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The Index of Asia-Pacific Regional Integration Effort

Victor Yifan Ye*
Duke University
yifan.ye@duke.edu

Mia Mikic
United Nations ESCAP
mikic@un.org

The Asia-Pacific region is not typically seen as one geographic or socio-economic space. Yet, 58 regional economies occupying the space of 28 million square kilometers from Turkey in the West, Russian Federation in the North, French Polynesia in the East and New Zealand in the South belong to the Economic and Social Commission of Asia and the Pacific (ESCAP). This commission provides a forum for member states that "promotes regional cooperation and collective action, assisting countries in building and sustaining shared economic growth and social equity". In 2013, ESCAP's members adopted the Bangkok Declaration to enhance efforts towards deeper regional economic integration. Yet this document neither proposes a concrete modality or modalities of achieving deeper integration, nor provides a sense of distance of individual countries to a "perceived" integrated Asia-Pacific.This paper aims to comprehensively quantify recent integration efforts of economies in the Asia-Pacific region. We provide an "index of integration effort" based on twelve metrics that measure the relative distance of a given economy to the region as an economic entity. Generally, we find that while the region has trended towards becoming integrated in general, both the level of integration and integration effort are inconsistent among Asia-Pacific economies. We discuss potential applications and extensions of the index in developing our perspective of the region's economic and social dynamics.

Keywords: Regional Integration Effort, Asia-Pacific, Index of Integration Effort, Social and Economic Integration, ESCAP, Trade Agreements, Investment Agreements
JEL classification: E15, O53, Y10

* Corresponding Author

I. INTRODUCTION[1]

For the past decade, the EU and, in particular, the Eurozone has pursued the concept of integration as a development goal (Molle, 2006; Crowley, 2006). In the European perspective, this goal is driven by both political and economic need: a currency union cannot be sustainable if its members are socially and economically disparate. Recent research quantifying nation-level integration efforts in the EU shows large discrepancies in both the degree and pace of integration between countries (König, 2015).

The concept of integration in the Asia-Pacific is evidently different from that in Europe. The region does not have unified monetary and trade systems or aligned regional targets of development. Regional barriers to trade and human capital flows are considerably higher in the Asia-Pacific, as are discrepancies between most and least developed nations. However, at its most fundamental level the benefits of integration equally apply to both regions: a country tightly bonded with its neighbors should enjoy gains from lower transaction costs, greater access to commodity and resource markets, information, and varied sources of education and investment. Therefore, while there are no formal policies or institutions for pan-Asia-Pacific integration, such integration could still be desirable from the viewpoint of both individual nations and the region as a whole, and hence merits in-depth investigation.

Using a variety of social-economic metrics designed to gauge the closeness of an economy to Asia-Pacific as a whole, we create an "Index of Asia-Pacific integration effort" covering all regional economies with available data (37 out of 58). We first obtain an "integration index" for the degree of achieved integration of these Asia-Pacific economies. Then, we employ a residual analysis approach based on a Generalized Estimating Equations (GEE) model to approximate their levels of integration *effort*, defined as the extent to which an economy, given its endowed conditions, has made social, economic and policy efforts to integrate with the region.

[1] Authors are grateful for the comments received when an early version of this work was presented at the ARTNeT seminar "Towards Measuring a Regional Integration Effort by Asia-Pacific Economies," 14 August 2015 at ESCAP. Without implicating them, authors would like to express appreciation for comments and suggestions from Charles Becker, Duke University Department of Economics and the anonymous referees.

Section two begins by reviewing stylized facts and existing modes of investigation of the level of current Asia-Pacific integration. Section three outlines data sources of the integration index inputs and discusses the choices of inputs. Section four details the procedure of index construction and determining of input weights, and presents the full integration index. To measure integration effort, section five provides a residual analysis of the factors facilitating regional integration and the resulting index of integration effort. Section six concludes and discusses integration effort in a macro-policy context.

II. THE ARGUMENT FOR AN INDEX OF ASIA-PACIFIC INTEGRATION EFFORT

Given the lack of a single set of political and economic regulatory institutions, the strongest common and enforceable modality for a pursuit of cooperation and integration for the majority of Asia-pacific economies is found in bilateral or plurilateral (sub-regional) agreements. These are mostly present in the following areas: Preferential Trade Agreements (PTAs), Bilateral Investment Treaties (BITs) and other International Investment Agreements (IIAs), as well as bilateral provisions related to labour mobility in inter-governmental agreements. As of 2015, the total number of PTAs involving at least one Asia-Pacific economy is estimated at 231, of which 155 are in force (ESCAP, 2015). Out of those, 67 bilateral PTAs are currently in force between ESCAP members, accounting for more than half of the 124 bilateral trade agreements that are both currently in force and involve at least one Asia-Pacific economy.

The relatively large number of regional bilateral PTAs is not necessarily a good sign: multiple bilateral trade rules may increase the overall cost of preferential trade, leading to what is commonly referred to as the “noodle bowl” effect (Petri, 2008). In addition, the current situation of PTAs still presents a highly fragmented view of the Asia-Pacific region. Several distinct sub-regions have robust internal cooperation and trade that is often disproportional to the number of PTAs within the sub-region (ESCAP, 2012), as is the case in Northeast Asia where trade and FDI flows among China, Japan and the Republic of Korea evolved without a sub-regional agreement involving all these economies. Country pairs with high-volume trade relationships often do not have any bilateral PTAs, while other pairs with PTAs do not trade much at all.

The fact that two economies are connected via PTAs seems to be no guarantee of economic integration and not even improved trade or investment. It has been noted that many PTAs do little more than express a willingness to negotiate and engage in potential, future cooperation and are hence not indicative of actual regional integration (ESCAP, 2015). The 2014 Asia-Pacific Trade and Investment Report concludes that with regard to trade policy in the Asia-Pacific, “the actual immediate speed of liberalization remains slow and the coverage shallow”. Therefore, while statistics on the number and coverage of PTAs roughly outline trends in pursuit of regional integration, they do not provide much information on the depth of regional integration or on the impact of the agreements on convergence between economies.

Compared to the extensive surveying of PTAs, literature on BITs and IIAs as modalities of integration remains limited. As of mid-2015, a total of 262 BITs exist between Asia-Pacific economies, of which 206 are currently in force.[2] In addition to BITs, the Asia-Pacific economies have signed 66 intra-regional IIAs and put 53 of them in force. The rate at which new BITs and IIAs are signed has decreased significantly in recent years: only 26 new intra-regional BITs and IIAs were signed in the half-decade since 2010. In contrast, 58 BITs and IIAs were signed between 2005 and 2009, and a further 62 were signed between 2000 and 2004.

