

# The Impact of IO Compliance on Economic Complexity:

## What ASEAN Provides

### Abstract

The measure of economic complexity is one that seeks to provide a projective tool of growth- one that observes the capacity of production of a state by their skill, and utilizes it as an expectation of how the future develops. Using the measures created for economic complexity, I test them to analyze the relationship ASEAN has to its composite member-states, and how compliance to the agenda, policy, and efforts of the organization has to the respective economic complexity score of the region as whole. In an entity that encourages higher regional integration and the progress of removing trade boundaries via tariff reductivity and uniform trade agreements within their neighborhood of influence, one would wish to see if the measures that it introduces hold tangible impact not on the influx of trade, but how the labor capacity of its populus grows, and reaches new markets to engage within. In existing analysis, identification of the impact of international organizations has not utilized this measure exactly, and many accounts for economic complexity observe individual states, or at most bilateral arrangements, especially not in total regard to ASEAN as an entity. For this, I measure the tangible variables most crucial to ASEAN's economic mission and projection, being its efforts in tariff reduction amongst the states, and the agreements signed under its name to promote free and preferential trade status. In expanding upon economic complexity, I also analyze the complexity outlook of each state, which represents the potential growth of complexity rather than actualized, to showcase the idea of offered potential as a means of analysis beyond utilized opportunities. While my findings are mixed, evidence of this study suggests that in following the policy and arrangements formulated through ASEAN, states see growth in their potential complexity and opportunities for increasing their productivity complexity, however this complexity is not always realized. Disaggregation of the observed nations, and implementation of nation-level controls would allow for the findings of this test to improve moving forward. Policy-wise, this paper displays the successive impacts of ASEAN on the regional growth of complexity capacity, and highlights the disconnect in this growth against a lack of connection to actual economic complexity developments.



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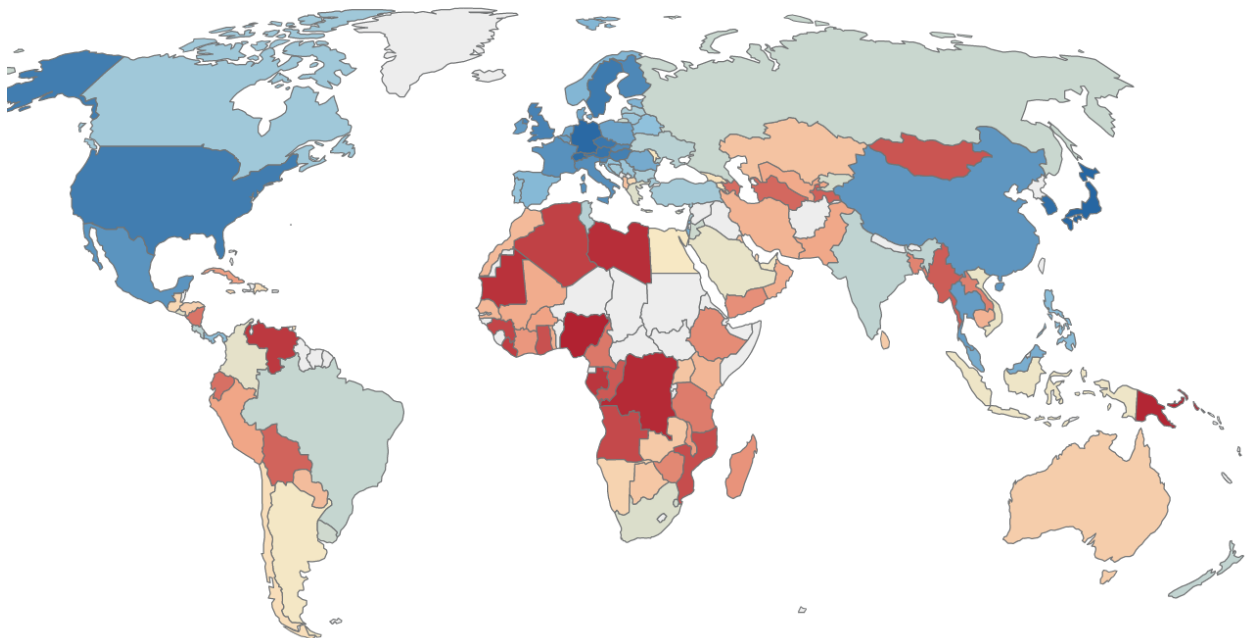
## Introduction

Scholars judge the evolution of a state by its integration into the global economy, measuring economic development using growth, participation levels, and HDI development. However, these metrics do not account whether these states are entering as open markets and partners, or feeders into larger, more dominant states. A state can see substantial growth, but if their economies only expand because of other dominant neighboring states, their actual international presence is minimalized; the extent of the growth of these nations is defined as being subservient to another power, whose control of their capital keeps the state from developing on their own. Especially in relatively young states, the capacity to understand how their economies are independently growing is important, as well as how they are able to achieve this growth.

Economic complexity helps to display the increasing autonomy and capacity of a nation, as well as policy decisions and engagement agreements, allowing us to better see what causes this growth. Economic complexity is defined as displaying the extent and ubiquity of a country's imports and exports to various other economies in a positive trend to increasing diversified outreach. Specifically, in looking at the diverse economic entities that compose ASEAN, I seek to observe if we can draw a connection between interregional organization development to economic complexity, rather than growth. Growth can occur in economies that do not procure ubiquitous, high-skill products, such as those that prioritize primary goods and resources only in large quantities, which differs from the measure of economic complexity, which observes how much a country effectively utilizes highly ubiquitous and skilled products, such as secondary goods. This is why it is important to understand the increase of complexity; because if a country is increasing in overall wealth by the utilization of raw or unskilled resources, then it may struggle when a competitor has a comparative advantage in said resources, or the supply of such resources diminishes. Economic complexity measures the level of skill and capacity within the labor force, and if ASEAN is linked to the increase in economic complexity, then it can also

be assumed it is increasing the skill of labor, and access to new productive capacities. In participating in interregional free trade agreements, tariff policy development, and emphasizing upon trade within these spheres, this tie can be better developed and established as being a leading cause in member nations observing increasing complexity. Depicted below is a graph showing a geo-graph of the world, colored to indicate economic complexity of each nation, in 2015<sup>1</sup>.

**Image 1.1:Economic Complexity Score World Map 2015 (Harvard Atlas of Economic Complexity)**

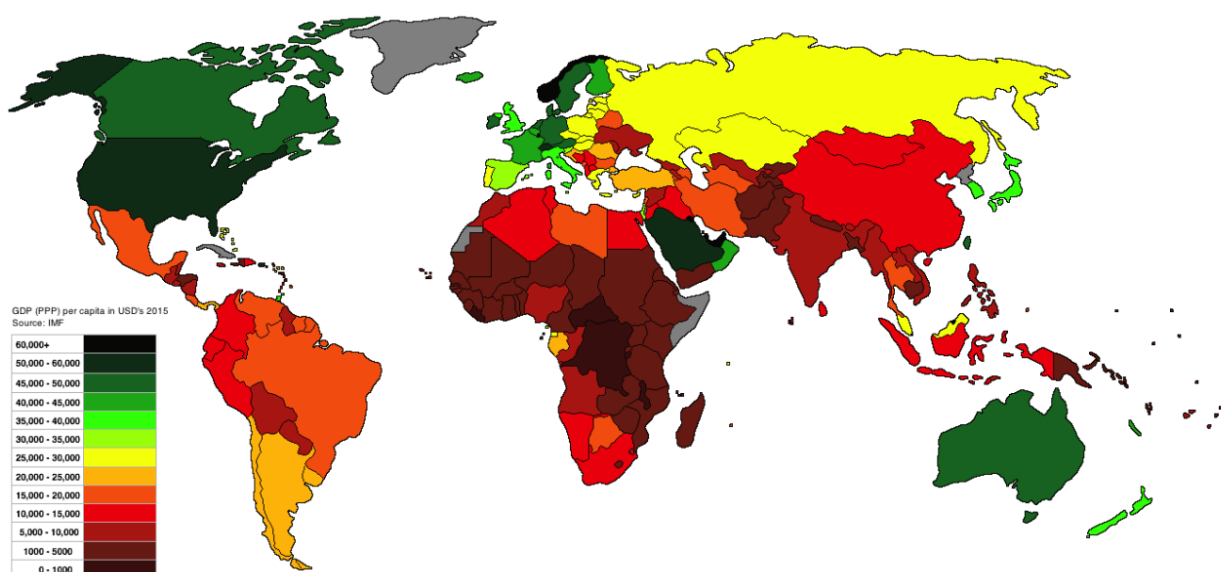


As shown above, this map displays countries in ranking of their economic complexity- which differs inherently from what a normal depiction of GDP may appear to be. While some economies, such as China and India, are rather larger, the ubiquity of their products and the average accessibility of their laborers is not, in comparison to nations such as Japan, or Thailand.

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<sup>1</sup> [The Atlas of Economic Complexity \(harvard.edu\)](http://atlas.harvard.edu/)

**Image 1.2: GDP (PPP) Per Capita World Map 2015 (Created from IMF Statistics)**

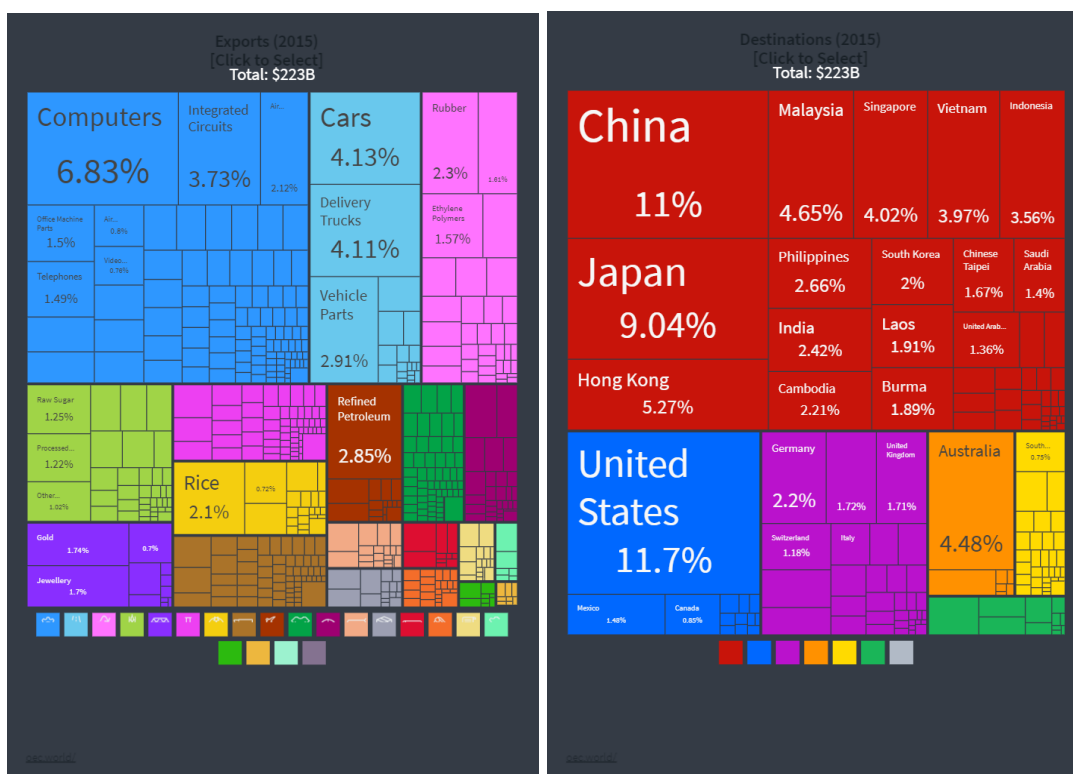


If we compare this to a 2015 mapping of GDP PPP for each nation, that the rankings and status for nations based on gdp differs from their economic complexity, and as such, differ in how they are impacted by economic policy and patterns. This is because economic complexity does not measure all goods and products equally- as some primary resources and goods are seen as less complex for labor, and as such, less likely to provide product space expansion into new, more ubiquitous goods.

Displayed below is the information pertinent to the economic complexity of a nation, specifically Thailand in 2015<sup>2</sup>, which analyzes both their exports by proportionality and good type, as well as the proportionality of export locations, which determines the ubiquity and reach of their trading networks.

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<sup>2</sup> Simoes, A. (2011). The Observatory of Economic Complexity (1270776300 938617169 R. Hausmann, Ed.). Retrieved March 25, 2021, from <https://oec.world/en>

**Image 1.3: Thailand Exports & Destinations 2015 (Observatory of Economic Complexity)**

This showcases the 'Product Space' of goods in terms of coloration, to group associated products, in terms of the resources and skill needed to produce them, and the proportion they compose of the economy. This also displays the destination of goods by their asserted 'neighborhoods', which is important for trying to see if a state is connected to multiple neighborhoods, or if their connection to trade areas are dominated by singular states, rather than multiple nations within the region.

I believe that in analyzing ASEAN specifically, we can observe an organization that's current status in attempting to develop an economic community requires internal development and adherence, and as such provides an opportunity to see if these efforts can result in increases to economic complexity.

The root of this puzzle is not tying the interregional organization to economic growth. Understanding whether or not the entity is an active participating force in the complexity of the regional bodies, and if it's proliferation allows for these states to extend their own influence is

what I seek to accomplish. I seek to observe whether or not engagement with the policy and actions of ASEAN as an organization will increase the economic complexity of member states in compliance with said policy.

My reason for focusing on ASEAN as an entity is because of its unique status as an international organization in terms of current development, as well as its standard and expectation for member states, in comparison to others. ASEAN is currently still within development of the AEC, abbreviation for the ASEAN Economic Community, which seeks to progress the economic cohesivity of the region in the goals of becoming a common currency, not unlike the EU. This effort began in 2007<sup>3</sup>, and is not yet complete, allowing for a large proportion of the time period I am analyzing to display ASEAN as it attempts to progress to such a level of integration- and as such, a period in which compliance and effectiveness of its efforts is most important. In addition, the ten member states that compose of ASEAN membership are widely varied in terms of economic development- with countries like Thailand and the Philippines boasting relatively high GDPs, whereas nations such as Laos and Cambodia do not<sup>4</sup>. This difference also comes politically- with states such as Myanmar having active appointment by military power in comparison to Singapore's parliamentary, mixed-appointment legislature, to Brunei Darussalem's legislature requirement appointment by the Sultan. As such, the capacity for power-leaning into an intergovernmental agency that efforts to create a common currency having to act through drastically different political systems is interesting to follow, for the sake of efficiency and capacity.

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<sup>3</sup> *Understanding the ASEAN Economic Community; A Primer* (PDF) (1st ed.). Department of Trade and Industry (Philippines). 28 February 2014. 30 September 2020. Retrieved 10 February 2015.

<sup>4</sup> "World Economic Outlook Database, October 2020". *IMF.org*. International Monetary Fund. 13 October 2020. Retrieved 13 October 2020.

## Summarization

My argument is that compliance and adherence to ASEAN policy and agreements will result in increased economic complexity for its member states, as well as open new avenues for increasing complexity outlook, which means the ease of engaging in new product spaces.

My research design holds two dependent variables, of economic complexity (*ECI*) and complexity outlook (*COI*) against a list of independent variables that are made to measure compliance to ASEAN policy, including tariff rate reduction (*TR*), trade in the ASEAN free trade area and partners (*ExportProp*, *ImportProp*), and time as a member state in the ASEAN charter and organization (*AGE*). These variables are tested against two controls, in HDI, and unemployment rating, after discovering the other attempted control measures decrease the amount of testable observations to a notably flawed margin. Measures for foreign investment (*FIS*, *FIW*) and Corruption (*CPI*) both had issues in recording for Southeast Asia, and so were cut to ensure there could be a proper observation of the relationship between the independent and dependent variables.

The findings of my study result in rejecting parts of my hypothesis- in that while ASEAN as an entity can cause some significant increase in complexity outlook, due to adherence to tariff reductivity measures with large trading partners, we cannot see a correlative, positive relationship between the impact of compliance to ASEAN to economic complexity, and so cannot fully measure if the relationship of compliance and specialization is inverse here.

## Background Study: ASEAN

In this iteration of research, we look towards a greater extension of our independent variable, and what exists that allows us to translate the depth of the topic around it. This is especially important in understanding the current status and progress of ASEAN as an economic institution, and what it represents; with study going both into the progress of

interregional organizations, the steps taken for a unified, singular market, and ASEAN itself in its integrative history towards regional unification.

One way to observe the economic polity and growth of the ASEAN is in a frame of looking at the path towards, and circulating around, the ASEAN economic community, acronymized as the AEC. I look for areas of both strength and weakness within the context of ASEAN, because even with insufficient polity and development, it shows infrastructural effort towards policies such as regional free movement of goods, or mechanisms for dispute settlement within AFTA. Documentation on both the extension of the individual state, such as those observing progress within the Philippines<sup>5</sup>, Laos<sup>6</sup>, and Indonesia<sup>7</sup> as a triad of deviant economic development stages, show ideas of compliance to policy. It also shows areas of struggle, particularly looking at firm participation, and various sectors of economic importance that have begun to comply, but are not fully in the goalmarks made by the AEC. Reports of the successes and progress made for individual nations help us to better understand which policy to look for in a sense of scale for time. This allows us to build a connection between increased economic complexity and policies implemented by ASEAN that seek to influence the economic behavior of its member-states, as well as explain why growth isn't a perfect measure in response to policy when nations may respond to and comply at different stages of functionality. While some states may already be at these levels, and as such not see increases in GDP, the potential increase for poorer nations within their network still results in access to more goods, thus increasing the skill and network components of complexity.

