in economic structure across the ASEAN. CLMV countries are catching up with ASEAN-6 in terms of economic structures over time as agriculture share in these countries are decreasing and there is rise of share in industrial and services sector. The catch up is also reflected in higher growth rates of CLMV countries. However, disparities in income structures still remain. This study supports that trade facilitated structural transformation across the ASEAN economy. The study also affirms that trade played a role in bringing down the share of agriculture in the CLMV countries. There is, therefore, the need for encouraging trade openness; also, in the services sector. There is also need for pursuing trade policies

aimed at enhancing the productivity and competitiveness of both industrial and services sector. This involves provisioning of infrastructure, trade credit, investment in innovations, developing human capital. Sustenance of catching up process by the CLMV countries entails sustenance of its industrialization process. With large share of agricultural sector, CLMV countries may adopt modern agriculture technology that will boost agricultural productivity which in turn will pave way for faster industrialization and tertiarization. As a result, CLMV countries will experience higher growth rates in per capita incomes, thereby catching up with higher income countries of the ASEAN.

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