The slowdown can at least partly be attributed to the “market saturation” of BITs and IIAs where the majority of desirable and attainable agreements may already have been signed prior to 2010. However, there has also been a recent body of literature raising doubt about the application and efficacy of BITs in attracting foreign investment. Studies have found that the link between BITs and Foreign Direct Investment (FDI) is weak and possibly dependent on existing, positive business conditions (Tobin and Rose-Ackerman, 2005). The findings suggest that the effect of BITs might be largely reinforcing in nature, tending to boost investment flows in economies that would have attracted investors in the first place. Other studies point to the risk exposure of policy-makers from giving preferential treatment to foreign investors over domestic ones and the possibility of BITs reducing the scope of reform options in financial markets (Hallward-Driemeier, 2003).

[2] Data obtained from UNCTAD Investment policy hub: http://investmentpolicyhub.unctad.org/(accessed Jan. 21, 2016)

Furthermore, the nature of BITs and IIAs suggests that no two treaties are identical. The differences in complexity, scope, attached protocols and degree of policy reforms makes aggregated estimates of the number of BITs or IIAs involving a given economy considerably less meaningful. Because of these significant issues, the applicability of BITs and IIAs in investigating regional integration efforts is severely limited: we cannot gain much insight unless treaties are examined on a case-by-case basis.

Labour mobility provisions are, in general, much less common among Asia-Pacific economies. As of May 2014, only 44 Asia-Pacific PTAs contain chapters covering mobility, of which less than half (16) have any participation from developing economies (ESCAP, 2015). These PTAs constitute the bulk of binding labour-related agreements in the Asia-Pacific. Literature points to public perception challenges as a possible explanation for the relative lack of such provisions: the citizenry of a given country generally tends to be much more pro-trade than pro-immigration. Bilateral Labour Agreements (BLAs) and sector specific Mutual Recognition Agreements (MRAs) have gained popularity in recent year, but are less indicative of actual labour mobility conditions given their non-binding nature.

Recent literature does seem to support the connection between integration and PTAs with labour provisions. Evidence suggests that PTAs with labour mobility provisions are highly effective in stimulating growth in migration flows (Orefice, 2012). In contrast, PTAs without labour mobility provisions seem to actually *deter* bilateral migration. However, even if one can interpret the low number of labour mobility provision-inclusive PTAs in the Asia-Pacific as a sign of low levels of integration, 44 observations out of more than 1600 possible economy-pairs does not provide much to operate with in statistical terms.[3] We conclude that while PTAs with labour mobility provisions are excellent predictors of integration, their coverage in the Asia-Pacific is currently far too low to establish meaningful results.

In summary, provisions in these three types of agreements-PTAs, BITs/IIAs, labour mobility-are not capable of providing significant insight into the features of Asia-Pacific integration. Their respective perspectives are perhaps in agreement in suggesting that the region is currently not well-integrated. Simply knowing this is, however, clearly not enough for the analyst or the policy-maker. It is evident that

[3] The total potential unique economy-pairs of the 58 ESCAP regional members is 1653.

any quantitative assessment of regional integration efforts would require a considerably more comprehensive and rigorous approach. The shortcomings of these agreement-based investigations strengthens the argument for the alternative: measuring integration and integration effort quantitatively by evaluating social and economic factors.

III. DETERMINANTS OF REGIONAL INTEGRATION

Before discussing the technical specifications and methodologies related to measuring integration, the distinction between integration and integration effort must be made. In this paper, we define the term integration broadly as the socio-economic distance of a given economy to the region-as-one economic entity. In contrast, integration effort is a measure of the extent to which an economy, given its endowed natural, historical and economic conditions, has combined social and economic policy efforts to integrate with the region.

It is obvious that some economies are more likely to be highly integrated compared to others. Smaller economies are less likely to self-isolate and are also incentivized to assume proactive, intermediary roles among the regional community (Casella, 1996; Kose and Riezman, 2000). Applying similar reasoning, one would expect islands and landlocked economies to be, on average, less integrated. Economies that are sparsely populated, i.e. those that are geographically larger given the same population size, should also tend to be less integrated because of higher infrastructure and development costs.

A large, sparsely populated economy is still free to pursue integration objectives, engage in regional affairs and, figuratively, “punch above its weight”. Conversely, a small, dense economy may fail to do these things and perform below what its exogenous conditions suggest. The latter may still be better-integrated in absolute terms than the former, but conceptually and policy-wise there is clearly something different between the two cases. This difference-introduced by disparities in policy and regulatory institutions-characterizes the term “integration effort” and is what we aim to measure.

Clearly, this concept cannot be measured without first measuring integration itself. To this end, we first introduce an “integration index” measuring the degree of integration of Asia-Pacific economies. The integration index consists of two sub-indices, respectively denoting the social and economic integration levels of a given economy. The social sub-index consists of four input sources, and the economic index of eight. The social sub-index inputs are designed to not be specifically directly linked to economic factors. While correlations between input variables and the level of an economy's economic development are unavoidable, we contend that at least in principle, relatively less developed countries can still perform well in these areas.

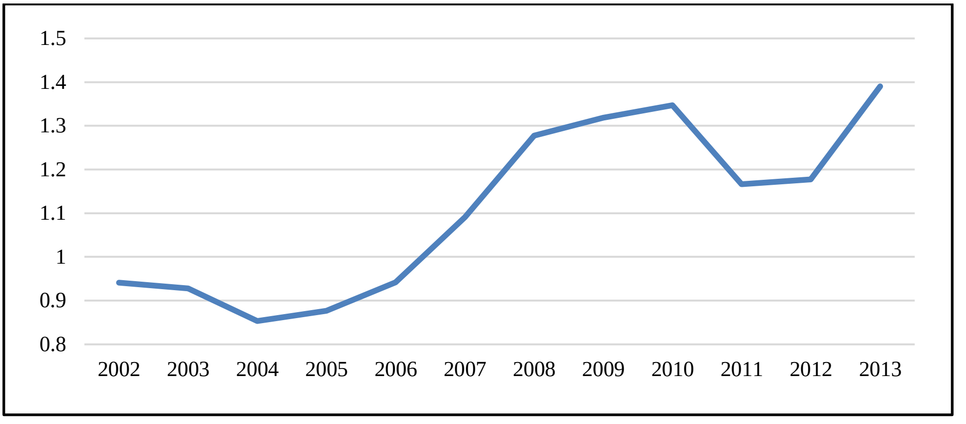
We note that our index inputs are not truly ideal in terms of diversity and scope. Indeed, established quantitative work on EU integration (König, 2015) utilizes larger sets of variables. However, we are not only constrained by available data but also by objectives of this paper. Our considerations involve a balancing between having a sufficiently robust set of inputs and encompassing a larger range of Asia-Pacific economies. A larger set of inputs is achievable were we to limit our investigation to the 10-15 largest Asia-Pacific economies. Yet this significantly diminishes the general regional policy appeal of this paper, in particular to policy-makers of developing nations that may desire a comparative perspective on regional integration. Similarly, the set of inputs must be further reduced, to the detriment of our empirical analysis, to include all 58 ESCAP members.