Expanding upon these micro-level observations, we also see papers that look to ASEAN as a whole- using regional results of development in direct correlation to policy as a means to

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<sup>5</sup> Aldaba, Rafaelita M., and Fernando T. Aldaba. "Services Liberalization in the Philippines: A Capacity Needs Assessment for AEC 2015." *Philippine Journal of Development*, vol. 39, Jan. 2012, pp. 23–48. *EBSCOhost*, search.ebscohost.com/login.aspx?direct=true&db=bas&AN=BAS855315&site=ehost-live.

<sup>6</sup> Buavanh Vilavong. "Laos in 2015: A Pivotal Year in Moving towards the AEC." *Southeast Asian Affairs*, Jan. 2016, pp. 169–179. *EBSCOhost*, search.ebscohost.com/login.aspx?direct=true&db=bas&AN=BAS890758&site=ehost-live.

<sup>7</sup> Findlay, Christopher, and Mari Pangestu. "The Services Sector as a Driver of Change: Indonesia's Experience in the ASEAN Context." *Bulletin of Indonesian Economic Studies*, vol. 52, no. 1, Apr. 2016, pp. 27–53.

keep scorecards- tracking areas of strength and areas of weakness.<sup>8</sup> Because of a field that looks to understand how to ensure improvement to pre existing policy decisions and procurement, it isn't difficult to find cited, and reanalyzed papers from several journals pertaining to policy enactment. In my research, I found international economic journals looking to fields such as the integration of industrial cooperation agreements into policy action<sup>9</sup>, and developments specifically oriented to the topic of economic integration itself as a whole, observing the ultranational efforts made to create a single market and monetary union.<sup>10</sup> Political institutions look directly to infrastructural polity in energy and transportation, both of which are factors that are integrated into the effectiveness of a nation's market output and product space, asserting their value as a commonplace, observable part of the ASEAN analysis<sup>11</sup>. The extension of this observation also goes into projections of yet unfinalized and proposed discussions to recognizable viability based upon the standing of current projects, many of which circulating around the proposition of the ASEAN monetary union<sup>12</sup>.

However, an expanding facet for our literature must observe the identity of international economic unions, developing interregional organizations, and their structures in comparison to ASEAN. This is because in seeking to measure the impact of economic complexity and their impact by an international organization, I sought to have a testable environment that was undergoing, in the modern day, a salient, declared effort for furthered economic integration and development. In this study, we can see ASEAN is currently in a state of observable, tangible integration- rather than an unlikely ideal as with modern SAARC whose agreements have not held any tangible weight, or in comparison to the EU or CARICOM, who have both completely

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<sup>8</sup> ASEAN Economic Community Scorecard : Performance and Perception, edited by Sanchita Basu Das, Institute of Southeast Asian Studies, 2013. ProQuest Ebook Central, <https://ebookcentral.proquest.com/lib/ucsd/detail.action?docID=1206995>.

<sup>9</sup> Yoshimatsu, Hidetaka. "Preferences, Interests, and Regional Integration: The Development of the ASEAN Industrial Cooperation Arrangement." *Review of International Political Economy*, vol. 9, no. 1, 2002, pp. 123–149. JSTOR, [www.jstor.org/stable/4177415](http://www.jstor.org/stable/4177415). Accessed 3 Nov. 2020.

<sup>10</sup> Chia, S.Y. & Plummer, Michael. (2015). ASEAN economic cooperation and integration: Progress, challenges and future directions. 10.1017/CBO9781316218587.

<sup>11</sup> *Enhancing ASEAN's Connectivity*, edited by Sanchita Basu Das, Institute of Southeast Asian Studies, 2012. ProQuest Ebook Central, <https://ebookcentral.proquest.com/lib/ucsd/detail.action?docID=1132452>.

<sup>12</sup> Engwerda, J., Boldea, O., Michalak, T., Plasmans, J., & Salmah. (2012). A simulation study of an ASEAN monetary union. *Economic Modelling*, 29(5), 1870-1890. doi:<http://dx.doi.org/10.1016/j.econmod.2012.05.032>

seen economic integration efforts into singular economies, and as such, are not currently enacting policy efforts to reach unified monetary unions. In this regard- comparative texts seem to largely observe a basis between the EU and ASEAN, given their similar orientation in terms of overarching financial goals in singular monetary and economic fields of trade, with comparisons to expansion and enlargement<sup>13</sup> in tandem with identities of intra-regional trade activity.<sup>14</sup> We also observe discussions connected identities- largely economically oriented- between SAARC and ASEAN as regional blocs-especially in their similarity when dealing with economic convergence of drastically deviant member states.<sup>15</sup> Perhaps most useful come in texts that observe internationally 'developing' markets, such as those that take into account the growth of FDI,<sup>16</sup> or observing the success of free trade agreement usage and accessibility.<sup>17</sup>

Altogether, ASEAN as a regional organization is unique in that it is within the modern day, undergoing a transitive, declared effort towards economic unification, which should reflect in compliance to policies enacted by the body, and thus provide reason to observe the impact of this declaration and effort on economic complexity. If we are to look at the impact the development a communal identity has on economic complexity and development- then ASEAN lies in a unique environment given its current progress, indicators, and movement regarding the AEC. While the AEC seeks to exist in a similar, singular market to the EU, it also differs due to current inquiries of the feasibility to a monetary union that other states are not following or matching to equal levels of development,<sup>18</sup> which is a standard for entrance into the EU, and not a blockade to any of the ASEAN member states. The development trends of contemporary

<sup>13</sup> Bafoil, François. "Reshaping Regional Identities through Enlargement. An EU/ASEAN Comparison", *Revue française de science politique*, vol. vol. 63, no. 1, 2013, pp. 75-92.

<sup>14</sup> Weilun, Soon. "Intra-Region Trade Links in Asean Closer than in EU: Asean's Latest Intra-Regional Trade Intensity Index Reading was 3.54, Compared to the EU's 2.04." *The Business Times* Mar 07 2016 *ProQuest*. 2 Nov. 2020 .

<sup>15</sup> Sakiru Adebola Solarin, Elsadig Musa Ahmed & Jauhari Dahalan (2014) Income convergence dynamics in ASEAN and SAARC blocs, *New Zealand Economic Papers*, 48:3, 285-300, DOI: 10.1080/00779954.2013.874399

<sup>16</sup> Kubny, Julia, Florian Molders, and Peter Nunnenkamp. *Regional Integration and FDI in Emerging Markets*. Edited by Ulrich Volz ed. Cheltenham, U.K. and Northampton, Mass.: Elgar, 2011. *ProQuest*, <https://search.proquest.com/docview/1023528515?accountid=14524>.

<sup>17</sup> De Lombaerde, Philippe, Antoni Esteveadeordal, and Kati Suominen eds. *Governing Regional Integration for Development: Monitoring Experiences, Methods and Prospects*. International Political Economy of New Regionalisms Series. Aldershot, U.K. and Burlington, Vt.: Ashgate, 2008. *ProQuest*, <https://search.proquest.com/docview/56750068?accountid=14524>.

<sup>18</sup> Asian Development Bank Institute. *ASEAN 2030: Toward a Borderless Economic Community*. Brookings Institution Press, 2014. JSTOR, [www.jstor.org/stable/10.7864/j.ctt1dgn685](http://www.jstor.org/stable/10.7864/j.ctt1dgn685). Accessed 3 Nov. 2020.

organizations, such as CARICOM, see much less of a situation of economic convergence, or the weight of developing free trade areas given their lack of withstanding developmental boundaries- whilst others of similar size akin to SAARC have minimalistic push towards economic integration, lacking the capacity to begin developing policy that observes pre-existing failures and mechanisms for improvement.<sup>19</sup> This difference to comparable IO's of similar size and economic goal, being communal integration, results in ASEAN being a favorable organization to analyze for this relationship.

Because of this, we can understand the reason for the usage of ASEAN as the observational sample within this study; due to its progress in comparison to less developed intergovernmental organizations with similar structure, as well as similar economic models and environments that have already developed their economic unification, and as such, do not need modern policies to reach states for such stability. In addition, with a greater reach on genuine policy development within the organization, and that procured by individual states in understanding their compliance and engagement, we can better reflect on the difference between what is proposed and complied to by member states of the organization, and what economic effects and variables are not linked to ASEAN as an organization.

## Literature Review

The literature and resources existing in the discussion of economic complexity is largely formula oriented, but crucial for understanding the observed topic of this paper; a variable that looks towards the productive capacity of exports of a country, as well as how many countries they are exporting to. It was first compiled and given an index for in depth analysis and recognition in 2009 by Cesar Hidalgo and Ricardo Hausmann, who developed it for basic descriptive analysis and perspective, and the intent of presenting itself as an option for better

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<sup>19</sup> "SAARC and the Limits of Cooperation in South Asia." *South Asian Regionalism: The Limits of Cooperation*, by Bhumitra Chakma, 1st ed., Bristol University Press, Bristol, 2020, pp. 137–154. JSTOR, [www.jstor.org/stable/j.ctv1453kr3.11](http://www.jstor.org/stable/j.ctv1453kr3.11). Accessed 3 Nov. 2020.

understanding economic growth and income inequality.

It seeks to compete with prior existing methods of analysis for economic growth and capacity, more accurately predicting per capita growth in a lens that expands beyonds conventionally expected identification, such as through the Kuznets Curve. Since 2009, research has shown it exists in several journals and texts, especially for linkage to institutions, the international environment, and how to readily observe how regions look in total in perspective analysis against the limits of economic complexity. The two primary, core texts of interpreting and understanding the theoretical background and application of economic complexity come via those written by Hausmann and Hidalgo- 'The Building Blocks of Economy Complexity' and 'The Atlas of Economic Complexity' both seek to introduce and ratify the usage of this mechanism by explaining its development, and a larger application of how it perceives the global economic environment, including the differences it establishes to other methods of data collection and analysis.

The argument of these texts- as they are inherently linked to the same goal- is as follows: economic efficiency is linked to the diversity of the labor committed by people and firms, which suggests that economic development is associated with the increase in individual, different activities, and the complex actions that occur when these activities interact with one another. These papers seek to quantify the complexity of a nation's economy by interpreting the connection between the exports a country produces and the environments it trades to, and quantifying the structure of said network in order to suggest that countries, on average, converge to levels of income and development based upon the productive capacities of the environments indicated by complexity measures, and as such, policy should be built around generating the conditions for increased economic complexity that would in turn, lead to sustained growth and productive development.

In addition, this data is made available in a visualization known as the OEC- The Observatory of Economic Complexity, which appears to take dates between, consistently,

2000-2018 analyzing reports for economic growth percentages, export and import complexity, and various other components that come to the reality of the economic complexity index. Including subnational data collection to include tariff rates and dynamic projection models, it serves as the basis for understanding comparable, in depth identities of economic complexity<sup>20</sup>. In looking to provide a statistical analysis, this source, compiled by the same individuals who wrote first unto the establishment of the economic complexity index, will serve invaluable for the method of research to complete. In addition, using the International Trade Centre's country portfolios- which use subnational data to observe firm productivity and engagement within an economy- will help to provide a secondary analysis and perspective onto the capacity of income inequality and participation in the international market- which I will attempt to observe with the anticipation of seeing larger development of firm engagement in free trade areas and firm establishment increase based upon ASEAN policy.

Responses to the index, in terms of improvement, fallacy, and potential growth, have sought to improve the model, and test it's accuracy to economic growth with some success- but always in large scale of economic productivity with less care to individual political mechanisms and influences. Factors such as Human & Physical Capital have been added to comparative analysis to the ECI, and various levels of projected model development are used to analyze ideas for how the model observes the future<sup>21</sup>. In comparison- some models of thinking seek to help clarify the purpose of the ECI and what it observes- identifying it as a dimension reducing tool, seeking to order the idea of effective and ineffective export baskets of individual nations<sup>22</sup>.

This model has been used in the case of individual nations and an observation of their economic development by the standards it provides- including a 25 year observation of rural

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<sup>20</sup> AJG Simoes, CA Hidalgo. The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. (2011)

<sup>21</sup> *Albeaik, Saleh; Mary Kaltenberg; Mansour Alsaleh and Cesar Hidalgo*, (2017), 729 new measures of economic complexity (Addendum to Improving the Economic Complexity Index)

<sup>22</sup> Mealy, Penny and Farmer, J. Doyme and Teytelboym, Alexander, A New Interpretation of the Economic Complexity Index (February 4, 2018). Available at SSRN: <https://ssrn.com/abstract=3075591> or <http://dx.doi.org/10.2139/ssrn.3075591>

economic development within China<sup>23</sup> by Tao Zhou and Jian Gao from the PCR to extend internal ideas of improved economic system management, providing context to the extent of its usage; a secondary example exists for the export competitiveness of Turkey by Birol Erkan and Elif Yildirimci<sup>24</sup>, displaying only two of various case studies that use the ECI to provide state-based conceptualization of economic status. Even at an internal level, the ECI has seen usage in analyzing regions within individual states, such as the research on US Metropolitan areas completed by Benedikt Fritz and Robert Manduca<sup>25</sup>. Despite its development only being solidified in 2009, the development and usage of the ECI seems to have been made to appropriate factors of capital and fallacy of interpretation, as well as being applied to case studies for the analysis it provides. Displayed below are depictions of the research completed by said studies, showing the different levels of observation and relationship observable under economic complexity. Foremost are the observations completed by Fritz and Manduca, with a depiction of the largest industries within the United States ranked by complexity, and graphs comparing income per capita to ECI, to observe the relationship between the two variables. Both showcase, on an interstate level, the observational relationships held to the economic capacity of a state, and how it reflects on the capability of a population to engage economically, as compared to measuring economic growth versus income.

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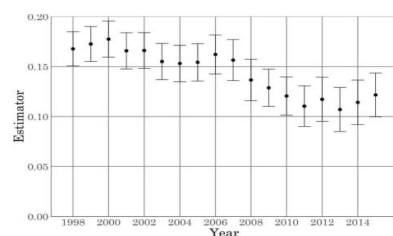
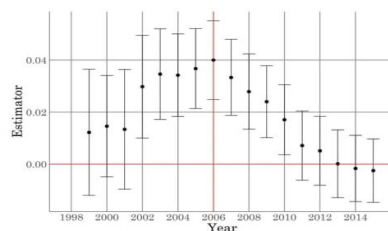
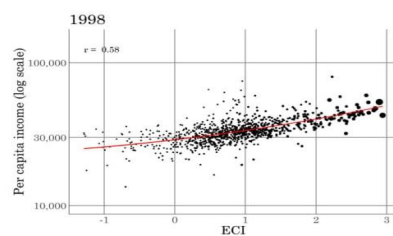
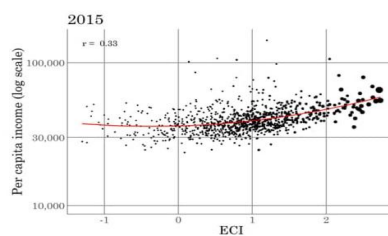
<sup>23</sup> Gao, Jian & Zhou, Tao. (2017). Quantifying China's Regional Economic Complexity.

<sup>24</sup> Birol Erkan, and Elif Yildirimci. "Economic Complexity and Export Competitiveness: The Case of Turkey" *Procedia - Social and Behavioral Sciences*, vol. 195, 2015. doi:10.1016/j.sbspro.2015.06.26

<sup>25</sup> Fritz, Benedikt, and Robert Manduca. "The Economic Complexity of US Metropolitan Areas." *SocArXiv*, 26 Jan. 2021. Web.

**Image 2.1: Industry Complexity Listing within the United States. (Fritz, Benedikt and Manduca.)**TABLE 1—ICI: HIGHEST AND LOWEST COMPLEXITY INDUSTRIES ( $ECI$ ,  $CM_{r,i}$ , NAICS, 2015)

	NAICS	Name	ICI	Type
1	523210	Securities and Commodity Exchanges	3.71	Traded
2	521110	Monetary Authorities—Central Bank	3	Traded
3	485112	Commuter Rail Systems	2.65	Local
4	485119	Other Urban Transit Systems	2.65	Local
5	522190	Depository Credit Intermediation	2.51	Traded
6	334517	Irradiation Apparatus Mfg.	2.3	Traded
7	336415	Guided Missile and Space Vehicle Propulsion Unit (...) Mfg.	2.22	Traded
8	336414	Guided Missile and Space Vehicle Mfg.	2.18	Traded
9	524130	Reinsurance Carriers	2.16	Traded
10	334112	Computer Storage Device Mfg.	2.12	Traded
11	...	...	...	...
969	115111	Cotton Ginning	-2.2	Traded
970	447190	Other Gasoline Stations	-2.21	Local
971	424910	Farm Supplies Merchant Wholesalers	-2.21	Traded
972	115112	Soil Preparation, Planting, and Cultivating	-2.3	Traded
973	484220	Specialized Freight (...) Trucking, Local	-2.31	Local
974	213111	Drilling Oil and Gas Wells	-2.46	Traded
975	813910	Business Associations	-2.51	Local
976	424510	Grain and Field Bean Merchant Wholesalers	-2.52	Traded
977	213112	Support Activities for Oil and Gas Operations	-2.76	Traded
978	211111	Crude Petroleum and Natural Gas Extraction	-2.78	Traded

**Image 2.2: Graphed relationships of Income per Capita and ECI (Fritz, Benedikt and Manduca.)**(a) Yearly bivariate cross-section regression of income per capita on  $ECI$  ( $CM_{r,i}$ , NAICS)(b) Rolling fixed effects regression of income per capita on  $ECI$  adding one year at a time ( $CM_{r,i}$ , NAICS)(c) Scatter Plot for 1998 Income per capita and  $ECI$  ( $CM_{r,i}$ , NAICS), sized by Population(d) Scatter Plot for 2015 Income per capita and  $ECI$  ( $CM_{r,i}$ , NAICS), sized by PopulationFIGURE 3. DIFFERENT ASPECTS OF THE CHANGING RELATIONSHIP BETWEEN INCOME PER CAPITA AND  $ECI$  ( $CM_{r,i}$ , NAICS))

What this secondary chart provides is a display of the relationship between spending power to economic complexity, and why there is merit to the usage of economic complexity as a predictive measure to the economic stability and growth of a nation due to how it's measurable, projectible levels seem to heavily correlate to measures of income. Because of our ability to project economic complexity based upon the complexity outlook index- which observes the

current state of complexity within utilized industries and firms and how they can access further complex products- we can use this measure to project economic growth, especially in that of labor and average income.

As completed in the work by Erkan and Yildirimci, we also have depictions of the ties between economic complexity to export competitiveness, in how the proliferation of hard to imitate goods over easy to imitate goods is seen as the link to growing economic complexity, and reason to analyze it specifically as a measure of growth for the value of specific productive capacities over others.

**Image 2.3: Comparison of Turkey's ECI and Goods Competitiveness (Erkan & Yildirimci.)**

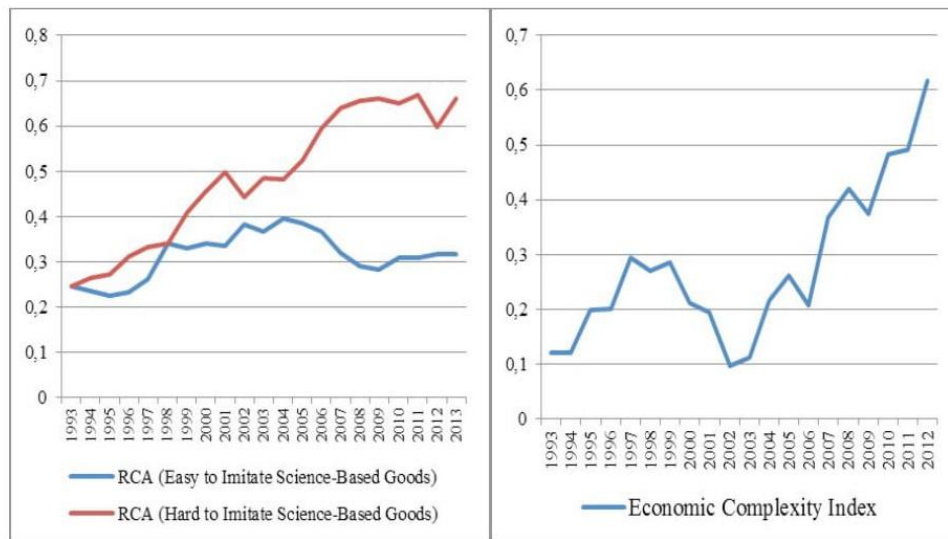


Fig. 1. Turkey's competitiveness in the export of science-based goods and economic complexity index (1993-2012,2013)

However, this relationship is not entirely perfect to one another, which provides reason to investigate the further ties of productive capacity to complexity, and part of my question, especially in the circumstances where intergovernmental entities play a role in the productive capacity and proliferation of markets, and their accessibility. What the research completed in Erkan and Yildirimci's paper allows us to understand the tie between complex goods to complexity, but also further inquire upon how much the accessibility of these goods matter, and how that may change projected score.

Part of this research also looks into productivity structure and how economic ‘product spacing’ for nations develop- from both places of economic sophistication and simplistic markets that seek to expand and develop further- or in the inverse<sup>26</sup>. However, the usage and conceptualization of economic complexity, whilst popularized by the index, is not it’s first inference- since the early 1990s, analysis of the idea of ‘economic complexity’ inferred to an idea stemming from the complex systems theory<sup>27</sup>, which identifies it as understanding the level of variables and influencing factors as well as complex economic environments altogether existing as non-linear. Efforts to both improve, and analyze the data of the ECI are in effect and research, with analysis of heterogeneous patterns of economic growth attributed due to usage of the index.<sup>28</sup>

In short, the analysis of the literature surrounding economic complexity, and as we infer to it as complexity of export and trade engagement, is one that relies heavily upon the discussion of the index that elaborates and displays its data- and that it’s usage in explaining individual country growth is documented, yet little correlation exists tying it to regional organizations at large, and whilst expansion of the parameters that the ECI is able to use and compare with has been given thought and development- the impact of interregional polity, and effect of governmental entities, can be drawn into relationship to not only understand patterns and projections, but also what causes heightened change or shifts in the given projections.

### Observation of I.O Literature: FTA impact on Complexity

In order to situate the results and discussion of this paper into larger literature, we must first look at the larger articles discussing the relationship compliance has within international organizations, and how compliance to an international organization can impact individual

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<sup>26</sup> Cesar A. Hidalgo, 2009. "The Dynamics of Economic Complexity and the Product Space over a 42 year period," CID Working Papers 189, Center for International Development at Harvard University.

<sup>27</sup> Steven N. Durlauf (1998) What should policymakers know about economic complexity?, *Washington Quarterly*, 21:1, 155-165, DOI: 10.1080/0163660980955030

<sup>28</sup> Cristelli M, Tacchella A, Pietronero L (2015) The Heterogeneous Dynamics of Economic Complexity. *PLoS ONE* 10(2): e0117174. <https://doi.org/10.1371/journal.pone.0117174>

economies. This is crucial, including how we follow which literature contests my assertion, and what implicitly supports the argument I intend to make. Inherently, Downs et al. in their International Organization piece, '*Is the good news about compliance good news about cooperation?*' contests that nations only comply with agreements if they already seek to follow through with the stipulated changes, and as such, does not force or enact change over individual measures.<sup>29</sup> While I do recognize the importance of this challenge for facing the feasible worth and capacity of an international organization to pressure policy, I assert that in the case that I am studying, all member states within ASEAN are indeed willing to comply with said agreements for the sake of economic complexity, giving each of them have signed approval to the various charters and agreements that dictate tariff reductivity. I believe much of the importance about cooperation and where it may fall through is tied largely to concerns of security, and measures that would demand administrative, political development, which I can perceive as being highly problematic within the context of ASEAN, given the variance of how member state legislatures are composed and enact policy. The Downs et al. argument is also contested by Ian Hurd, in their article '*Legitimacy and Authority in International Politics*', which contests the perception that within an international political context, especially among states on unequal power, the authority of an intergovernmental body is provided a further sense of legitimacy,<sup>30</sup> which Hurd views as a more favorable motivation to listen to authority over coercive force, or self-interest, due to the tenuous ability for states that may have fluctuating interest over years. Whereas we can analyze the relationship ASEAN as an entity has to Southeast Asia, as a legitimized form of regionalistic protection formed in the Post-Cold war environment, and thus, a favorable, legitimate asset for progress and growth following a period of repressive action taken against the state.<sup>31</sup> In following the ideas proposed and recollected by Buszynski, what

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<sup>29</sup> Downs, George W., et al. "Is the Good News about Compliance Good News about Cooperation?" *International Organization*, vol. 50, no. 3, 1996, pp. 379–406. JSTOR, [www.jstor.org/stable/2704030](http://www.jstor.org/stable/2704030). Accessed 21 Mar. 2021.

<sup>30</sup> Hurd, Ian. "Legitimacy and Authority in International Politics." *International Organization*, vol. 53, no. 2, 1999, pp. 379–408. JSTOR, [www.jstor.org/stable/2601393](http://www.jstor.org/stable/2601393). Accessed 21 Mar. 2021.

<sup>31</sup> Buszynski, Leszek. "Southeast Asia in the Post-Cold War Era: Regionalism and Security." *Asian Survey*, vol. 32, no. 9, 1992, pp. 830–847. JSTOR, [www.jstor.org/stable/2645074](http://www.jstor.org/stable/2645074). Accessed 21 Mar. 2021.

ASEAN provided for its initial member states was a vessel for secured, independent cooperation between entities, and a large motivation for furthered membership once conditions of stability were met for states like Vietnam and Laos, and so it is politically perceived as a legitimate entity for regional proliferation. I believe that the purpose of this document, when looking at its impact to international organization literature, is to contest the Downs et al. argument in that the selective decision making to enter these agreements is influenced by the fact that ASEAN itself has been seen as a legitimate vessel of regional-specific progress, and that while these states would be able to follow through with these measures on their own accord, because they are favorable, they prefer to use ASEAN, because of what it means for a political display of prioritizing the medium of their regional community over individual international agreements. What this means for this article's place in literature is less an observation of the effectiveness of regional organizations in demanding cooperation, but the actual impact of the cooperation, and what compliance to an international organization in this setting can provide for furthering economic complexity.

What follows is an additional observation of the impact of international organizations in a larger discussion of their impact on member economies, and the intentions of membership. The entrance of a state into a community, and their capacity to comply, becomes a variable we must account for and discuss when understanding the relationship between growth and compliance, as if there are underdeveloped states that could join, but have chosen not to given their own status or failure to meet standards, it would be skewed data altogether. This becomes a discussion of the selection effect, and what entrance in ASEAN looks like, given the current dialogue asserting that in many environments, compliance may not be a motivating factor. The first contender for this idea stems more negatively, asserting that states will only enter agreements and participate when it already convenient for them to do so- data that shows positivity for entities within these agreements would have shown so still prior, or the capacity of

it easily- and that it results in cooperation that doesn't face any challenge<sup>32</sup>. This research, compiled by Downs, Rocke & Barsoom, points out the issue of what happens when a state is non-compliant, and what mechanisms exist there, with a clear discussion of the lack of an enforcement mechanism, stating that "Instances of apparent noncompliance are problems to be solved, rather than violations that have to be punished."<sup>33</sup> The factors for the functionality of this include the depth of cooperation developed, which is dependent on the founder states levels of pre-existing capacity. In the opposite corridor, Chayes and Chayes assert that states develop treatise and agreements with the full intent for compliance, deciding to measure their own depth of cooperation and an analysis of potential benefits; however, the capacity of a state acts as a mechanism that holds it behind, and so non-compliance as an indicator can simply be a failure of the individual state due to shifts in their economic and political capacity, which is a considerable factor for some of the less stable nations within ASEAN<sup>34</sup>. How both of these interpretations of issues of international compliance apply to the situation within Southeast Asia is determined by looking at how it as an international organization approached membership, and to what extent individual state instability has impact on their policies. This is defined, largely, by the identity of consensus, and resilient agreement-forward action, the entity has taken; in a general review by outside observation, ASEAN has faltered, but not failed in methods of cooperation. This cooperation has persisted, and transformed largely from its primary causes due to the purpose initial membership; formation having origin not on economic, but fully politically typed political security and stability- with a large emphasis by states on reducing dependency on foreign powers, namely the United States at the time<sup>35</sup>. I intend to contest the Downs interpretation with this piece- namely for the value of how compliance has aided ASEAN

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<sup>32</sup> Downs, G., Rocke, D., & Barsoom, P. (1996). Is the Good News about Compliance Good News about Cooperation? *International Organization*, 50(3), 379-406. Retrieved December 7, 2020, from <http://www.jstor.org/stable/2704030>

<sup>33</sup> Downs, G., Rocke, D., & Barsoom, P. (1996). Is the Good News about Compliance Good News about Cooperation? *International Organization*, 50(3), 379-406. Retrieved December 7, 2020, from <http://www.jstor.org/stable/2704030>

<sup>34</sup> Chayes, A., & Chayes, A. (1993). On Compliance. *International Organization*, 47(2), 175-205. Retrieved December 7, 2020, from <http://www.jstor.org/stable/2706888>

<sup>35</sup> FROST, F. (2016). Australia and the origins of ASEAN (1967–1975). In *Engaging the neighbours: Australia and ASEAN since 1974* (pp. 7-34). Australia: ANU Press. Retrieved December 7, 2020, from <http://www.jstor.org/stable/j.ctt1rqc9hb.7>

in a matter of complexity on an international scale that is not yet recorded, for the purpose of analyzing the genuine efficiency and rate of changes caused by the depth of ASEAN polity. This stems largely from the internal dynamics of ASEAN and their modum of operation, which I believe will be better understood when seeing the rates of change of the internal policy that will help define compliance for this research. A combination of large scale emphasis on regional and internal stability<sup>36</sup>, which results in less penalized mechanisms of tariff implementation, and slowly developed integration as a means of growing extra-regional appeal<sup>37</sup>. It is from this that I see a widened gap between the functionality and purpose of ASEAN in comparison to several other international organizations, on measures we won't record in this research due to their orientation on foundation, rather than policy compliance. The most comparable entity is SAARC<sup>38</sup>, the South Asian equivalency of a regional stability based agreement for international cooperation- whose literature regarding integration and stability show implementation of policy, but a lack of capacity to engage, directly comparing it to ASEAN's increased rates. With both entities showing similar origins of stability and enablement of policy, as well as membership of both poorer and richer states, the Chayes conclusion seems to be prominent, in the inability of capacity, and that the idealistic measure of membership efforts have much unrecognized SEAnpotential<sup>39</sup>. Since ASEAN does not seem to suffer from this issue, it may lead one to conclude with the identity of the Dowes et al. argument of simply having states agreeing to what they wish and nothing more- but that would discount the genuine infrastructure shift ASEAN went through that introduced standards that were not initial points of joining, largely being wholly

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<sup>36</sup> Natalegawa, M. (2018). *CSCAP REGIONAL SECURITY OUTLOOK 2018* (pp. 26-28, Rep.) (Huisken R., Brett K., Milner A., Smith R., Vermonte P., & Wanandi J., Eds.). Council for Security Cooperation in the Asia Pacific. doi:10.2307/resrep22262.10

<sup>37</sup> Kabir, S., & Salim, R. (2014). Regional Economic Integration in ASEAN: How Far Will It Go? *Journal of Southeast Asian Economies*, 31(2), 313-335. Retrieved December 7, 2020, from <http://www.jstor.org/stable/43264721>

<sup>38</sup> "SAARC and the Limits of Cooperation in South Asia." *South Asian Regionalism: The Limits of Cooperation*, by Bhumitra Chakma, 1st ed., Bristol University Press, Bristol, 2020, pp. 137–154. JSTOR, [www.jstor.org/stable/j.ctv1453kr3.11](http://www.jstor.org/stable/j.ctv1453kr3.11). Accessed 13 Oct. 2020

<sup>39</sup> "SAARC and the Limits of Cooperation in South Asia." *South Asian Regionalism: The Limits of Cooperation*, by Bhumitra Chakma, 1st ed., Bristol University Press, Bristol, 2020, pp. 137–154. JSTOR, [www.jstor.org/stable/j.ctv1453kr3.11](http://www.jstor.org/stable/j.ctv1453kr3.11). Accessed 13 Oct. 2020

free flow of capital, services, and goods<sup>40</sup>. As I will discuss further in the piece, I indicate this to be a facet of ASEAN trade agreements that seems unique in comparison- being that the capacity to negotiate and serve as an interregional body for outwards entities. The largest issue with collective action, that Dowes et al. points out is this: Smaller observer states are less inclined to participate for the sake of free rider benefits; however, if those benefits are not ensured due to it hinging on extra-regional standards of compliance for functionality, it may create an economic avenue that incites further engagement internally. Without doing so means the additional benefits cannot be accessed; in much of the discussions ASEAN has with entities like Korea, Japan, and China, the trade was focused only on that which applied within the AFTA, and so, states that wished to have more success in their neighborhood are more properly incentivized, and also are given an opportunity for economic growth that they could not have accomplished individually<sup>41</sup>. This also comes with a CEPT scheme of tariff reduction<sup>42</sup>, and tiered status of dates and anticipation for when different nations are expected to reach these standards- and so agreements of certain states do not require full capacity, but rather allows for frameworks to be observed, followed, and facilitated by more power nations; Cambodia follows Indonesia after they reduce their own tariffs, and find the benefits by the extra-regional trade. It is by these mechanisms that I have helped to introduce a new observational facet of ASEAN Compliance as hinging on extra-regional trade, and how the growth rates of the different tiers within ASEAN is impacted, to address the Dowes question of depth in cooperation; I believe that the structure of compliance within ASEAN is inherently built to respond to this failure, and believe that by showing the rates of economic growth to free trade areas specifically, will display

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<sup>40</sup> Chalk, P. (2015). ASEAN ascending: Achieving 'centrality' in the emerging Asian order (pp. 9-12, Rep.). Australian Strategic Policy Institute. Retrieved December 7, 2020, from <http://www.jstor.org/stable/resrep04212.6>

<sup>41</sup> Coates, Stephen (31 December 2009). "ASEAN-China open free trade area". *Agence France-Presse*. Archived from the original on 1 January 2010. Retrieved 1 January 2010

<sup>42</sup> BRUNEI DARUSSALAM-INDONESIA-MALAYSIA-PHILIPPINES-SINGAPORE-THAILAND: AGREEMENT ON THE COMMON EFFECTIVE PREFERENTIAL TARIFF (CEPT) SCHEME FOR THE ASEAN FREE TRADE AREA (AFTA). (1992). *International Legal Materials*, 31(3), 513-521. Retrieved December 7, 2020, from <http://www.jstor.org/stable/20693688>

an understanding of state limitations, and working future forward, rather than present-day imposition.