The first social sub-index input concerns student outflows to the region. The connection between international student flows and economic growth is well- studied (Bergerhoff, Borghans, Seegers and van Veen, 2013; Le, 2012). Empirical evidence also suggest that robust international student flows facilitate regional integration (Donchenko, 2015; Kuroda, Yuki and Kang, 2010). Intuitively, higher ratio of Asia-bound international students means that an economy has a better understanding of the cultural and social norms of other Asia-Pacific nations, as well as a higher propensity of initiating professional and academic collaborations within the region.

Specifically, we measure for a given economy the ratio of the number of total students studying abroad in the Asia-Pacific to that of its adult population, in units of 1000 persons.[4] Figure 1 shows that between 2002 and 2013, the regional average of this ratio has increased significantly from 0.95 to approximately 1.4 students per thousand adult citizens.

[4] Adult population is defined as total number of citizens between ages of 15 and 64, inclusive of the two bounds.

Figure 1. Number of Outbound Students to the Asia-Pacific per Thousand Adult Citizens[5]



The second social input source uses the male-female employment gap as a proxy for gender equality. An input for gender equality is employed for the following three reasons. First, economies with severe gender inequality issues are likely to face significantly greater difficulties in terms of regional integration (Martin, 2013; van der Vleuten, 2013). Second, economies where growth is predominately driven by agriculture or industries involving menial labor will necessarily have significantly higher male employment rates, whereas professional, service-sector and capital-intensive positions are much more likely to be gender-neutral. Gender equality can therefore also be considered as an indicator for the modernity and structural transformation of an economy.

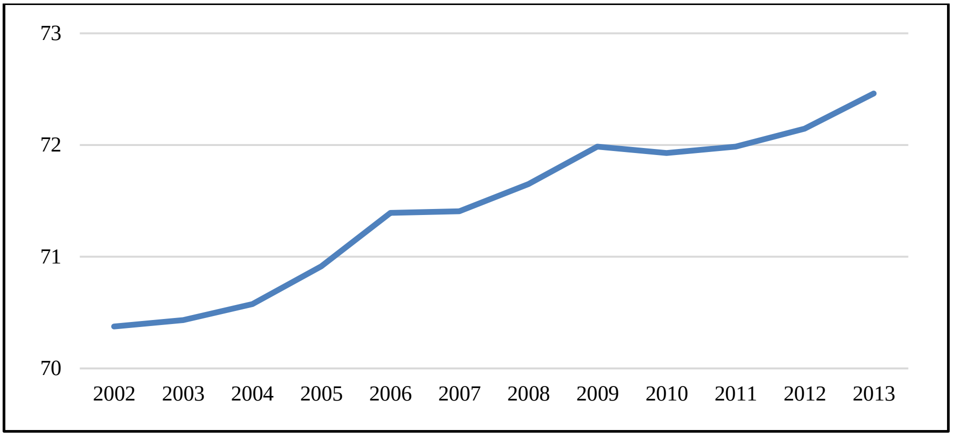
Third, societies that have disparate views on the equality of gender will most likely differ on their views of other social-economic issues. A society's treatment of the difference between genders is often an indicator for a much wider vector of social, political and cultural norms (WEF, 2015). While it is generally difficult to find data directly concerning general aspects of social norms, such as the rule of law, acknowledgement of intellectual property, and views on political and economic rights for Asia-Pacific economics, many of these aspects are likely strongly

[5] Outbound student flow data provided by UNESCO, adult population data retrieved from the ESCAP statistical database. The average estimate excludes figures for Brunei Darussalam, DPRK, Lao PDR, Turkmenistan, Tuvalu, Uzbekistan, and all Pacific Island economies except Fiji and the Solomon Islands.

correlated with gender equality. Hence, even if the direct link between gender equality and integration is not clear-cut, equality nonetheless serves as an indicator for a large range of factors that are strongly related to integration.

While we recognize the role of local cultural norms and historical conditions in determining a society's current view on gender, we regard equality between genders as being unequivocally beneficial to modern society: discrimination in a modern labor-production framework necessarily implies inefficient allocation of human capital and unrealized potential for economic development (Cain, 1986). We hence treat *equal* employment for citizens of both genders as the ideal condition, and measure this input source by number of females employed per 100 males employed. As figure 2 suggests, between 2002 and 2013 there has been some, albeit limited improvement in this regard: the Asia-Pacific average has increased from 70.4 to 72.5 female per hundred male employees.

Figure 2. Employment Gap by Gender, 2002-2013[6]

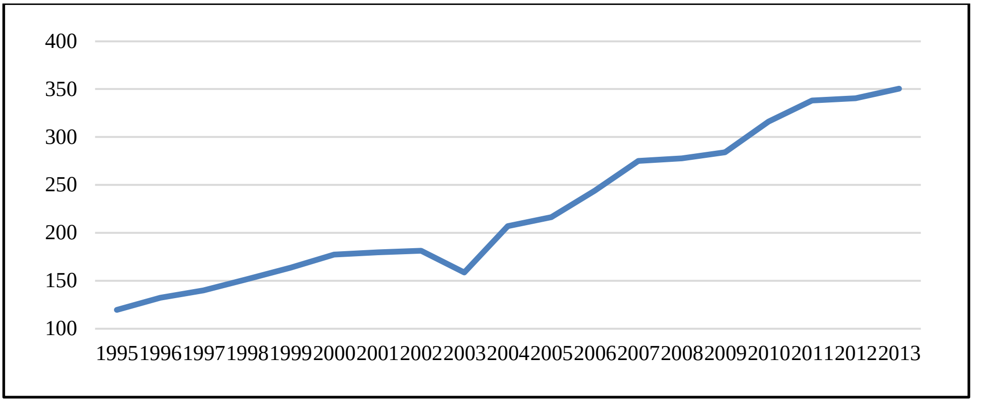


The third social input source measures the number of outbound visits to Asia-Pacific destination markets for every thousand citizens. The premises of this input metric as a driving factor of integration and development (Milne and Ateljevic, 2010; Wahab and Cooper, 2001) are similar to that of the education input source, but expands beyond students to intra-region business and leisure travel in general. Note that

[6] Data retrieved from ESCAP statistical database. The estimate excludes figures for all Pacific Island economies except Fiji and the Solomon Islands.

with the exception of flows between China, Hong Kong, China and Macao, China, same-day "excursionist" travel is not omitted from the data.[7] Among the social sub-index input sources, this is the area where recent growth is most significant. Figure 3 shows the Asia-Pacific average for intra-regional outbound visits per thousand citizens. The number has increased from approximately 119 visits per thousand citizen in 1995 to 181 visits in 2002 and 350 visits in 2013.