### How specialization assists Economic Complexity

The tying mechanism that becomes crucial here is an observation of why. Is it normal to question how engagement in a supranational organization- which traditionally leads to greater specialization of markets and productivity- allows for growth of economic complexity, which specifically observes the relationship in ubiquitous good productivity to a measure of the amount of actions taken in comparison to the amount of partners traded with. My preliminary observations however, have shown accelerated rates of economic growth and sustainability within Southeast Asia that ties directly to the dates after their membership within ASEAN<sup>43</sup>; a large part of GDP annual growth seeing recovery post-global financial crisis that would normally not occur in more specialized, and thus less economically diverse environments. Because the measures of economic complexity, and the idea of diversified product space, rely on how effective products are being exported, and how widespread they are internally to how much they are being sent out, I desire to observe whether or not the environment and policies ASEAN enforces, in reducing tariffs and establishing free trade agreements, results in a comparatively more free environment than what existed beforehand- especially in the lens of larger neighbors.

This environment is dependent on the measure of the complexity output index, which looks at the currently utilized productive capacities of a nation- both in the skill of their labor and their accessible primary resources utilized in the construction of secondary resources- and how they are able to expand into newer, more complex products for the nation to competitively export. For many of these smaller states, the neighborhood must be considered before an individual nation should produce and expand to new markets for it to genuinely contribute to

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<sup>43</sup> GDP Annual Growth Rate: Asia. (2020). Retrieved December 04, 2020, from <https://tradingeconomics.com/country-list/gdp-annual-growth-rate?continent=asia>

economic growth; the relative proportion of production capacity and capability help us develop an understanding of where nations follow next<sup>44</sup>. The proximity of markets allows for greater efficiency- that a largely agricultural nation deciding to produce more distinct agricultural goods gains more than reaching into industrialized ship building materials. In a heterogeneous region of proximity, in which there are widely different basis of established markets, it may be more apparent that in order to increase regional economic complexity and efficient growth, that specialization would allow for those areas to expand in their 'product space', thus allowing for more approximate goods to be protected and grow<sup>45</sup>. While we may see it as being only an agricultural, or industrial growth, it allows for diversified market outreach, to more nations, when the specialization occurs within nations that are given more opportunities within their own neighborhood.

The idea that a specialized economy can more easily expand and diversify into certain sectors, composed the base idea of economic growth by Hidalgo & Hausmann's idea of complex economic systems. Because this is only recorded and given analysis to variables on the individual state level, I wish to see if ASEAN as an entity, which seeks to better encourage regional trade protections through tariff reduction and free trade agreements, allows for member economies to more efficiently trade with one another and as a singular entity to their neighborhood. Because these nations are all comparatively small economically, approaching treatise and trade as a singular entity creates an environment that encourages for the aforementioned specialized product expansion and action to spread internally, to better present themselves in their agreements externally. If the policies enacted by ASEAN are connected to the economic complexity of a nation, where tariff reduction and free trade agreement presence can observe the proliferation of new markets, and the ubiquity of pre-existing ones, it would

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<sup>44</sup> A. Hirschman, *The Strategy of Economic Development* (Yale University Press, New Haven, CT, 1958)

<sup>45</sup> C.A. Hidalgo, B. Klinger, A.-L. Barabási, R. Hausmann, *Science***317** (2007).

implicitly assert that the integrating nature of an regional economic body would provide the grounds of growth in this measure.

For the case of ASEAN specifically, I would assert that the comparative advantages with many of the states in the region, and the good they were producing, were largely going to limited amounts of partners- Thailand had one fourth of its net exports going to the United States in 2000, and trade with regional partners was minimalistic, and only approaching one or two sectors each. For Indonesia, approximately 20% of it's trade was through Japan, and secondarily 15% through the United States. For Cambodia, over 40% of all exports were heading to the US- and while there may have been a number of different markets by each nation in terms of production, they were all being largely dominated by singular partners. In each instance, when observing their export destinations, there is a much more diverse share of export destinations by both partners, most notably with larger shares within nations where ASEAN has facilitated tariff reduction and free trade agreements, such as other SE Asian nations, New Zealand & Australia, and China. What ASEAN provides is a grounds, through tariff reduction and FTA proliferation, for trading partners to diversify their export destinations in a way that encourages growing trade and outreach within their neighborhood- thus expanding the complexity of their networks, while also ensuring that not only the wealthier nations, but poorer nations, can receive the same goods, so a country like Cambodia does not become dominated by another state, since it has opportunities to negotiate trade as part of a secure organization.

Essentially, it is true that in a closed environment and trade zone, specialization with a select few countries would traditionally result in economies becoming less 'overall' complex, because they're building themselves into further prioritizing their comparative advantages, and investing less in economic spheres where they have comparative disadvantages. However, ASEAN as an entity is also a negotiatory body to extend and grow trade with other entities, allowing for all member states to act as one body for the sake of tariff reductions and trade

potential with bodies they would not be able to acquire alone, such as some of the poorer states in the region (Cambodia, Laos, Myanmar) being advantaged by trade with China, and the comparatively richer states still benefit due to their individual abilities still receiving benefit from the presence of mutual trade agreements with many of their major partners facilitated. In addition, economic complexity as a measure looks to the effectiveness of markets, and their abilities to expand, as a measure of how complex a country is - proximity of other markets and ease of the movement of goods is a part of this - which is facilitated further by tariff reduction providing more avenues for higher volumes of goods to be transferred. In order to show this relationship, I will use the complexity output index (COI), which observes the productive capacity of a state, and how many complex goods are within this set of capacities, and thus capable of being built into. According to the language of the Atlas of complexity, "Complexity outlook captures the connectedness of an economy's existing capabilities to drive easy (or hard) diversification into related complex production, using the Product Space."<sup>46</sup> As this output index increases, it shows how much a country is gearing itself to becoming more complex, and I believe that as ASEAN is able to introduce a larger network of tariff reduction, and enable higher volumes of trade in an environment with less barriers, economies will see increasing productive capacities, even as they begin to specialize in the pre-existing areas of comparative advantage and disadvantage, since they will begin to better utilize, and shift markets into accessing this advantage. The image for this would be akin to perceiving different trade goods and sectors as different rooms, and the complexity as the space in total you have. As you engage more in a free trade environment that is expanding, you may not be utilizing as many individual rooms, but the rooms you do use will be expanding, and adding more sub-rooms. In using the COI as a dependent variable, as well as ECI, we will not only be observing their placement at the time of treatise, but also how their potential networks and opportunities expand in total.

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<sup>46</sup> Hausmann, R. (2013). The Atlas of Economic Complexity by @HarvardGrwthLab (1170032762 877498018 B. Leonard, Ed.). Retrieved January 29, 2021, from <https://atlas.cid.harvard.edu/rankings>

## Hypothesis

My hypothesis is as follows: If the compliance/impact of economic and infrastructural policy introduced by ASEAN is high in analysis of member states, then we can expect to see a corresponding level of growing economic complexity by member states; if the compliance/impact is low, then economic complexity will not increase correspondingly.

What this implies is a sub-hypothesis in relation to the larger relationship, that if ASEAN international economic policy allows for the stability and extension of individual nation trade goods, then their complexity outlook index measure become more effective and can therefore expand to new connecting markets; if ASEAN policy does not have an impact on the structure and growth of trade goods, then we expect the complexity outlook index, to not grow correspondingly.

Finally, if ASEAN economic policy is directly correlated to, and a contributing facet of economic complexity within the region, then the efficiency of accessibility via trade partnership the organization provides outweighs the impact of specialization on the spread of new markets; if ASEAN economic policy does not contribute to economic complexity, then we cannot assert that the organization's trade policies and market accessibility has enough impact to ensure economic complexity over the connected market specialization attributed to most supranational economic bindings.

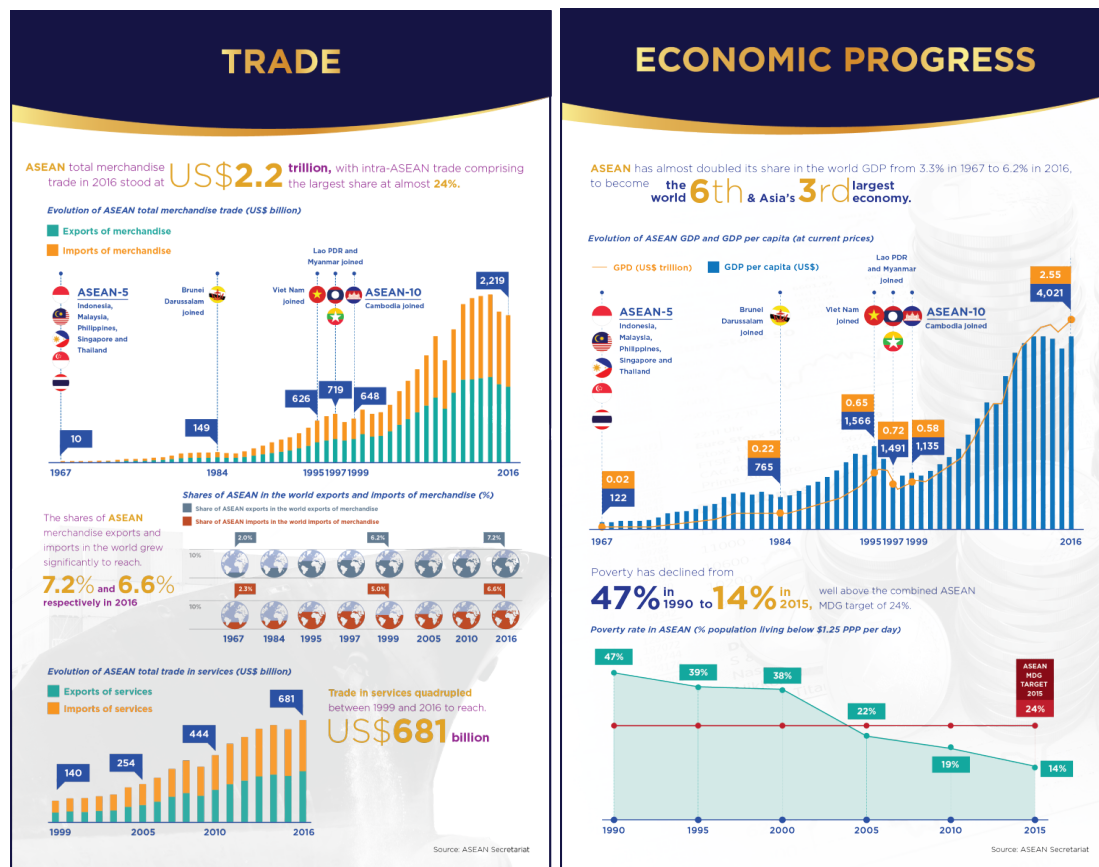
What this demonstrates is an observation of the impact ASEAN has on member nations that utilize the organization for the expansion of the export operations, and the complexity of their individual markets. It holds on the belief that a nation's complexity outlook index determines the capacity of goods and markets to expand when trading and dealing within their own neighborhood, and that while the number of markets a nation can more easily branch into overall decreases, the proximate markets to their protected and specialized goods are promoted, and given an infrastructure that leads to their quicker and more effective entrance into the trade network, therefore leading to more complex economic systems.

## Research Design

In order to test this hypothesis, I will conduct an observational study- specifically a panel based study that would look at countries per year with the focus on nine ASEAN Member states, and the timespan of data collection beginning from recorded rates from 2003 to 2015- as to have uniform information for the progress of all member states. I am currently excluding Brunei Darussalam from this study, because the nation does not fit the criteria for formulaic observation by the researchers compiling complexity data, and as such, I would have no dependent variables to account for the nation. For this, I will be comparing rates of effective output with economic ASEAN policy; including tariff reduction rates( $TR$ ), the proportion of ASEAN-zone exports and imports to total GDP( $ExportProp + ImportProp$ ), and the amount of time present as a standing member of ASEAN ( $AGE$ ). This data is collected through the OEC for information on export and import levels, as well as the data surrounding average tariff rates for each nation. This data, in a multivariate study case, will be used to analyze my two dependent variables of Economic Complexity ( $ECI$ ), and Complexity Output Index ( $COI$ ) rates per year, as compiled through the OEC, and datasets provided by Harvard's Databases. Economic Complexity and the Complexity Output Index respectively represent measures of actualized complexity of a nation in terms of the productive capacity of their labor and distribution of goods, and the potential growing complexity of a nation based upon the pre-existing complexity of their resources, and what skills they can utilize to produce new goods. This method is most accessible, given the data sets that already exist via the ASEAN statistics provided by their official census collection, and the OEC, both with project per year based rates of growth in various facets, such as tariff rates, economic complexity rating, and complexity outlook index shares for annual exports/imports. Displayed on the next page are two infographics established

by the ASEAN Secretariat, displaying values of growth of inter-ASEAN trade, economic development, trade in services, and percentage of populations living below the poverty line<sup>47</sup>.

**Image 4.1: ASEAN Trade & Economic Progress Infographics. (ASEAN Secretariat Statistics.)**



In addition, a panel study across multiple nations allows me to see areas of variance in growth, and we will also separate these nations by their categorizations of wealth, to see trends of ASEAN effectiveness, and if they are dependent on pre-existing development status. This does raise the identity of the potential of a selection problem- which we will address given the nature of ASEAN as an interregional economic community marking this capable for acceptance of membership as a tool of measuring economic complexity increase and how we will account for it, by adding a distinctive measure of initial states whose partnership was solidified as a

<sup>47</sup> ASEAN Secretariat. (2017, August 06). Infographic. Retrieved March 23, 2021, from <https://www.aseanstats.org/category/infographic/>

sociopolitical decision, and the later members, many of which joined after the 1997 Asian Economic Crisis, to see if there is a distinct difference between the two categories in levels of economic complexity growth. In addition- I also record and set specific date separations for rates of growth and complexity in between establishments of different trade agreements and areas both internally and externally- comparing market space for Korea, India, China, Australia, and New Zealand starting in 2010, where free trade agreements were established by ASEAN with each of these nations<sup>48</sup>.

### Dependent Variable Measures

“In this article we develop a method to characterize the structure of bipartite networks, which we call the Method of Reflections, and apply it to trade data to illustrate how it can be used to extract relevant information about the availability of capabilities in a country. We interpret the variables produced by the Method of Reflections as indicators of economic complexity and show that the complexity of a country’s economy is correlated with income and that deviations from this relationship are predictive of future growth, suggesting that countries tend to approach the level of income associated with the capability set available in them.”<sup>49</sup>

This is the descriptor for how the Observatory of Economic Complexity provides a calculation for economic complexity, developing a measure that not only illustrates the capacity of a country, but also uses it to correlate to the growth of income as a means to display projection onwards, published in the article, “The Building Blocks of Economic Complexity”, completed by Cesar. A Hidalgo and Richard Hausmann.

My dependent variable, of economic complexity and complexity output, are both measured by the Observatory for Economic Complexity and given direct, calculated measures

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<sup>48</sup> Shira, D. (2018, January 04). ASEAN's Free Trade Agreements: An Overview. Retrieved December 05, 2020, from <https://www.aseanbriefing.com/news/aseans-free-trade-agreements-an-overview/>

<sup>49</sup> Hidalgo, C. A., & Hausmann, R. (2009). The building blocks of economic complexity. *Proceedings of the National Academy of Sciences*, 106(26), 10570-10575. doi:10.1073/pnas.0900943106

from which to understand the complexity of each nation, and the complexity potential of their networks. Economic complexity is a holistic measure of the productive capacity of a large economic system, looking to observe the knowledge and skill of a population, and how this translates into economic output. It is given a numerical value and score as determined by the formula developed by the Observatory of Economic Complexity, calculating based upon the diversity and complexity of their export basket- with the assertion that highly complex countries sustain a range of specialized, sophisticated capabilities, and thus host the productive capacity to create a diverse set of specialized products<sup>50</sup>. The mathematical calculation for economic complexity in full is as follows;

**Image 4.2: Economic Complexity Formula. (Hausmann, Atlas of Economic Complexity.)**

Economic complexity is calculated from equations for diversity and ubiquity to express the recursion:

$$\begin{aligned} k_{c,n} &= \frac{1}{k_{c,0}} \sum_p M_{cp} \frac{1}{k_{p,0}} \sum_{c'} M_{c'p} k_{c',n-2} \\ &= \sum_{c'} k_{c',n-2} \sum_p \frac{M_{c'p} M_{cp}}{k_{c,0} k_{p,0}} \\ &= \sum_{c'} k_{c',n-2} \tilde{M}_{c,c'}^C \end{aligned}$$

where we define

$$\tilde{M}_{c,c'}^C \equiv \sum_p \frac{M_{cp} M_{c'p}}{k_{c,0} k_{p,0}}.$$

Hence, in a vector notation, if  $\vec{k}_n$  to be the vector whose  $c$ th element is  $k_{c,n}$  then:

$$\vec{k}_n = \tilde{\mathbf{M}}^C \times \vec{k}_{n-2}$$

where  $\tilde{\mathbf{M}}^C$  is the matrix whose  $(c, c')$ th element is  $\tilde{M}_{c,c'}^C$ .

If we take  $n$  to infinity, this equation leads to the distribution which remains fixed up to a scalar factor:

$$\tilde{\mathbf{M}}^C \times \vec{k} = \lambda \vec{k}$$

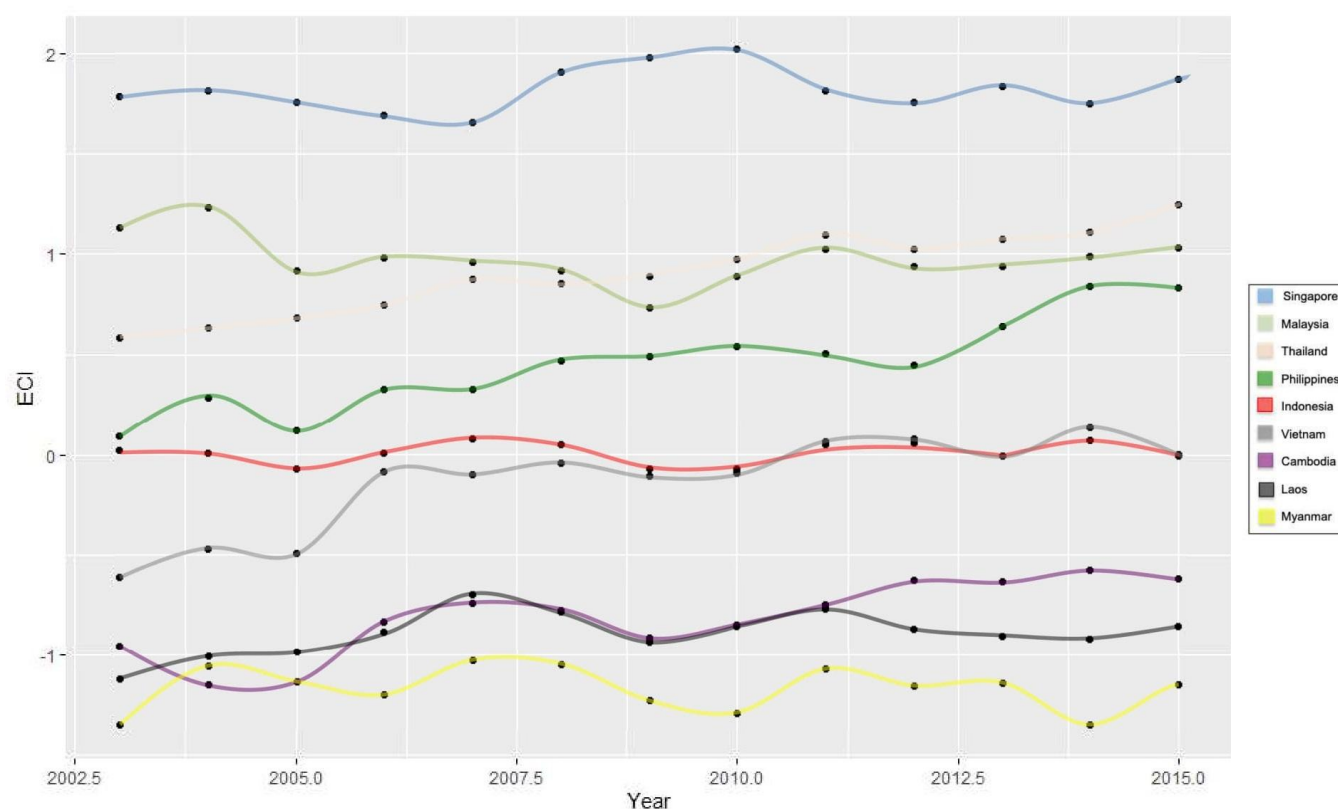
Therefore,  $\vec{k}$  is an eigenvector of  $\tilde{\mathbf{M}}^C$ . We define Economic Complexity Index as the eigenvector corresponding to the second largest eigenvalue of the  $\tilde{\mathbf{M}}^C$  matrix.

Under this formula, an economic complexity score fits within the range of -2.0 to 2.5 on average, comparing connectivity and complexity of the products that compose an economy, and their

<sup>50</sup> Hausmann, R. (2013). The Atlas of Economic complexity by @HarvardGrwthLab (1242142976 921278983 B. Leonard, Ed.). Retrieved March 10, 2021, from <https://atlas.cid.harvard.edu/rankings>

prevalence. In comparing ubiquity, and complexity of the composite goods of an economy, a score is assigned by this measure to determine how complex an economy is, using the characteristic variable, known as the eigenvector, as a score of determination. For the purpose of our dataset, below is a graph depicting the economic complexity scores of our ASEAN nations, excluding Brunei Darussalam, over the years within the observation period.

**Graph 4.1: Economic Complexity Index score (ECI) over Time.**



The second dependent variable, COI, is measured and given form when looking at the complexity outlook index(COI), which is the opportunity and ease of which a country may diversify, determined by the country's current level of productive capability. What this insinuates is how many complex products a country has the capacity, knowledge, and skills on average to begin to produce and engage with. This is separate from actual economic complexity, because

this represents the potential to engage in new complex goods based upon similarity to current goods, and what goods can be accessed given current skills of labor, and what new goods would rely upon for their development, and how much that compares to what an economy currently produces. Usually, this comes into looking at what is determined as the ‘distance’ of a good, or how separate it is in the Product Space of an economy- if a good isn’t far in ‘distance’, it insinuates that the economy has the technology, knowledge, and resources to be able to easily begin to produce that good. Given below is the official formula posted by the Atlas of Economic Complexity;

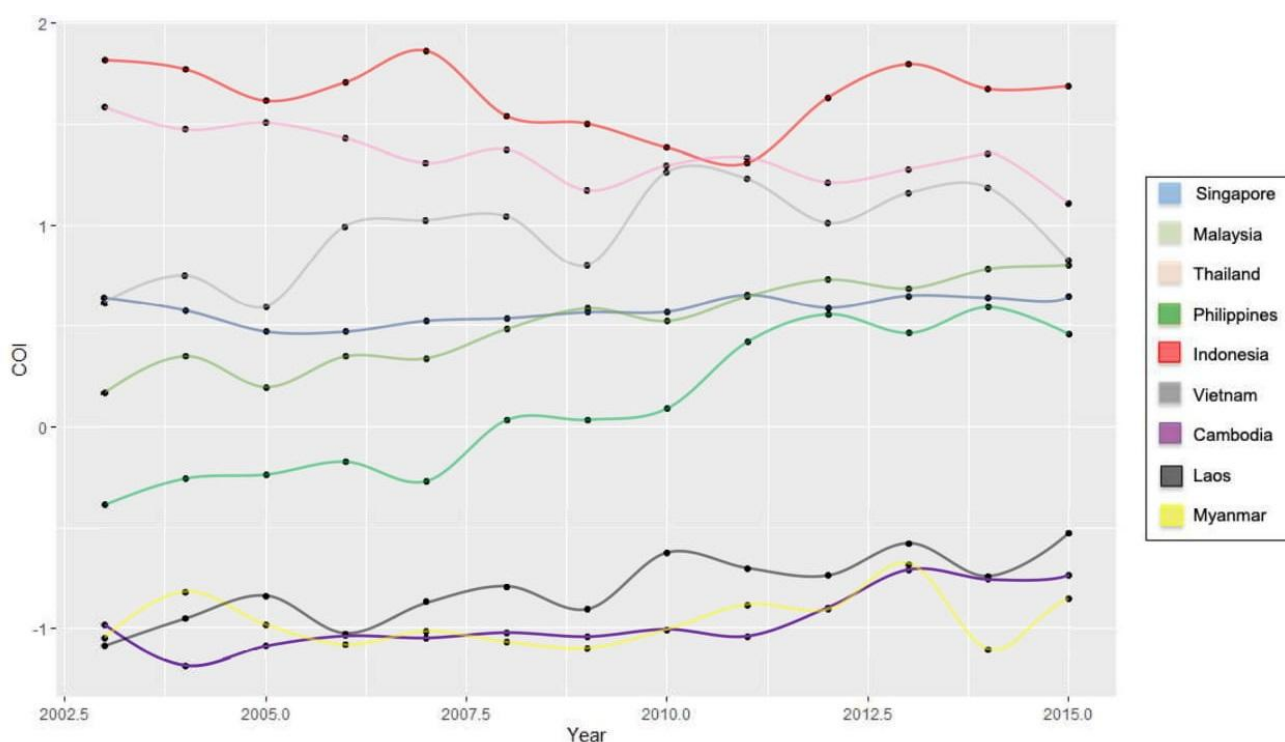
**Image 4.2: COI calculation. (Hausmann, Atlas of Economic Complexity)**

To calculate COI we first need to calculate **distance** of every product to existing production (from 0 to 1). We then sum the ‘closeness,’ i.e. 1 minus the distance to the products that the country is not currently making, weighted by the level of complexity of these products. Formally,

$$COI_c = \sum_p (1 - d_{cp}) (1 - M_{cp}) PCI_p$$

where PCI is the Product Complexity Index of product  $p$ . The term  $1 - M_{cp}$  ensures we only count the products that a country is not currently producing.

Under this formula, a country may earn a score averaged between -3 to 3, citing the complexity outreach that they currently have and are able to attain- with a higher score asserting the closeness and opportunities of future engagement and potential. This measure is separated inherently from economic complexity, because a highly complex country may not be able to diversify further, while a low complexity country may have a high capacity to diversify and engage in new methods of productivity. Stated below is a graph depicting the COI levels for our study, observed over the time span of observation;

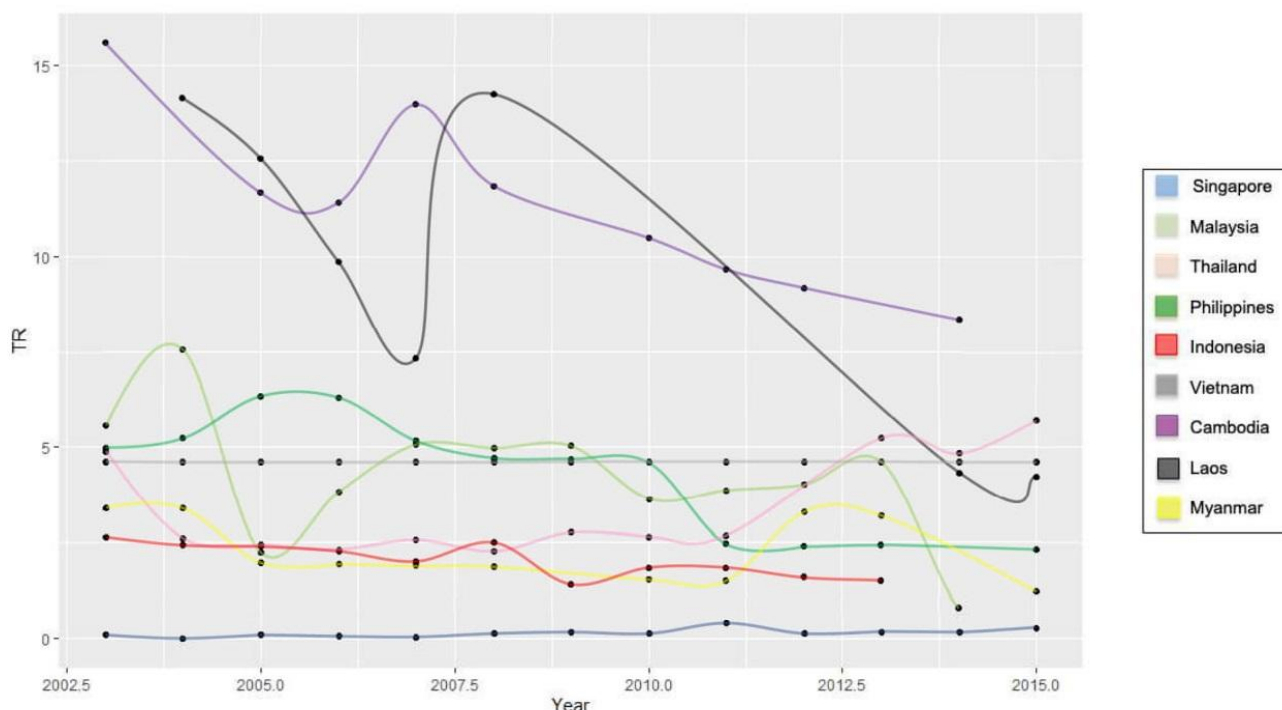
**Graph 4.2: Complexity outlook index score (COI) over time.**

### Independent Variable Measures

*TR*, as in tariff rates, is the most important independent variable of my selection, due to its nature as existing as a direct action and effort made by ASEAN as an organization to influence and change the behaviors of its composite member states. To measure this as a variable, I have gathered the weighted mean applied tariff, which is the average of effectively applied rates weighted by the product import shares corresponding to each partner country, focused on declines that are made to other ASEAN nations, as well as the nations that have formulated tariff reduction agreements with the ASEAN body. In addition, because of the restriction of the testing mechanism and knowledge of which products are allowed and applied to tariff restrictive, our tariff rate average is based largely in primary products, since many secondary products do not fall into the same tariff reduction agreement, and have the capacity to skew data to indicate measures that do not fall under the influence of ASEAN. This data was collected from the World Bank WITS (World Integrated Trade Solution) page, which provided

statistical evidence of weighted tariff levels per nation. Shown below is our sample's measured tariff rates over the timespan of the study. In the study, it will be used as a dependent variable against between economic complexity, and complexity outlook.

**Graph 4.3: Tariff Rate(*TR*) over time.**

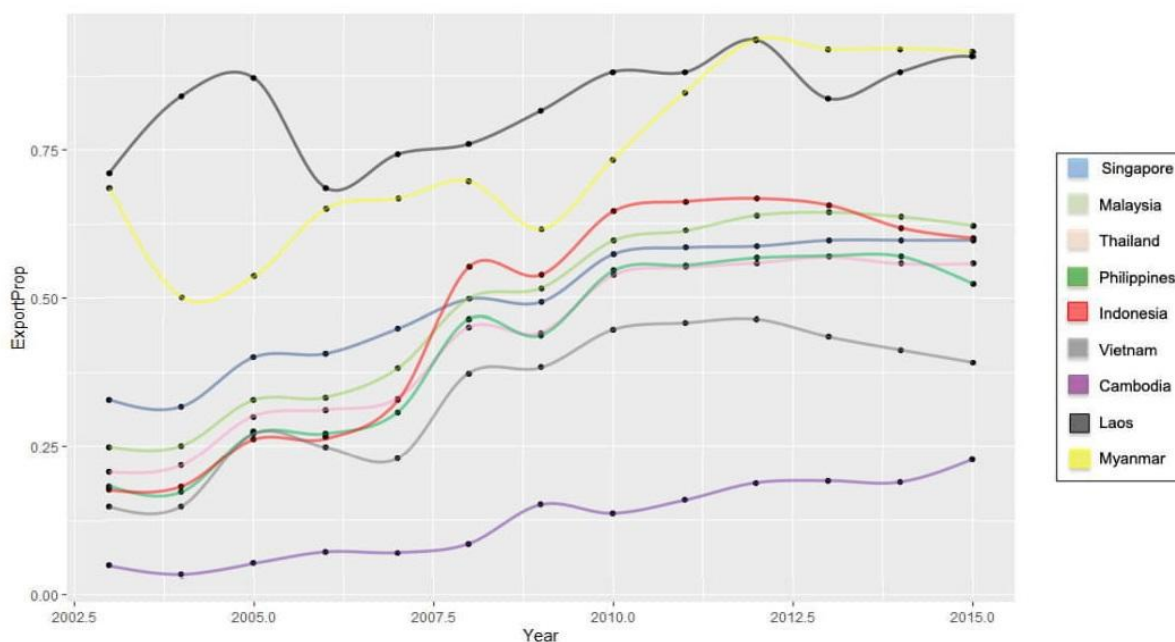


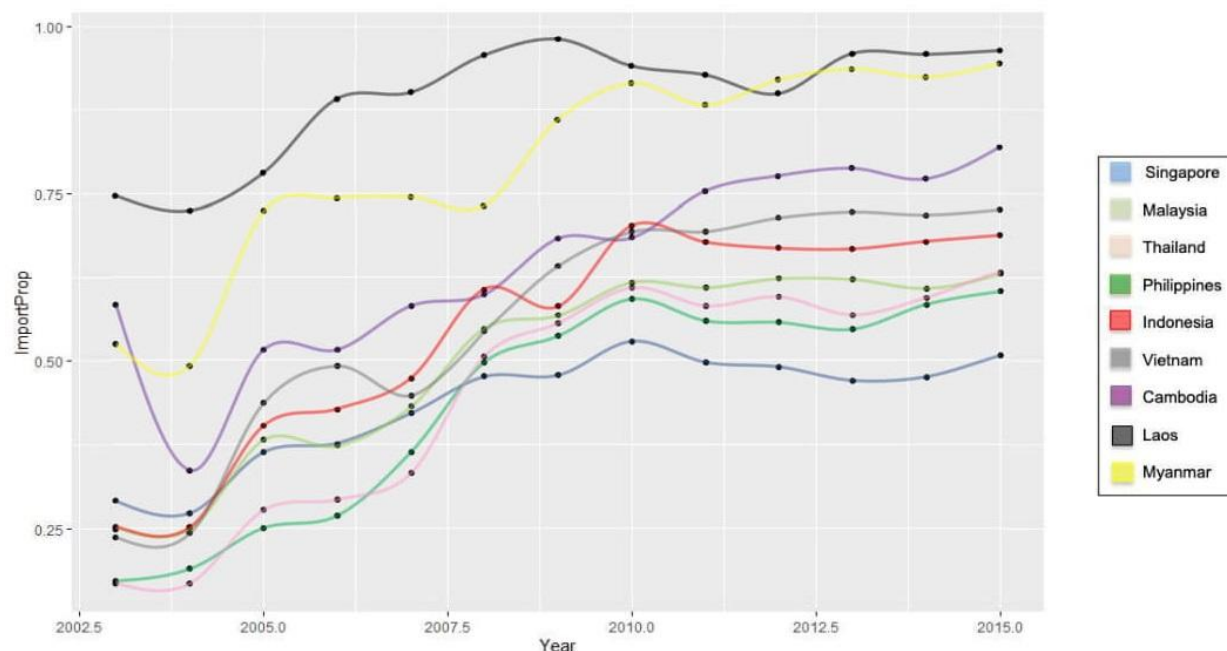
In observation of the above graph, we can see that for a majority of states that begin with lower tariff rates, there seems to not be as much fluctuation, but states with middling or higher tariff rates both see larger reductions, especially around key years where new agreements are discussed and established.