Figure 3. Intra-Regional Outbound Visits per Thousand Citizens[8]



The fourth and last social sub-index input source represents the relative intra-regional connectivity of an economy for its size, measured by the total number of international outbound flights with destinations in the Asia-Pacific region per thousand citizens. This figure complements the metrics for tourism and student travel, but differs in that it also gauges the accessibility of international, intra-regional travel and importance of the economy as a regional hub for transportation by air: a larger number of intra-regional flights per citizen suggests relatively attainable air travel for the population and higher volumes of inbound tourism activity. Due to a lack of data on historical air travel availability conditions, this

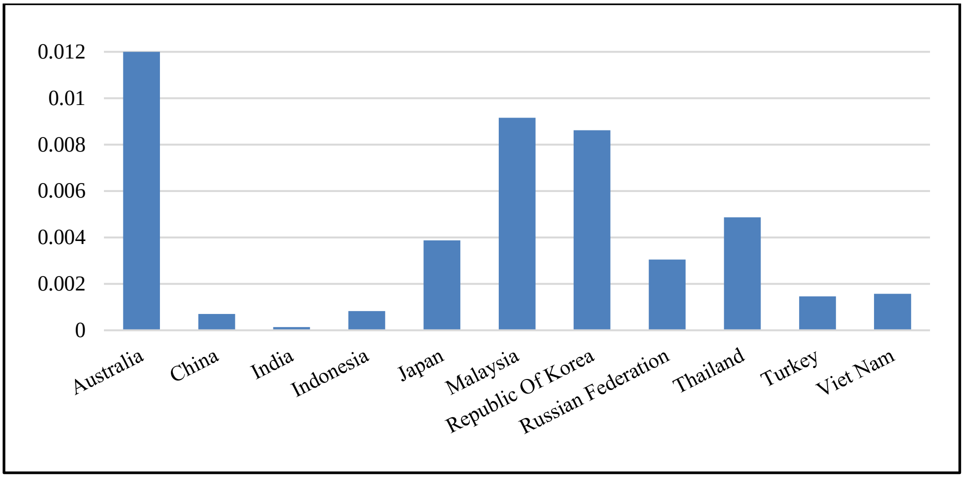
[7] These outbound flows contain substantial amounts of day-to-day commuting travel that cannot be separated from regular tourism or business activities, and are also too large in general compared to other outbound tourism flows in the Asia-Pacific.

[8] Tourism statistics provided by UNWTO and complied by authors. Population data retrieved from the ESCAP statistical database. Outbound flows between China, Hong Kong, China and Macao, China are excluded from the economy-specific and total outbound volume estimates.

source is not year-specific. Figures are obtained from Openflights.org, an open-source website on worldwide air travel information, and represent the world air route situation as of June 2015. Figure 4 presents intra-regional flight per thousand citizen figures for a select number of Asia-Pacific economies.

We justify our choice of using air travel data in addition to data on international student flows and regional tourism for the following two reasons. First, existing empirical work suggest that availability of air transport plays a major role in globalization (Adey, Budd and Hubbard, 2007) and international mobility (Gössling and Nilsson, 2010). Therefore, a direct relationship between air travel accessibility and regional integration as defined in this paper is conceptually likely. Second, our Principal Component Analysis (PCA) based empirical approach is specifically designed to address internal correlation structures of index inputs. From this perspective, it is not undesirable to incorporate multiple index inputs that are respectively directly related to regional integration yet correlated with each other. Our statistical approach and the use of PCA are discussed extensively in section 4.

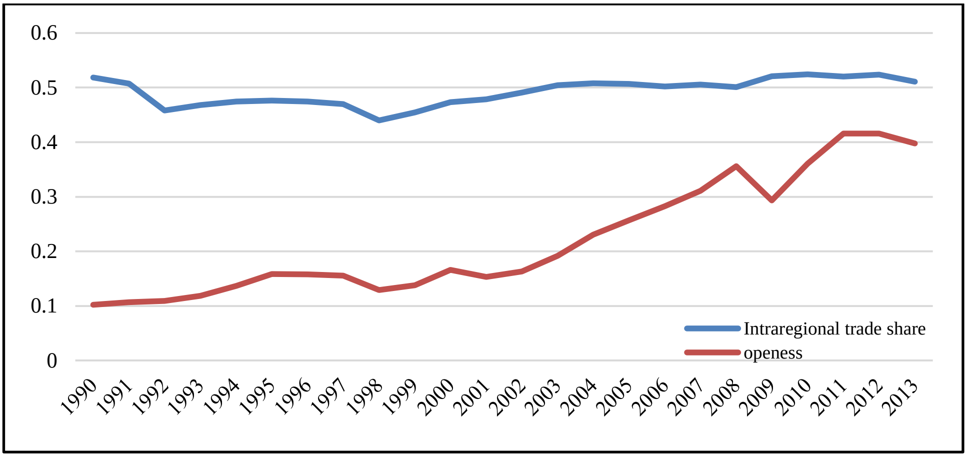
Figure 4. Intra-Regional International Outbound Flights per Thousand Citizens, 2015[9]



[9] Data obtained from Openflights.org. Population data retrieved from the ESCAP statistical database.

The economic sub-index involves two international trade metrics, respectively denoted as “intra-regional trade share” and “trade openness”, and six macroeconomic metrics designed to assess an economy’s closeness to the Asia-Pacific region as a whole. Intra-regional trade share is calculated by dividing the total volume of intra-regional trade of an economy over its total trade volume with the world. This represents how important trade with the rest of the Asia-Pacific is, in relative terms, for a given Asia-Pacific country or economy. Trade openness measures regional trade volume over Gross Domestic Production (GDP), and gauges the size of an economy’s intra-regional trade sector with respect to its total domestic output.

Figure 5. Intra-Regional Trade Share and Openness of the Asia-Pacific Region[10]



As figure 5 indicates, intra-regional trade share has remained at approximately 50% levels since 1990. This contrasts sharply with the situation in Europe, where intra-regional trade importance has decreased by roughly 10 percentage points since 1993 (König, 2015).[11] On the other hand, trade openness in Asia-Pacific has increased from 10.2% in 1990 to 39.8% in 2013. A closer look at by-economy

[10] Trade and gross domestic product data retrieved from ESCAP statistical database. The estimate excludes figures for American Samoa, Guam, Marshall Islands, F.S. Micronesia, Nauru, Niue and the Northern Mariana Islands.

[11] Measured at the level of EU-15 and discounting influence of addition of new members on the level of intra-EU trade.

figures suggests that regional growth is highly unbalanced: while economies such as Thailand and Malaysia significantly outperform the average regional level, other economies (Bangladesh, Myanmar) show little improvement or even a reverse trend.

Three of the six remaining economic input sources involve the cycle symmetry of an economy's performance to the region's average performance trend. This approach follows an extensive body of economic literature on the relationship between business cycle symmetry and regional integration and development. Similar methods have been applied to investigate the economic and social integration of regions such as Central America (Fiess, 2007), the Caribbean (Deonanan, 2011), the Eurozone (Frankel and Rose, 1998) and East Asia (Shin and Wang, 2004). Here, we apply this concept to three major macroeconomic indicators: inflation, real GDP growth and unemployment.