The second set of variables includes both the proportionality of Exports and Imports for each ASEAN member state that consist of trade with states that have current agreements established through ASEAN, or follow policy administered by ASEAN. The purpose of observing this trait is to see if ASEAN as a body that allows for the facilitation of trade and growth of it with specialized, prioritized partners, should inherently result in a greater growth of trade with participating partners, and as such, we must observe its impact on complexity, and complexity

outlook. This value was collected by adding together the net exports of ASEAN member states with other ASEAN member states as well as ASEAN partners, and dividing it by total exports per year, with the process also repeated for imports, with all data collected via ASEANstatistics and World Bank. This relationship is depicted in the below graphs, over the time span of our study, and provides a comparative variable that prioritizes looking not only on the impact of total economic growth, but partnerships and depth of trade with partner countries. *ExportProp* stands properly for the proportion of exports belonging to ASEAN-associated nations, and *ImportProp* stands for the proportion of imports belonging to ASEAN-associated nations, accounting for when free trade agreements are enacted, rather than discussed or written.

**Graph 4.4: Export Proportionality of ASEAN+ Trade(*ExportProp*) over time.**



**Graph 4.5: Import Proportionality of ASEAN+ Trade(*ImportProp*) over time.**

Because of the necessity to collect data that separated the locations of exports and imports by locations and regions, I use the data collected by the ASEAN data statistics compilation sources via the organization, which accounts for the makeup of internal, and external exports of each ASEAN member state from 2003 onwards<sup>51</sup>. Because of this, I assume my time frame of analysis to be 2003 onwards entirely, providing a 12 year period of analysis for total data in this research. My values of AI/E, OI/E, and WI/E respectfully analyze the amount of imports and exports for ASEAN, Outer-ASEAN, and the World as whole.

After conducting my first test with this data, I also added an additional independent variable to analyze compliance within ASEAN in identifying time of membership within the intergovernmental organization, labeled *AGE*, as a simple membership detection variable. *AGE* is important because of the limitation and expectation of stability and capacity for a state to participate that led to staggered join periods, and some withheld invitations until stability was

<sup>51</sup> External Trade Statistics - ASEAN: ONE VISION ONE IDENTITY ONE COMMUNITY. (n.d.). Retrieved January 29, 2021, from [https://asean.org/?static\\_post=external-trade-statistics-3](https://asean.org/?static_post=external-trade-statistics-3)

provided, such as Cambodia's internal instability in 1997 leading to a delayed acceptance until their government had recovered two years later.<sup>52</sup> This variable represents how long a state has been a member of ASEAN, and as such, inherently viewed as stable enough to continue membership within the body. This is also a base level of comparison to the dependent variables, as it is a parsimonious variable that directly connects only membership to the results of complexity, and any deviation between this result to others could further indicate the impact on economic variables that occur independently, such as those listed below in the discussion of my control variables.

### Control Variables

Because there are already several factors that are used to calculate, and thus are already given relationships, including economic complexity, involving productivity, trade frequency, good productivity, the alternative explanations are largely those of individual political decisions that would impact the economic stability and growth of ASEAN member states, but would not inherently be something established by ASEAN directly. All following country per year panel observation- overlaid with one another. This piece of the paper includes the control variables I was able to use throughout the period of the research, as well as those that had to be removed, due to lack of observational datasets to use. This reflects in my conclusion of what improvements would be made in future testing, as I believe all of the compiled variables are important factors in testing the relationship between intergovernmental compliance to the growth of economic complexity.

**Corruption Perception Index:** If a nation has reported high levels of corruption in terms of economic transparency and movement of goods, then the level of official policy compliance doesn't match to firm exploitation of official channels, and thus negatively influences economic

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<sup>52</sup> Carolyn L. Gates; Mya Than (2001). *ASEAN Enlargement: impacts and implications*. Institute of Southeast Asian Studies. ISBN 978-981-230-081-2.

complexity growth<sup>53</sup>. This stems from the fact that in many ASEAN Countries, unaccounted for mobilization and firm activity may make a substantial level of commerce and transportation- so when we look at firm participation rates we need to consider this as an avenue. In my updated analysis, I've discovered that the Corruption Index Policy is not an adequate measure due to them changing their measure of documentation and formula, without providing a uniform model to read their data, or at least calculate it. Because of this, after my initial testing, I decided to remove my Corruption Perceptions Index data from testing.

**HDI:** Recorded and proposed in an ECI+ paper<sup>54</sup>, the addition of education rates and the quality of human capital is thought to be an important factor in observing growth of economic complexity and may provide reason to believe that the level of engagement an IO may have on common educational standards or supplication may have an effect on internal growth. If a nation is seeing increasing levels of national education quality (in literacy/rates of higher education within population) then we should observe correlating rates of increasing economic complexity due to an increase in human capital.

**UNE:** While economic complexity observes the skill and knowledge of a workforce, and their productive capacity, I believe that in observing declared unemployment rates, we can see a disruptive pattern that does not influence the skill and knowledge of the economic capabilities and avenues of product capacity. ASEAN has been compared to the EU for it's lower unemployment rates, but based upon reports of the entity and the organization, it does not possess a uniform unemployment insurance mechanism, being left to individual states, leading me to believe that if unemployment as a control variable has influence, it points out individual statehood influence over complexity potential in a manner that ASEAN as an entity has no sway

<sup>53</sup> Ogwang, T., & Cho, D. (2014). A Conceptual Framework for Constructing a Corruption Diffusion Index. *Journal of Business Ethics*, 125(1), 1-9. Retrieved December 5, 2020, from <http://www.jstor.org/stable/24033150>

<sup>54</sup> Mealy, Penny and Farmer, J. Doyne and Teytelboym, Alexander, A New Interpretation of the Economic Complexity Index (February 4, 2018). Available at SSRN: <https://ssrn.com/abstract=3075591> or <http://dx.doi.org/10.2139/ssrn.3075591>

towards<sup>55</sup>. In addition, formalized unemployment in a majority of ASEAN nations does not exist for what is inferred to as an informal economy. Despite this, a majority of professions that would be accounted for and recognized in terms of export and import tariffs and international productivity can be recorded, and as such, this variable is to be used. If the unemployment is to decrease, then we can expect that economic complexity may increase in return. As an alternative, if declared unemployment increases, we may anticipate this assumes more people are attempting to participate and find a way to enter the job market, and as such, complexity may increase because of a desire to participate in the productivity capacity of a nation.

**Crisis Vulnerability:** This is a difficult facet to observe, in terms of global trends of economic flow, but we can see this analyzed in market analysis literature<sup>56</sup> as a mechanism of changes in foreign reserves. From this, we can assert that if a country sees a large scale shift in financial reserves to remove the international surplus endangered during the global financial crisis, then we can expect large shifts in short term economic complexity. This is observed as data looking at foreign investment flow levels, for how much it grows, or shrinks from each year. (FIW), or, foreign investment in stock, for how much is kept and accounted for in foreign currency total. (FIS) This data was collected through the OECD, however, due to the large amount of data not available, and how it lowered the amount of observations available for the primary relationship between my independent and dependent variables, I am not able to continue using this as an alternative variable, since a majority of its impact comes from sustaining a sample size of less than fifty total observations.

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<sup>55</sup> Schmitt, V., & Bista, C. P. (2015). Unemployment protection in ASEAN. Retrieved March 11, 2021, from [https://actrav-courses.itsilo.org/en/a3-55201/a3-55201-resources/info-on-social-protection-in-asia/factsheet\\_ui\\_24042012v5/at\\_download/file](https://actrav-courses.itsilo.org/en/a3-55201/a3-55201-resources/info-on-social-protection-in-asia/factsheet_ui_24042012v5/at_download/file)

<sup>56</sup> Pitterle, I., Haufler, F., & Hong, P. (2015, April 03). Assessing emerging markets' vulnerability to financial crisis. Retrieved December 05, 2020, from <https://www.sciencedirect.com/science/article/pii/S0161893815000381>

I believe that by performing a panel study for each of these variables and being able to compare them with one another, we will be able to begin to compose functional controls for each of these alternative examples. A multivariate study will allow me to control for these outstanding variables, in comparison to the data collected between the independent and dependent patterns. In recording a larger, macro-set for average global impacts, and those that can compare each country, we can see facets such as crisis responsibility with more clarity, and begin to isolate those results. In addition, taking averages for regional education rates and corruption for the whole of the region, as an ASEAN-member states total comparison, and observe in versus the composite member states, we can attempt to observe how much sway it can have in the differences to actual economic complexity growth. National policy in financial subsidies may be the most difficult, but if we add it to the base economic complexity solution, and attempt to see if any difference emerges fully in the rate of each individual nation, we can attempt to see if it has a viable impact on economic complexity.

## **Test Findings and Data**

### **Data Source Discussion**

In restating my hypothesis, the purpose of these tests is to propose a relationship between economic complexity, and measures of compliance to ASEAN as an organization and the policies that it enacts. Our sample observes nine ASEAN nations from the time span of 2003 to 2015, where I have a consistent measure of economic data and observations to observe changes in complexity measures and tariff rates consecutively. From this, we look at the initial datasets that I attempted to use in my first test for independent variables.

My first note comes in finding it difficult to fully collect some data sources consistently, and that in some cases, data sets would not have collected information for one or more of the individual nations that are member-states of ASEAN, pointedly, Brunei Darussalam not being

one, due to the limitations of the Atlas of Economic Complexity- one of the only sources to download compiled data of economic complexity and projected complexity potential- stipulating that countries with populations under one million are not accounted for in the compilation of data<sup>57</sup>. For this, in using Harvard's database for full collection of my dependent variables in both economic complexity (ECI) and complexity projected growth (COI), I use the Atlas and information possible, whilst excluding Brunei from my data due to its inability to be accounted for in the data collection process used to calculate economic complexity.

For my various independent data sources, I collect them from a variety of websites, and have found varying measures of success in being able to account for them all, including controls for comparison. Foremost, my data collected for most of my dependent variables, including tariff rates, by weighted mean, GDP per capita and standalone GDP accounted for to LCU, are all downloaded and compiled by the World Database, downloaded and framed to reflect only my time period of accounted for data<sup>58</sup>. In this, I would have also included my data for export and imports for each nation, however the data collected by the World Database does not allow me to separate them based upon export destination, and import origin, which is what is needed within my data to be able to build comparisons to the growth of ASEAN-nation economic engagement, versus extra-asean economic engagement, which is one of the facets I am also using to determine as a control. I will however, be using this as well to account for the percentage of economic activity and growth that comes outside of exports and imports, and observe this as an additional control in the areas in which I can observe resulting data. These take place in my data analysis as TR (Tariffs), GDPPC CLU (GDP Per Capita), GDPCLU (GDP), ASEAN/GDP, OUTER/GDP, and WORLD/GDP, all accounting for the percentage of formula of exports and imports added together, then divided by the GDP of each nation for each year, equate to, with different calculations for internal ASEAN calculations, external, and total. In addition, using the

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<sup>57</sup> Hausmann, R. (2013). The Atlas of Economic Complexity by @HarvardGrwthLab (1170032762 877498018 B. Leonard, Ed.). Retrieved January 29, 2021, from <https://atlas.cid.harvard.edu/rankings>

<sup>58</sup> Database Compilations. (n.d.). Retrieved January 29, 2021, from <https://databank.worldbank.org/home.aspx>

Asia Regional Integration Center, I collected information on the establishment and enactment of all trade agreements that went through ASEAN, including some staggered dates for participation by different members, which does not impact my time frame largely, and use the ATA identifier for this value in my dataset to account for the number of established and active trade agreements involving ASEAN as an entity<sup>59</sup>.

Many of the Control variables come from different sources, and select locations entirely for measures of their calculated values, such as the HDI coming from the United Nations Development Programme<sup>60</sup>, data on foreign investment in both flows (FIW) and stock (FIS) arriving from the OECD<sup>61</sup>, and the dependent variable analyzing national policy and economic growth not dependent on trade garnered by analyzing the total value of world, and regional exports, divided by total GDP. The crisis and corruption vulnerability values however, as displayed in the corruption perception index(CPI), have some issue- given that the calculation methods used for data from 2000-2011 are different in formula from the methods used for 2012-onwards, with no virtual method of translating the data to equate from one formula to the other. In my search for levels of political corruption, social upheaval, and instability, other sources seem not to account for some states that are ASEAN Members, with the ICRG not compiling any data for Cambodia. If I will continue to use the values for the ICRG to both government stability and corruption, I would have to conduct these tests and observations with a smaller sample of ASEAN States, which may skew the compiled identity for poorer states.

From this, only two of my control variables were statistically complete enough to warrant ability to test, since the majority of control variables resulted in a major decrease in viable observations for testing to be completed. Measures observing HDI as well as the unemployment

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<sup>59</sup> Economic Research and Regional Cooperation Department (ERCD). (2006, July 25). Asia Regional Integration Center. Retrieved January 29, 2021, from <https://aric.adb.org/database/fta>

<sup>60</sup> Conceição, P. (Ed.). (n.d.). Human Development Reports. Retrieved January 29, 2021, from <http://hdr.undp.org/en/indicators/137506#>

<sup>61</sup> B. (n.d.). Foreign direct investment (FDI) - FDI flows - OECD Data. Retrieved January 29, 2021, from <https://data.oecd.org/fdi/fdi-flows.htm#indicator-chart>

rate for each country, monikered *UNE*, measured internal capacity measures in both the labor market, as well as skill of labor and internal policy, since actions towards education, unemployment security, and health are not variables controlled by ASEAN, but have significant impact on their economic performance.

### Actual Primary Findings

From the data I have been able to properly analyze, I have four regressions, separating into those observing ECI, which is the actual economic complexity of a country, and those observing COI, which is the complexity potential and opportunity of a country, which indicates how much easier it is for a country to grow into new markets, and thus become more complex. In determining my model specification, I am running two multiple regression models, with the two focal dependent variables of Economic Complexity and Complexity Output index being compared to several independent variables. The variables that I include within my regression equation include those I believe to be the most representative of the core facets of compliance I wish to study: *TR* as a direct measure of tariff rate influences, *AGE* as a simple measure variable to the amount of time spent as a member of ASEAN compliant to its standards of stability, and *ExportProp* & *ImportProp*, as measures of how much intra-ASEAN+ movement composes total trade of member nations. Both *TR* and *AGE* are direct numerical values gained from their respective dataset of the IMF and simply counting the years from initial membership, and required no prior additional data. *ExportProp* and *ImportProp* more simply take the sum of total ASEAN member state and partner statistics, and divide it from the sum of total world export and imports respectively, leaving us with a numerical value to represent how much of exports and imports come from within the region of focus. Initially, I also included measures of Export and Import values as total percentage of national GDP-as *ASEAN/GDP* to measure only member-state trade and *ASE/GDP* to include partner states- but found that these variables resulted in multicollinearity, and that their correlation to one another was too close to include

them both within the test. Because my proportionality measures are more important to understanding the impact of compliance as an extension of the active proliferation and goal of ASEAN to increase regional trade, I decided to prioritize their analysis, and remove the GDP measures to avoid multicollinear flaws in my regression formulas. This difference is important, because it is possible for a country to become more complex without gaining more avenues for future accessibility into new markets, and it is also possible for a country to have more opportunities for increasing their complexity, but to not utilize these mechanisms and opportunities due to outstanding difficulties, such as labor conditions, environmental impact, or pre-withstanding economic obligations. For both, I have a regression looking at only the relationship to my dependent and independent variables directly, and a regression adding my control variables into the calculation. The first regression analyzes the aspect of either COI, or ECI, and pairs it to indicator variables that represent compliance to ASEAN, especially as an economically influential organization. After this, I add my control variables, and observe changes in the relationship to my dependent and independent variables, as well as their own individual impact on my dependent variable. From this, I am able to make the following observations.

The below table is a display of the first test I attempted to run- as of which you can display, the amount of observations, as well as the flaw of collinearity between some of my independent variables, results in difficulty proving any salient form of correlation consistently, and thus reason to require large removal of some variable due to their inherent statistical impact on proving relationships.

Table 5.1: First Regression Results: Hypothesis &amp; All Controls, ECI &amp; COI Dependent Variables

	Dependent Variable				
	ECI		COI		
	1	2	3	4	Coefficient
ASEAN+ Proportion of Total Exports ( <i>ExportProp</i> )	0.528 (0.438)	-0.425 (0.640)	-0.504 (0.564)	0.013 (0.871)	Estimate Std. Error
ASEAN+ Proportion of Total Imports ( <i>ImportProp</i> )	-2.136*** (0.473)	-0.961* (0.544)	-1.382** (0.609)	-0.741 (0.741)	Estimate Std. Error
Average ASEAN Tariff Rates ( <i>TR</i> )	-0.038* (0.022)	-0.006 (0.029)	-0.152*** (0.028)	-0.113*** (0.039)	Estimate Std. Error
ASEAN+ Exp+Imp Proportion of GDP ( <i>ASE/GDP</i> )	1.026 (0.800)	0.049 (0.587)	1.555 (1.030)	-3.147*** (0.799)	Estimate Std. Error
ASEAN Only Exp+Imp Prop. of GDP ( <i>ASEAN/GDP</i> )	1.065 (1.428)	-0.453 (1.352)	-3.825** (1.837)	2.026 (1.841)	Estimate Std. Error
Foreign Investment in Stock ( <i>FIS</i> )		0.00000 (0.00000)		0.00000*** (0.00000)	Estimate Std. Error
Foreign Investment in yearly change ( <i>FIW</i> )		-0.00001 (0.00000)		-0.00000 (0.00001)	Estimate Std. Error
Human Development Index ( <i>HDI</i> )		9.157*** (1.808)		6.300** (2.462)	Estimate Std. Error
Corruption Perception Index ( <i>CPI</i> )		-0.043 (0.101)		-0.251* (0.138)	Estimate Std. Error
Constant	1.106*** (0.199)	-4.925*** (1.051)	2.090*** (0.256)	-2.248 (1.430)	Estimate Std. Error
Observations	100	34	100	34	
R2	0.668	0.964	0.418	0.891	
Adjusted R2	0.650	0.950	0.387	0.850	
Residual Standard Error	0.561 (df = 94)	0.172 (df = 24)	0.722 (df = 94)	0.234 (df = 24)	
F Statistic	37.764*** (df = 5; 94)	70.903*** (df = 9; 24)	13.519*** (df = 5; 94)	21.786*** (df = 9; 24)	

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

First, I look at the relationship between my independent variables, and the COI dependent variable, which represents the ease of diversification, and the capacity for a country to grow more complex. The P-value, for accessibility and definition, represents the probability of obtaining results at least as extreme as the observed results of the statistical test for our hypothesis, assuming the null is correct. The lower a P-value, the greater we may reject the null hypothesis, which is why it is important to analyze for the statistical capacity of a test and in proof of relationships between variables. In this, when looking at the P value, I can see that there is a statistically significant relationship in the relationship between COI, the proportion of ASEAN-region specific Import growth (*ImportProp*) and Tariff reduction rates (*TR*) which both measure below .05, whilst my proportion of ASEAN-specific Export growth (*ExportProp*). What this means for *ImportProp* is that with each unitary increase in Import Proportionality, we should

actually see a larger decrease in Complexity Outlook Index, which implies a negative correlation relationship. This compares to our Tariff Reduction rating relationship, which insinuates that as a tariff rate decrease by a singular unit, or percentile for average calculated tariff, then we should anticipate a marginal increase in complexity output scoring. I consider these variables to be important, as tariff reduction rates is a direct reflection of the policies implemented by ASEAN as an organization in terms of economic policy, and the expansion of ASEAN-region specific trade and economic output reflects the influence of the establishment of the free trade area, and the encouragement of trade and economic prioritization of trade within the region. However, when I add my control variables, including HDI, CPI, and Foreign Investment, the rate of correlation for some of these variables do change, and it is rather significant in some cases.

In running the total regression, we first observe the impact for my *COI* regression test. In this test, *ImportProp* rises dramatically above the .05 P measure, indicating that there is a relationship of control and significance with the observed control variables. This is the same for *ASEAN/GDP*, in rising above the P value measure, *ASE/GDP* decreasing above the P value measure, while both export proportionality and tariff rates remain constant in their statistical significance. In addition, the level of significance by P value changes for several of my variables, with HDI and Foreign Investment in stocks(*FIS*) both being below the .05 threshold, implicating their significant relationship to complexity capacity. What this substantively asserts is that when a nation's HDI score increases by a measure of a single unit of score, we should anticipate a large increase correspondingly with our COI, larger than potentially possible given the scale. This is also true with our FIS, however all data for it is at a measure for 0, leading me to believe that its statistical significance is a flawed measure. This had led me to initially believe that in the relationship pertaining to complexity potential, the accessibility and increase of imports coming from ASEAN nations, as well as tariff reduction altogether, have some semblance of a relationship with the capacity of a country to increase its potential for market diversification.

However, the HDI of each nation, and its level of foreign investment and global engagement, have more impact as well on the capacity for imports to matter.

In comparison with my *ECI* regression test, both GDP measures and export proportionality remain constant, while tariff rates and import proportionality both decrease in their p-value measure, and as such, their statistical significance in the observed relationship. When looking at the first regression test, we see that similar to our COI test, the ImportProp rate is significantly below the .05 P value threshold, and that Export Prop does not show statistically significant values to display any relationship. What the .05 P value means is that there is a direct correlation to the increase of ASEAN Member state proportionality of imports to the complexity outlook of each nation. However, in this record, we can see that the Tariff Rate relationship with ECI does not have a significant P-value, not falling under .05. When adding my control variables in this relationship, there is a large shift in the ImportProp value, which results in it no longer having a viable P value for recording. And as such, none of the variables in my ECI regression show statistical significance in this relationship. In addition, we can also see the importance of HDI, asserting that its relationship in this study is heavily influential to the relationship with economic complexity, and complexity potential. This leads me to my next desired testing method, which would be to separate the recording of these nations each by their average HDI values, and see if this relationship is maintained and consistent for nations of all HDI, thereby emphasizing the impact that is held by this constant variable.

I also see some issue with the difference in observations between my different regressions, as adding the controls certainly decreases the amount of viable observations- mostly due to gaps in the data resulting in total shifts. Specifically, I find that both the corruption perception index and the foreign investment variables remove a third of my variables each, resulting in my total number of observations going from a hundred to approximately 34 after committing to the control test. This is especially prominent in both of the foreign investment observations- leading me to believe that removing them from the observation may allow me to

better analyze a larger set of observations, because there are several gaps in both sets that may be eliminating several of observed independent variables. This will be so I can have a healthy observation sample size. This may also impact my desire to include the corruption perception index due to it also decreasing the amount of viable samples to record, given the gap of years 2012-2015 it creates. I wish to run my control test without these variables, and still include HDI, to see how much the deviation in sample size influences this relationship, and if so, then perhaps the impact by the control variables is not due to their genuine impact, and instead the method of the experiment and results being drastically impacted by the removal of data.

### Test Improvement

From what I have collected and observed, my initial conclusion is that there is not a strong enough connection to support my primary hypothesis- that there is not a relationship between mechanisms of ASEAN as an entity and the economic complexity of the nation that are significant in measure, at least above individual mechanisms of growth and status. This is currently supported most by the lack of significant status displayed in the relationship to the proportionality of exports to other ASEAN-zones, and the inconsistency of the relationship with imports to other ASEAN-zone nations and tariff rates when facing the control variable of HDI. This is potentially questionable given that there is a robust, tangible relationship between my tariff reductivity rates to complexity output index- however I believe still that to conclude a connection despite the clear errors to other relationships within this iteration data set would have been preemptive.

This however, leads me to try and further consider my secondary hypothesis, on the impact held by ASEAN on market capacity and product space growth- since more of the data there seems to emphasize and indicate the potential of a relationship, perhaps implying that while the actions of ASEAN create more potential complexity, this isn't realized or acted upon, and so ASEAN provides the opportunity, but in a manner that allows it to be realized.

I wish to perform a more in depth test- primarily by removing some of my control variables due to their inconsistent recordings, and how much they skew and damage the amount of potential observations. Since my intention is not to change how much these variables matter, and more how much it takes away from the variables present in the relationship between my dependent and independent variables, I will keep HDI, and also see if there is another measure to include for corruption to the same scale that will allow me to observe this relationship. I believe unfortunately, that with the region of observation, foreign investment data is too inconsistent for this method of testing. This is due to my foreign investment data observations removing over 59 applicable relationships with my dependent variable in total, and my corruption perceptions index data removing 49 applicable relationships, and I believe that there is some overlap between these two that results in the total 66 missing observations in this first regression and depiction of the relationships. Because of this, my standard of error observed for these relationships is very high in comparing the baseline data observations in comparison to when I add my control variables.

### Secondary Testing

For the next test, I removed my control variables that were decreasing the amount of observations, being FIS, FIW, and CPI. After this, I tested my independent variables for collinearity, and found that my *ExportProp* and *ImportProp* measures were too highly correlated to *ASE/GDP* as well as *ASEAN/GDP*, and chose to remove the latter, due to the former variables better representing the ASEAN goal and effort to increase regional trade. Finally, I added a new independent variable that marks the relationship between compliance in membership and its impact on economic complexity, analyzing each nation's time spent as a member of ASEAN. My reason for not using this immediately was simply a lack of forethought of the impact of sustained membership, due to the requirement of stability held to retain

membership, and benefit from the tariff and trade agreement opportunities it provides; in a future test, I believe this variable should have been one of the base variables to include from the beginning due to its simplicity of calculator and observation. With this, I will have a tool to analyze if the amount of time spent as a participant in the organization, and following through with its regulatory mechanisms, has an impact on increasing the potential of economic complexity and effectiveness in realizing these new complexities. Labeling it as AGE in the regressions, this variable matters because not every member of ASEAN entered the organization at the same time, with the initial five member-states of Indonesia, Malaysia, Thailand, the Philippines, and Singapore having been within the organization for nearly half of a century, while Cambodia, Vietnam, Laos and Myanmar all became members near the turn of the 21st century, almost thirty years after the initial foundation.

**Table 5.2: Second Regression Results: Hypothesis & HDI Control, ECI & COI Dependent Variables**

	Dependent Variable				Coefficient
	ECI		COI		
	1	2	3	4	
ASEAN+ Proportion of Total Exports (ExportProp)	-0.223 (0.148)	-0.012 (0.161)	-1.379** (0.537)	-1.359** (0.539)	Estimate Std. Error
ASEAN+ Proportion of Total Imports (ImportProp)	-0.786 (0.480)	-0.560*** (0.185)	0.351 (0.616)	0.373 (0.619)	Estimate Std. Error
Average ASEAN Tariff Rates (TR)	-0.027 (0.020)	0.022*** (0.008)	-0.089*** (0.026)	-0.084*** (0.027)	Estimate Std. Error
Years of ASEAN Membership (AGE)	0.044*** (0.005)	0.011*** (0.002)	0.031*** (0.006)	0.027*** (0.008)	Estimate Std. Error
Human Development Index (HDI)		6.403*** (0.274)		0.615 (0.916)	Estimate Std. Error
Constant	-0.411 (0.280)	-4.155*** (0.193)	0.264 (0.359)	-0.095 (0.646)	Estimate Std. Error
Observations	100	100	100	100	
R2	0.715	0.958	0.503	0.506	
Adjusted R2	0.703	0.956	0.482	0.479	
Residual Standard Error	0.517 (df = 95)	0.199 (df = 94)	0.664 (df = 95)	0.666 (df = 94)	
F Statistic	59.625*** (df = 4; 95)	430.740*** (df = 5; 94)	24.050*** (df = 4; 95)	19.219*** (df = 5; 94)	

**Note:**

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

With a consistent number of observations in both tests, we can better understand the impact held by HDI on our test results, which once again presents that it as a control variable has significant impact on the relationship between a majority of our independent variables within the economic complexity regression test, however we see that it no longer correlates heavily with my complexity outlook index regression test. Instead, with the removal of the multicollinear error, we can observe that there is heavy positive correlation between a majority of my independent variables to increase in complexity outlook index scoring, save *ImportProp*. First, when looking at the ECI test, these results display that member-states within ASEAN see overall increase in their economic complexity the longer they've been members of the organization for the first dependent variable results, however this could also simply be indicative of the trend for economies to become more complex over time on average. We also observe that there is not an observable, correlatory relationship between our independent and dependent variables for the ECI test, with our control variables both statistically influencing, and holding major influence over the value of the dependent variable over what we attempt to measure for compliance. In our second dependent variable, we can see that there is a statistically significant relationship between our complexity outlook index and tariff reduction rates, which infers that as ASEAN membership decreases their tariffs towards goods and services with one another, the capacity for their economies to become more complex increases, and that the opportunities for expansion to adjacent markets for their advantaged exports and goods become more viable. In addition, we see that we have a correlational relationship between *ExportProp* to *COI*, however it is not as strong as both *AGE* and *TR*. In this relationship, our coefficient estimate is negative, which insinuates that as Export Proportionality increases, we can actually anticipate a decrease in our complexity outlook index score. In tangible terms, as the proportion of trade increases exclusive to only ASEAN and partner states, there is a decrease in complexity outlook index scoring. This, coupled with an increasing in complexity outlook index scoring as tariff rates decrease and the amount of time within ASEAN increases as highly correlated outputs, leads

me to recognize that if ASEAN's emphasis on regional trade increases only internal export proportionality, it may decrease total complexity outlook index scoring, but the reduction in tariff rates, as well as the time spent maintaining the standards of stability to remain an ASEAN member-state, seems to act against the negativity in this relationship. One part that is important to recognize for this test is that the complexity outlook index spans both a negative and positive range for scoring- and that when looking at the raw scored for COI- states that are within negative COI scorings on average are progressing towards zero, while some of the states with higher COI are decreasing slightly, but never into negative numerical assertions. I believe this to be the impact of convergence theory, and the disparity between the movement of states with less COI differing greatly from states with higher COI. ASEAN as an organization is focused on total growth of the entirety of the environment, and because the growth from negative scores, such as Laos moving from a COI of -1.08 to -0.53, has less impact than perhaps Indonesia moving from 1.81 to 1.68, I believe that the interpretation of the data may be highlighting more saliently decreases, rather than the increase for poorer nations. This is especially salient when considering how my data is calculated; because it is a multivariate regression model analyzing data per year to complexity scores, it may be interpreting a larger range of negative scores remaining negative, despite decreasing, as well as positive scores decreasing- as observable in Indonesia and Thailand- as a larger trend towards negativity. I may also, in future study, look and see specifically if this pattern and relationship remains consistent for the entirety of the time span, or if it is specifically due to larger impact prior to the inclusion of partner nation values; that there is a negative connection that occurs when it is only ASEAN member-state trade, and this changes later in my data when states such as China, New Zealand, and India became partners under ASEAN-based treaties. In observing all of this, I also recognize that this score has a lower p-value testing score for proof of the null hypothesis than my tariff rates and age scores, leading me to believe that this may also insinuate that if there is a negative correlation

relationship on average, that this decrease is less salient than the increase seen through both *AGE* and *TR* variable impacts.

In my observation of ECI we see an enormous prevalence of HDI as an impacting variable, as well as a large separation in complexity potential and realized complexity, leading me to believe that factors of accessing new opportunities for complex exports and goods are impacted by internal values dependent on development, especially in terms of labor. To observe this further, I added a variable to testing as a control in unemployment rates labeled *UNE*, which looks at unemployment rates for each nation to indicate an internal determining factor of their economic functionality and growth. As displayed below, we see that a majority of our observations remain the same- that tariff rates, age, and total ASEAN proportionality of trade display statistically significant relationships as with the previous test and regression. Our *UNE* variable displays significance as a conditional variable as much as HDI, however with a positive relationship indicated towards complexity outlook, and a negative relationship indicated towards actual economic complexity. What this seems to imply is that as unemployment goes down, the capacity for the economy to grow more complex increases, yet this does not connect towards how economic complexity has been growing, insinuating that when unemployment decreases, actual complexity does not grow.