In our index, business cycle symmetry is approximated as the simple average of the year-on-year changes of the economies in the top 15th percentile of all Asia-Pacific countries and regions.[12] The reasoning behind this approach is that the vast majority of Asia-Pacific economies are involved in significant trade relationships with at least one of the major regional economies (In Asia almost all have China as the major trading partner). The region's aggregate economic conditions are therefore largely driven by the aggregate macroeconomic situation of these major economies: an economy with close economic relationship to one or more of these economies is therefore, by definition, well integrated.

Data for year-on-year changes in inflation, real GDP growth and unemployment for each economy in the dataset are adjusted with the Hodrick-Prescott (HP) filter using a smoothing parameter value of 6.25 and correlated with Asia-Pacific regional average levels by five-year increments. The presented value for each year is therefore the correlation coefficient of smoothed figures of the year and four preceding years. A correlation coefficient of 1 for a given year suggests that an economy perfectly tracks the Asia-Pacific performance levels of the period, while a value of-1 means that its performance fluctuates in the exact opposite direction.

[12] A weighted average approach is used for inflation cycle symmetry because of the potential of historic high inflation levels in the Russia Federation and Turkey biasing simple average results.

Figure 6. Average Levels of GDP (Growth) Cycle Symmetry, 2002-2013[13]

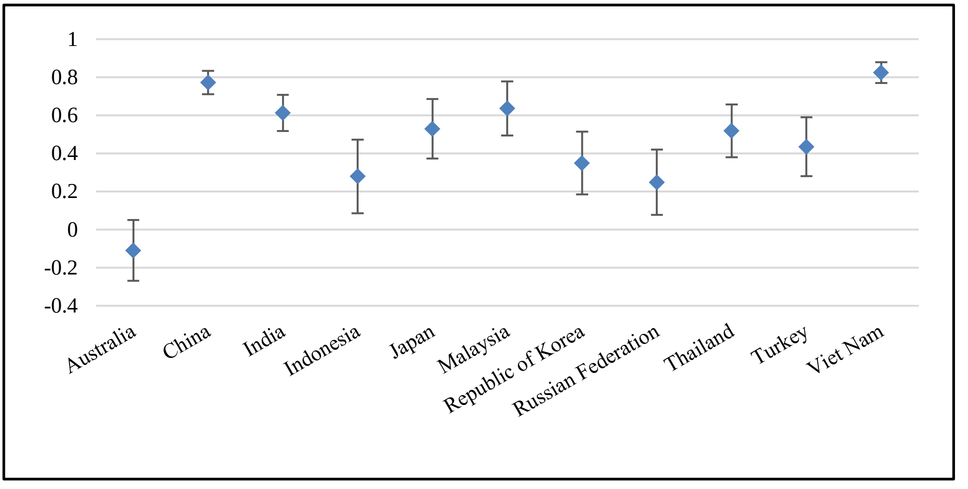
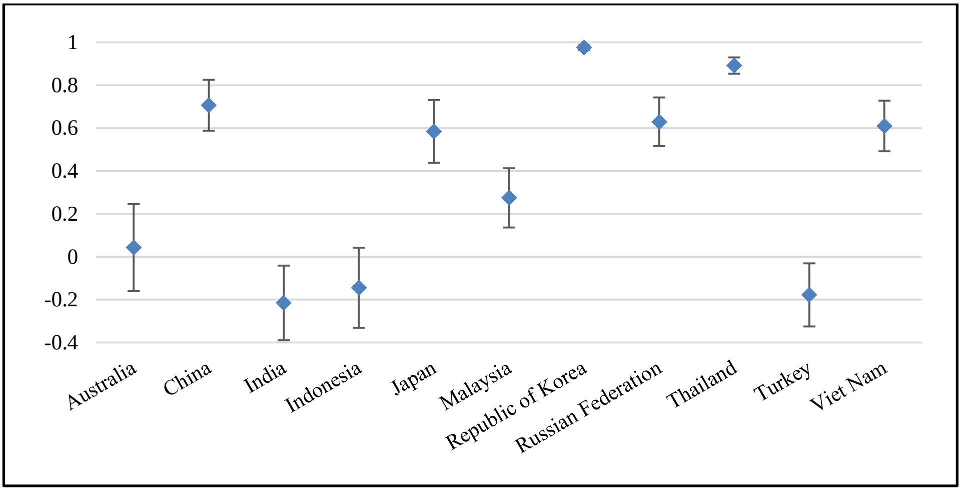


Figure 7. Average Levels of Unemployment Cycle Symmetry, 2002-2013[14]



13 Real GDP data retrieved from ESCAP statistical database. Error ranges represent 1-standard deviation values. Growth rates reflect annual data smoothed in adjustment for trend effects.

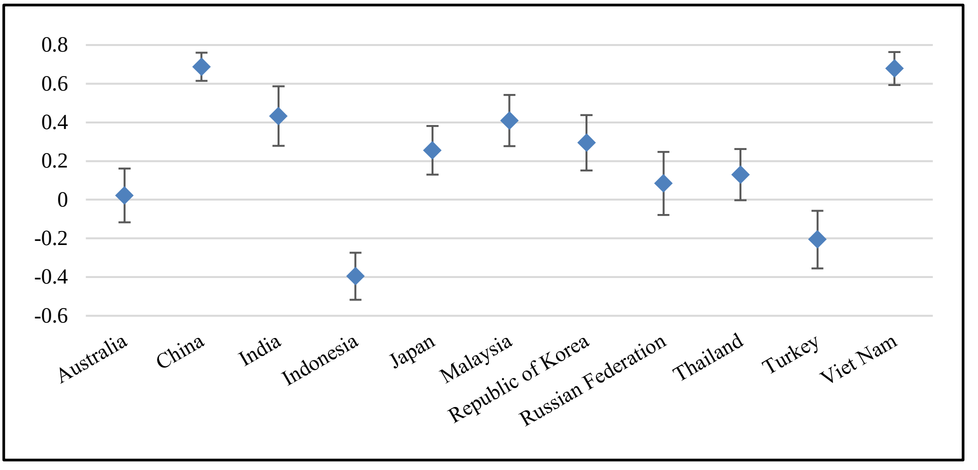
14 Unemployment rate data retrieved from ESCAP statistical database and complied by author. Error ranges represent 1-standard deviation values. Year-on-year unemployment rate change figures are smoothed in adjustment for trend effects.