Table 5.3: Second Regression Results: Hypothesis &amp; All Controls, ECI &amp; COI Dependent Variables

	Dependent Variable				
	ECI		COI		
	1	2	3	4	Coefficient
ASEAN+ Proportion of Total Exports (ExportProp)	-0.223 (0.148)	-0.072 (0.152)	-1.379** (0.537)	-1.317** (0.544)	Estimate Std. Error
ASEAN+ Proportion of Total Imports (ImportProp)	-0.786 (0.480)	-0.639*** (0.175)	0.351 (0.616)	0.428 (0.625)	Estimate Std. Error
Average ASEAN Tariff Rates (TR)	-0.027 (0.020)	0.016** (0.008)	-0.089*** (0.026)	-0.080*** (0.027)	Estimate Std. Error
Years of ASEAN Membership (AGE)	0.044*** (0.005)	0.014*** (0.002)	0.031*** (0.006)	0.025*** (0.008)	Estimate Std. Error
Human Development Index (HDI)		6.322*** (0.258)		0.671 (0.922)	Estimate Std. Error
Unemployment Rates (UNE)		-0.047*** (0.013)		0.033 (0.045)	Estimate Std. Error
Constant	-0.411 (0.280)	-3.964*** (0.188)	0.264 (0.359)	-0.228 (0.673)	Estimate Std. Error
Observations	100	100	100	100	
R2	0.715	0.964	0.503	0.508	
Adjusted R2	0.703	0.961	0.482	0.477	
Residual Standard Error	0.517 (df = 95)	0.187 (df = 93)	0.664 (df = 95)	0.667 (df = 93)	
F Statistic	59.625*** (df = 4; 95)	409.574*** (df = 6; 93)	24.050*** (df = 4; 95)	16.022*** (df = 6; 93)	

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

From this final test, we can make two conclusions. On the discussion of my economic complexity index test, we can see that a majority of relationships between my independent variables and ECI do not display a significant relationship, and the ability to be given correlatory measure to one another. When a measure is statistically significant, many of these relationships fluctuate between the absence and presence of my control variables, asserting that the relationship independently is not enough to provide proper causality.

Secondarily, on the topic of my complexity outlook index test, we can see that a majority of the relationships do display a significant relationship, and the ability to be given correlatory measure against one another. My control variables are not statistically significant in this test, nor do they shift the coefficient estimate for any of my variables when adding them to the regression test, leading me to believe that the statistical relationship for my variables is not impacted by the variables and influences represented by both *HDI* and *UNE*. I am interested in the disconnect

between the significance between export and import proportionality, and why the change in import composition does not seem to have a correlatory impact. I would potentially predict that in a future test, if we were able to further separate the scoring of these exports and imports by the measure of the complexity of their goods, we may see what direct changes are occurring in exports and imports, and if the imported goods are compositionally more or less complex productively than net export goods, and if that may be reason for differentiation.

## **Results & Discussion**

Foremost, I will restate my hypothesis, and break apart each individual query made to analyze how the results of our test speak to how much we can prove, disprove, and further question the inquiries made by the primary inquiry itself. We begin with the primary, core hypothesis; If the compliance/impact of economic and infrastructural policy introduced by ASEAN is high in analysis of member states, then we can expect to see a corresponding level of growing economic complexity(ECI) by member states; if the compliance/impact is low, then economic complexity(ECI) will not increase correspondingly.

In my measures of compliance, which includes extent of full membership, proportion of export and imports internally and to partnered nations, and tariff rates, we see only partial evidence of statistically significant relationships between these variables of compliance and actual economic complexity scores. Furthermore, with my variables that do not display statistically significant relationships, I see a negative trend in the relationship between variables, contrasting in the belief that all components of what ASEAN provides would directly result in economic complexity increasing. In measuring this, we see that the amount of time as a member of ASEAN correlates directly to growing economic complexity; however, both my Export and Import proportionality, as well as tariff reduction rates, do not. Because of how tenuous the age of membership is in detecting complexity, when states inherently become more complex

with time, and only a single measure of ASEAN-Based export modeling showing positive statistical significance, I do not have enough evidence to presume this correlation is correct, or observable through the means of what I have tested.

However, when looking at my secondary hypothesis, I can assert that there is a higher extent of success to my ability to successfully prove this relationship exists. This hypothesis is repeated as follows- if ASEAN international economic policy allows for the stability and extension of individual nation trade goods, then their Complexity Outlook Index measure become more effective and can therefore expand to new connecting markets: if ASEAN policy does not have an impact on the structure and growth of trade goods, then we expect the Complexity Outlook Index measure to not grow. The largest indicator for economic policy that we have in our measure was the tariff reduction mechanisms established by ASEAN, and emphasized in its trade agreements. When looking at tariff reduction as a variable, we saw that it had a direct statistical impact on COI scores, with the decreasing tariff rates holding an inverse relationship to complexity outlook. As tariff reduction represents the direct, tangible measure of observing how compliance to ASEAN policy reflects on each member state, observing that their COI increases in proportion to lowering tariff barriers allows me to assume that this hypothesis is correct- the policy laid out by ASEAN, when followed, allowed for growth in the Product Space of these nations. In addition, the amount of time spent as an ASEAN member also displays a successful, correlatory relationship to this variable, displaying that the complexity index output over time, does increase for ASEAN members. The reason why this hypothesis is able to be looked at successfully, and yet my primary hypothesis is unsuccessful, is that the product space measure of a nation represents only potential complexity outlooks- a nation is capable of having complex avenues accessible to them, without utilizing these new markets. From the test, we also must address the negative, but tangible correlation between export proportionality to complexity outlook index, due to the difficulty in interpreting this relationship right away. I believe that this variable is under the impact of what we interpret as convergence theory in impacting

the widely deviant scale of economic development seen within ASEAN- in that the salience of decrease may come from some of the more, already complex states, sacrificing some of their complexity output index scoring as poorer states increase. This can also be emphasized because for many of the less complex states, their increases remain negative, with this trend applying for Cambodia, Laos, and Myanmar. Because three of the states with the largest negative COI scores remain negative, despite this negative value reaching closer to zero, and some of the wealthier states decreasing in COI, I believe this results in the negative correlatory relationship we observe in my dataset. This also comes into mind when seeing that there are a large number of states in my observation that see overall increases in their COI score, while also seeing an increase in their Export Proportionality. This relationship applies for Cambodia, Laos, Malaysia, Myanmar, The Philippines, Singapore, and Vietnam, which is a majority of my observational states. I also assert that because this correlatory relationship has a much lower p-value score than those of *AGE* and *TR*- which both indicate increasing complexity output index scorings- that if there is an average, negative relationship, the impact of it is not as salient as that seen in the other influences of ASEAN membership. Finally, because the scoring of ECI ranges from -2 to 2, I believe that in order to balance the actual changes in score, a control variable for starting point was needed, because of the difference in impact for poorer and richer states, whilst also providing a point of control for movement from their original point and to where they are at the end of the dataset, because of outstanding economic variables, such as the 2008 economic crisis, or individual, internal fluctuations that may impact a singular year of the pattern. Because of this, I assert that ASEAN policy has an impact on the structure of trade goods through tariff reduction and membership that is more influential than the relationship potentially highlighted through Export Proportionality increases, and as such, results in a growing Complexity Outlook measure.

My final hypothesis looks at the relationship between specialization of markets and complexity, especially due to the salient issue in a regional organization encouraging

specialization of goods and services that may decrease the capacity of exports. In my third hypothesis, I ask that if ASEAN economic policy is directly correlated to, and a contributing facet of economic complexity within the region, then the efficiency of accessibility via trade partnership the organization provides outweighs the impact of specialization on the spread of new markets. If ASEAN economic policy does not contribute to economic complexity, then we cannot assert that the organization's trade policies and market accessibility has enough impact to ensure economic complexity over the connected market specialization attributed to most supranational economic bindings. I believe that while my data trends towards the counter-hypothesis, I believe that from the results of the tests performed, I am unable to properly answer this posed question or propose a clarified relationship for ASEAN as an entity and its impact. In many of the measures of the extent of trade exclusive to ASEAN member states and their neighbors, my data displays a negatively inverse relationship, insinuating that as the proportion of trade dominated by the area increases, there is a decrease in complexity. However, this relationship is not statistically significant enough, and is altered significantly by adding my control variable of HDI, emphasizing that while it may have some impact, it is not enough to provide a clear, cognizant relationship between decreasing complexity to increasing ASEAN-specialization. I believe this is particularly insinuating that the amount of realized trade and impact of ASEAN may not be enough to cause this relationship, as reflected in the failure of the first hypothesis. Because I am not able to prove that ASEAN policy is able to cognizantly impact economic complexity- due to my control variables of HDI and Unemployment being more impactful towards complexity, and not able to be influenced by ASEAN at this time given policy weakness- I believe that as such, it is not able to impact it inversely either. Therefore, I do not believe my test allows me to conclusively value either hypothesis- because of the failure of the first hypothesis, the lack of a cognizant relationship in either a positive or negative level of impact results in an inability to observe if specialization by ASEAN cognizantly harms complexity levels for each member state.

Whilst the impacts of membership on tariff reduction and access of preferential trade area establishment allows for an increase to the potential of complexity to increase, we see they do not necessarily equate to the country capacity to realize and access these new opportunities for economic complexity, with individual levels of unemployment and corruption holding more influence over complexity than membership. I am given partial success in my hypothesis in seeing that ASEAN as an entity does provide opportunities for growing economic complexity, but it does not have a successful mechanism for ensuring states can realize this new window of complexity, and thus, my primary hypothesis is not fully correct.

## Conclusion

From this study, I reflect on what I have learned, would improve in hindsight, and wish to explore further, from the questions presented and given more form from the testing completed. I have been able to conclude that whilst ASEAN provides opportunities for economic complexity to develop, it does not possess mechanisms or abilities to move states directly into growing economic complexity via its engagement with individual member nations, and that while the participation and emphasis of ASEAN in member economies as favored trading partners seems to incline towards a decrease in complexity, this relationship is not significant enough to indicate it existing as the most crucial measure of changing and influencing complexity.

In improving this test if completed again, I would wish to introduce more salient control variables, as well as separate ASEAN nations into separate categories of economic status and stability to see if the impacts of HDI as a heavily influential control variable would apply to all manners of statehood, or if there are only certain states that are more heavily impacted by its addition as a pull on economic complexity and complexity outlook. I would also emphasize an improved, individual case study, which I was unable to complete with the testing period and manner of experimentation, to observe sample states and their economic development with a more comprehensive and accessible understanding of how their economic complexity score is

achieved- which given my level of access to institutional formula, was not an achievable avenue to follow through. I believe that adding a dummy variable for comparison to ASEAN would also provide more viability for the ability to fully use these results to build a time-span based comparison of how trends in growth change over the span of membership.

Furthermore, I believe that in a future test, having a more solid identification for a comparable neighboring country would allow me to see impacts of tariff reduction. This would be important to help decipher if this relationship I am observing is specific to ASEAN individually due to its composition and member states, or to intergovernmental trade agreements akin to ASEAN's efforts of developments, and observe if this relationship of growing complexity outlook, but not actual economic complexity, is a repeating relationship.

Most importantly, In a future test I would believe that introducing a control for the starting point of the economic complexity and complexity outlook index scores of each nation would be largely beneficial in better contextualizing and observing patterns of growth as they compare to richer and poorer nations, especially as they interact with one another on common policy. Because of the expectation of convergence theory on the movement of developed and undeveloped economies in comparison to one another,<sup>62</sup> and how salient of an impact they may have, to have a control for 'starting point' so we can better understand actualized growth on average would be beneficial. This is core, due to the influence of some of the states that have growing complexity remaining in a negative, albeit smaller rating, and the larger, more complex nations seeing some decline.

I have also developed new questions based upon the data analyzed through testing, and emphasized upon through my literature review and analysis of both complexity, and the impact of interregional organizations upon its ability. Most importantly, the distinct difference between complexity outlook and economic complexity scoring, and what determinant factors matter

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<sup>62</sup> Korotayev A., Zinkina J. On the structure of the present-day convergence. *Campus-Wide Information Systems*. Vol. 31 No. 2/3, 2014, pp. 139-152

within an interregional organization to create this disconnect. When looking at economic complexity rankings, many of the higher ranking countries, such as Japan, actually have very low complexity outlook scorings, due to the fact that in becoming so specialized, and using all of their capable markets, they no longer have avenues to product expansion. This may prompt an analysis to the extent in which an international organization can provide accessibility to new product capacities based upon the pre-existing complexity of a state- and as such, their use in accomplishing this goal. In addition, because both my HDI and Unemployment controls have heavy influence, changing a majority of my variable relationships in regards to export and import proportionality, an analysis to how access to international organizations interact with labor markets would be a future project, especially concerning policies that influence both developed and underdeveloped economies. The vast difference in economic development and status within ASEAN has also led me to believe that if I had been given time, I would have separated and tested the ASEAN member-states in respective categories of GDP and HDI separations, so to see if the relationships between my dependent and independent variables are uniform, or if there are certain member states more heavily influenced, both in looking at the impact of tariff reduction, as well as the impact of control variables. I believe that in completing a future test that would look specifically at an internalized comparison of ASEAN member states, and the variables that are most crucial to how the organization impacts them, such as through labor market capacity, capacity to develop skilled labor, and perhaps economic corruption, a question towards the effectiveness and ability of an interregional organization when dealing with such varied member-states may be formed, and investigated further. Finally, when looking at my final hypothesis in the relationship between specialization and economic complexity, all sources seem to indicate that a highly specialized economy that is able to access several, ubiquitous products will more than likely have a high economic complexity ranking; however, during my research, the question of specialization in a poorer state, and how much it allows for complexity to genuinely develop, is apparent. This is especially cognizant as an inquiry when trade

agreements between developed and underdeveloped states inherently encourage countries that have comparative advantages in primary products to remain exporters of primary products, rather than work to develop more complicated, and thus more ubiquitous, secondary products. I believe that this question would have me look towards the range in which specialization becomes beneficial to an economic complexity score, and when it instead becomes detrimental dependent on the composite productivity and capacity of a nation. I would seek to understand this relationship in order to determine how much interregional trade organizations implicitly benefit certain member states, and what potential policies would need to be enacted in order to potentially address this issue in ensuring total development for all partners.

For where I believe this piece fits into expanded literature; I would analyze its impact in two categories, separated in how it connects to the literature of international organizations, and in the discussion of economic complexity. I believe that for the literature of international organizations, my piece does not contest any of the larger arguments to the value of compliance, but partially validate both arguments from Downs et al. and Chayes. For Downs et al., the argument of states only agreeing to policies they already wish to be enacted is true- however I would contest that this paper more speaks on effective utilization of IO policy, which is closer to Chayes point. With Chayes speaking on the capacity to comply, I believe ASEAN states have the ability to decrease their tariffs and follow suite in arranging trade arrangements, as as such are willing to follow infrastructural, initial steps, but individually are incapable of effectively exploiting these news avenues- which brings up whether or not it is the place of the IO to move states to these productive capacities, and how. It also contributes to the discussion of convergence theory and its impact within international organizations on the matter of economic complexity, specifically due to the questions posited through the Export Proportionality result in my *COI* regression testing. I believe that from the results of my test, it may be worthwhile to further observe from here the full extent of how this gap in impact on wealthy and poorer states can be properly represented, and how the sacrifice of potential, expandable

productivity opportunities compares to actual economic realities of a nation. In comparison, in the literature of economic complexity, I believe my paper fulfills a similar role as many of the subsequent papers spawning off from the original work completed by Hidalgo and Hausmann in a specialized, regional study, save efforts to project economic growth, which I did not focus on for my research. I believe instead, what my paper does is align itself to the same frame of Mealy et al. in expanding the variables measured for economic complexity, especially for interregional organizations, to measures of difference in HDI, as while it may not impact a singular state drastically, the disparity between states as they interact with one another may change how they can effectively utilize the resources of one another, and as such, increase their productive capacities based through the networks they have gained access to.

I believe that this paper is still important to future research because of the questions it posits on the relationship of complexity to compliance. The larger inquiry it presents is the disconnect between complexity output index scoring to actualized economic complexity, and how this difference can be rationalized, or explained, and what potential solutions exist if any. It also presents the disconnect in the impact of export and import proportionality to overall economic complexity, as well as complexity outlook index scoring, which potentially brings up the inquiry of the difference in what is brought in and out of nations by means of opening trade, and if the composition of these goods is drastically deviant to result in this change of effect.

From this experience, in my conclusions being mixed with trends towards the inability to prove relationships, I analyze the value of this test in highlighting the disconnect of complexity outlook index and economic complexity scoring as it pertains to compliance and participation in interregional trade organizations, with ASEAN's emphasis on expanding into the neighborhood and establishing uniform tariff reduction serving an example to this relationship. While I am not able to provide a direct correlatory link to compliance and complexity, due to the weakness of compliance within the organization to have salient impact on the actions of an economy, it does display effectiveness in providing opportunities for an economy- why a state does not take these

opportunities, and to what extent it has difficulty accessing these opportunities, is the question to postulate from this study.

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