Major Asia-Pacific economies display inconsistent economic cycle symmetry with the region (figure 6 and figure 7). Moreover, GDP and employment cycle symmetry seem only loosely inter-connected for each individual economy. Export -intensive economies such as China and Viet Nam exhibit a high level of cyclical symmetry for both GDP growth and shifts in unemployment rates. However, India has a reasonably high cycle symmetry coefficient for GDP growth (0.61) and a negative unemployment cycle symmetry coefficient of-0.2. The Republic of Korea's GDP cycle symmetry coefficient is lower than that of India (0.35), yet it reports the highest unemployment cycle symmetry coefficient of all economies in the dataset at 0.98. The overall correlation between GDP and unemployment cycle symmetry scores is moderately strong (0.4), but far from levels one would expect of two figures that both evaluate the tracking of regional economic performance.

Conceptually, economies dependent on trade, in particular exports of raw materials and labour-intensive products are relatively more susceptible to region-wide shocks to the real economy. Economies that have deregulated labour markets with relatively developed and open service sectors will display unemployment movements similar to those of the region. The two sets of conditions may not necessarily coexist-an export-intensive economy may, for example, suffer from long-term, market-distorting labour imbalances. This suggests that although GDP and unemployment cycle symmetry measure the same general concept, they are likely not close substitutes of each other.

Inflation cycle symmetry data is relatively incomplete for the dataset countries, many of which did not collect data on commodity prices until after 2002. The inflation cycle symmetry score for each economy is therefore calculated as a single coefficient for all available years, based on year-on-year percentage changes in the inflation level. As displayed in figure 8, inflation cycle symmetry is on average weaker than GDP or unemployment cycle symmetry. In a sense, inflation cycle symmetry is a more *relatable* version of growth cycle symmetry, focusing on the consumer side instead of the producer side: an economy that is relatively isolated from the region is much more likely to sustain higher or lower commodity prices with regard to the regional level.

Figure 8. Average Levels of Inflation Cycle Symmetry, Available Years between 2002 and 2013[15]



It must be noted that these cycle symmetry measures treat economies as the same regardless of whether they are *price-makers* or *price-takers* in the region. An economy could display significantly cycle symmetry because it is setting the price within the region, as is most likely the case for China for manufactured tradable goods, or because its mode of economic development heavily relies on the region, as is likely the case for Hong Kong, China and Singapore. The cycle symmetry figures cannot meaningfully distinguish between these two situations. While this is also a concern for research on European integration, the problem is amplified for the Asia-Pacific perspective because of large disparities between sizes of economies and their sources of growth.

Two of the last three components of the economic sub-index are, respectively, the ratio of intra-regional flows to national GDP for inbound and outbound foreign direct investment (FDI).[16] An economy that either receives or provides a large amount of FDI to the Asia-Pacific, relative to the size of its domestic

[15] Inflation data retrieved from ESCAP statistical database. Error ranges represent 1-standard deviation values. Year-on-year inflation rate change figures are smoothed in adjustment for trend effects.

[16] For empirical discussions about the relationship between FDI and regional integration see Motta and Norman (1996), te Velde and Bezemer (2006), and Blomstrom and Kokko (1997).

economy, is regarded as well-integrated. The approximately equal treatment of inbound and outbound FDI gives economies of different sizes and levels of development a similar propensity to score highly in the section: highly developed countries will inevitably have greater FDI outflows than inflows, and less developed countries greater inflows than outflows. As shown in figure 9, the divided between inbound outbound FDI varies from economy to economy.

Figure 9. Inbound and Outbound Intra-Regional FDI as Percentage of Real GDP, 2013[17]

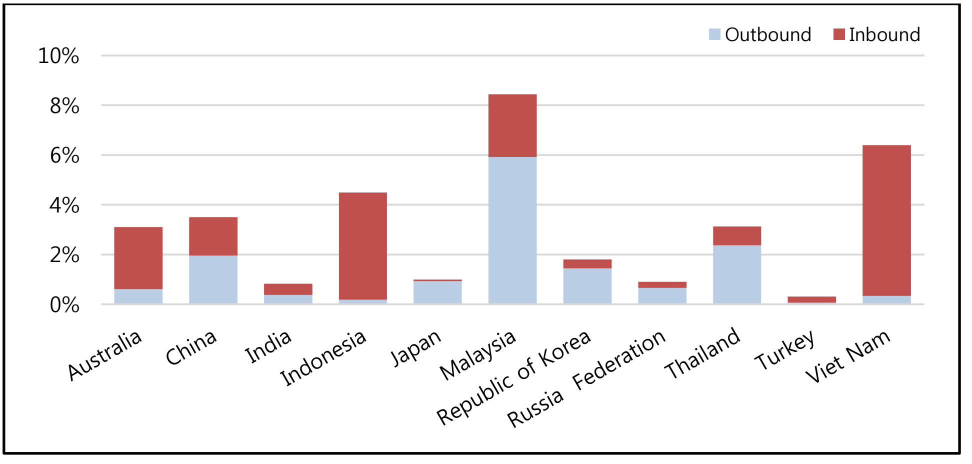
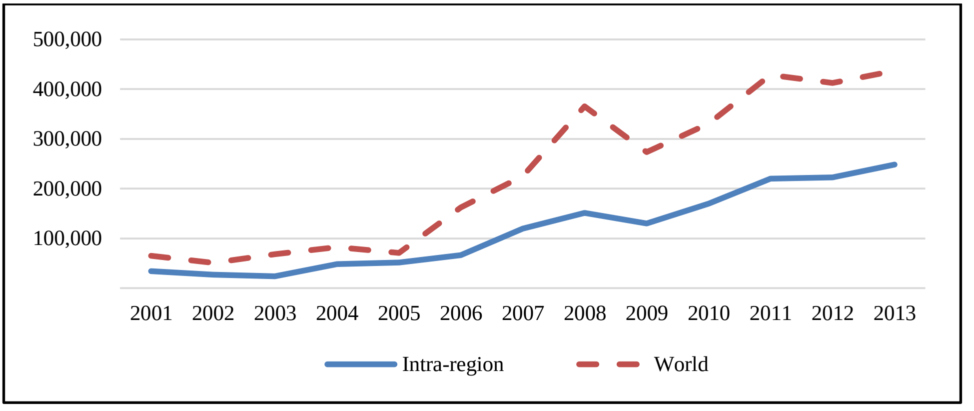


Figure 10 presents the trend of intra-regional FDI flows compared to world FDI flows from the Asia-Pacific. The growth of FDI volume since 2001 is substantial: the period reports an approximately four-fold change in the total amount of intra-regional outbound FDI. However, there is little evidence that intra-regional FDI growth outperforms the growth of worldwide FDI volume. In 2001, 52.7% of the total Asia-Pacific outbound FDI flow has destinations in the region. By 2013, this ratio has increased to approximately 56.9%, with an average of 52.1% for the years 2009-2013.

[17] FDI data retrieved from UNCTAD database and formatted by author. GDP data from ESCAP statistical database. GDP figures denominated in 2005 dollars.

Figure 10. Asia-Pacific Outbound FDI to Region and World, 2001-2013 (Million USD)[18]



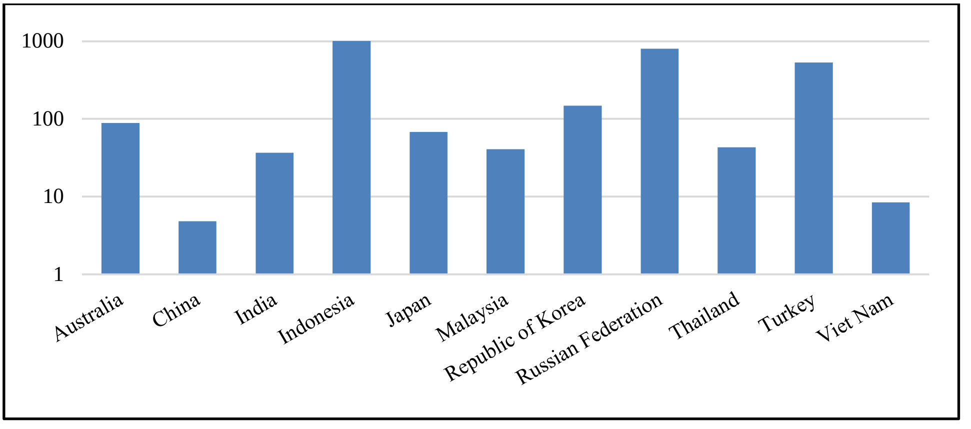
The last economic sub-index component involves the stability of an economy's currency. This factor is relevant because of three reasons: First, many if not most of the Asia-Pacific economies have large trade or finance sectors and could hence benefit in terms of regional economic activity from a relatively stable currency value. Second, unlike the EU, the majority of intra-regional trade in the Asia-Pacific is still denominated in US dollars. This means that from the region's perspective, economies whose currencies fluctuate significantly against the dollar will be at a distinct disadvantage in terms of regional trade and investment. Third, there exists a body of literature discussing the numerous benefits for a region where, via the dollar, currencies are relatively internally stable (McKinnon and Schnabl, 2014). Keeping the local currency value under control provides valuable "anchors" for the region in periods of economic or financial distress. Economies that achieve this goal are therefore indirectly contributing to the economic well-being of the Asia-Pacific region.

Given these three reasons, a metric that evaluates currency stability, measured by the volatility of the local currency's value against the US dollar, is useful for measuring integration. The value for a particular year is calculated as the variance of the year's dollar exchange rate and that of the four preceding years. Evidently,

[18] FDI data retrieved from UNCTAD database and formatted by author. 2013 figures for some countries extrapolated using five-year trends. Data excludes figures from American Samoa, Guam, Kiribati, Niue and the Northern Mariana Islands. Note that because of UNCTAD formatting guidelines, intra-regional outbound and inbound flows may not be equal.

economies that have managed a perfect, hard peg against the dollar or simply use the dollar as the local currency get full marks in this regards, with greater period fluctuations lowering the final category score correspondingly. Figure 11 shows 2002-2013 average currency value variance for a select number of countries.

Figure 11. Average Exchange Rate Variance, 2002-2013 (Log Scale)[19]



We clarify here that this input does not suggest that the hard pegging of a given economy's currency against the dollar is desirable *per se*. However, we do propose that maintaining a relatively stable relationship to the dollar, at least in the short-run, has significant benefits both in terms of growth and integration. A number of major Asia-Pacific countries (China, Vietnam) and trade-centric economies (Hong Kong, Singapore) have either pegged their currency against the dollar or employ measures against large fluctuations against the dollar. Either directly or indirectly, a stable currency with regard to these economies facilitates trade, investment and, to a lesser extent, tourism, research and the exchange of cultures. It is these benefits that we hope to approximate via introducing this index input.

In conclusion, the index involves twelve metrics designed to measure regional integration-education flows, gender equality, tourism flows, connectivity, trade importance and openness, cyclical symmetry of growth, unemployment and inflation,

[19] Data retrieved from ESCAP statistical database. Note that high figures for Indonesia may be explained by recent currency re-denominations.

relative volumes of inbound and outbound FDI, and currency stability. A list of inputs used in the index and their sources are provided in the appendix.

Note that the selection of these variables is based on measurements of the distance of a given economy to the Asia-Pacific region as an artificial "entity", and not in relationship with specific economy-pairs. This approach further limits the number of usable variables but adheres to a stricter definition of regional integration. Using data on country-pair distances for integration measurements is often problematic: a given country may be extremely close to a single particular country but with no others in the region. Each country-pair is also unique in many ways and might not provide meaningful conclusions in aggregated treatment. The approach we outline therefore attempts to avoid this issue in general.

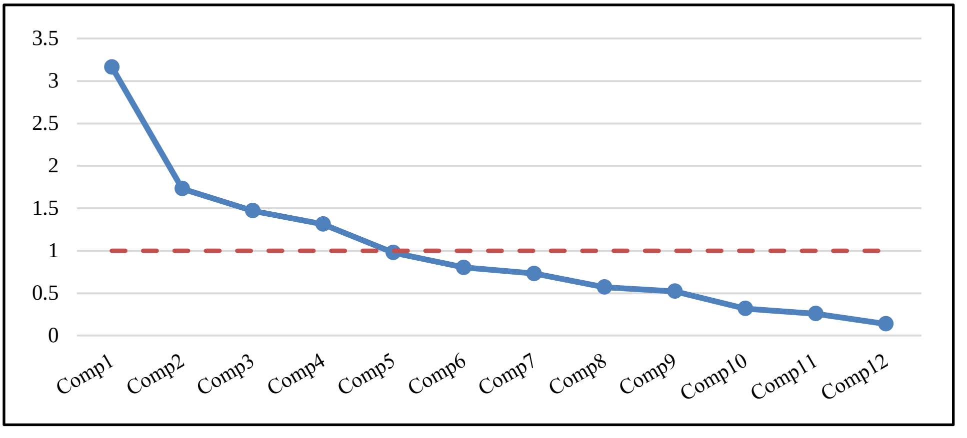
VI. DETERMINATION OF INPUT WEIGHTS AND INTEGRATION INDEX RESULTS

In determining the weights of the index input sources and their format, we draw from methodologies of the European Index of Regional Integration Effort (König, 2015) in the goal of creating a final product that is roughly comparable in output. The final scores of each input category are adjusted to accommodate a statistical weight derivation process. For each category, scores are given by the relative ranking of a particular economy for a given year, compared to the highest and lowest values for all dataset economies and all years. In other words, the inclusive percentile ranking of an economy for a certain year, adjusted on a 0-100 scale, determines its final category score.

This approach has several advantages. First, it guarantees that regardless of the distribution of the actual values, the final score of a category runs from 0 to 100 and is centered distributionally on 50. This implies that the hypothetical "average" economy will receive a final index score of exactly 50. Second, it allows scores between categories to be directly compared, as the same gap in percentile figures corresponds to the same difference in ranking. Third, given that the categories are equalized with respect to maximum, minimum and mean values, the statistically determined weights directly represents the relative importance of each category in the integration index: a category that is twice as important as another will have exactly twice the weight.

Principal Component Analysis (PCA) is used to determine the weights of each input category. Originally devised by Pearson (1901), PCA is designed to reduce multicollinearity issues of large dataset with internal correlations by transforming linear combinations of variables. The resulting set of "components" maximizes the amount of variance in the observations, and can be interpreted as a breakdown of the relative information value and statistical meaning of the individual variables. In this paper, the derived variable weights could be regarded as, under ideal conditions, the weight set that best describes how much each variable *should* contribute to the index.

Figure 12. Scree Test of the Principal Component Analysis with Kaiser-Guttman Criterion



PCA is attractive from this perspective because it automatically assigns weights according to the total explanation of variance, with minimal-to-no need for human input. Compared to an equal weight approach which cannot account for cross-category influences or a discretionary approach that may yield different results given the researcher's personal preferences, PCA allows for a more comprehensive, objective treatment of the inputs. The selection of the number of extracted components follows a strict Kaiser-Guttman criterion (Kaiser 1961, Guttman 1954) of cutoff value 1. We believe that this approach is suitable for the given data because of a lack of readily identifiable "kinks" in eigenvalues beyond component one. As illustrated by Figure 12, components one through four pass the criterion and are extracted.

Several statistics confirm the data's suitability for applying PCA. The internal correlation level of the dataset, as approximated by Cronbach's alpha, is rather high at 0.66. The overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value is 0.65, well above the “unacceptable” level of 0.5. Furthermore, the Bartlett’s test of sphericity reports a high p-value (<0.001) and a Chi^2 of 1702.9, suggesting that the null hypothesis of an identity matrix is not of substantial concern.

After determining the number of components to be extracted, the factor loadings are rotated to account for the possibility of components correlating with each other. An oblique promax rotation with Kasier-normalization is used to effectively increase the optimality of allocating variables to the four components, a procedure that is necessary given that multiple variables contribute significantly to each component. Table 1 presents the post-rotation by-component weights of each variable, as well as the overall assigned weights of the variables in the final integration index.

Table 1. Computed by Component and Final Weights for the Integration Index[20]

	Comp1	Comp2	Comp3	Comp4	**Weight(%)**
Education	5.54	1.86	0.66	0.32	**8.37**
Gender equality	0.13	0.59	3.07	0.06	**3.86**
Tourism	10.65	0.16	0.32	0.20	**11.33**
Connectivity	11.21	0.02	0.00	0.00	**11.24**
FDI outbound	0.36	0.00	7.36	0.00	**7.72**
FDI inbound	0.04	0.32	5.61	0.01	**5.98**
Openness	0.29	7.36	1.84	0.04	**9.53**
Importance	0.00	10.36	0.22	0.00	**10.58**
Unemployment cycle symmetry	1.37	2.90	2.70	0.06	**7.03**
Inflation cycle symmetry	0.78	0.42	0.76	7.10	**9.06**
GDP cycle symmetry	0.10	2.45	1.07	2.39	**6.01**
Exchange rate stability	0.64	0.77	0.09	8.68	**10.17**
Share of total variance (%)	*30.83*	*26.96*	*23.50*	*18.70*	***100***

Note that components 1, 2 and 4 offer straightforward interpretations of their role in the index, as indicators for, respectively, general social connections, real-economy conditions and monetary links with regard to the Asia-Pacific region. However, what component 3 measures is less than clear. The component

[20] Component weights are calculated by squaring the factor loading and multiplying it with the share of total variance of the corresponding component. Assigned weights are determined by summing the individual component weights for each variable. Shaded numbers represent the highest-weighted component for each variable, i.e. which component does the variable primarily contribute to.

weights suggest that gender equality may in some way be linked to FDI flows, which might be somewhat difficult to conceptually explain. Given that a relatively small number of variables shape the entire index, it is possible that details in FDI computation methods or in surveys on employment by gender create statistical links. It is also possible that there is in fact some conceptual connection between foreign investment and gender equality. Therefore, while component 3 may seem somewhat arbitrary in nature, it should not be dismissed for appearing as such.

Using the weights in table 1, results for the integration index are calculated. Almost 64% of the regional ESCAP economies, 37 out of 58, have available data to construct all twelve input categories.[21] Together they represent 98.4% of the Asia-Pacific region's total population and 99.4% of the region's economic output as of 2013.[22] Figure 13 graphs the average integration index score for all available economies, economies in the top quartile and those in the bottom quartile from 2002 to 2013. As indicated, index experienced moderate growth between 2002 and 2013. Average index scores for all available economies increased from 43.6 in 2002 to a high point of 52.5 in 2008, then decreased to 48.4 in 2013. Similar patterns can be observed for the most-integrated economies and worse-integrated: the average index score difference between 2002 and 2013 is 4.8 for all available economies, 5.0 for economies in the 1st quartile and 4.4 for economies in the 4th quartile.

21 The 58-economy list excludes the United States of America, France, Netherlands and the United Kingdom which are considered non-regional members and thus are deemed of lesser importance for investigating regional integration.

22 Economic output is measured in real GDP. Population and GDP data retrieved from ESCAP statistical database. Population figures cover all 58 ESCAP economies; 2013 GDP figures are missing from the following economies: American Samoa, Guam, Niue and the Northern Mariana Islands.

Figure 13. Results of the Asia-Pacific Integration Index, 2002-2013

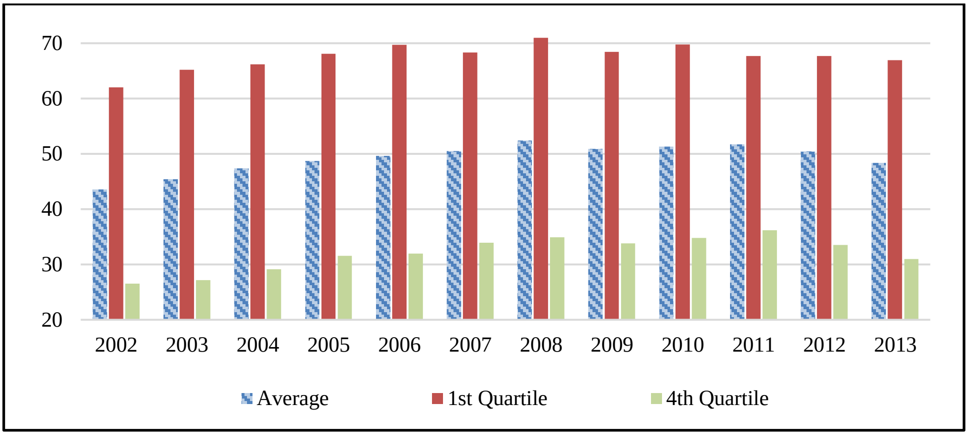


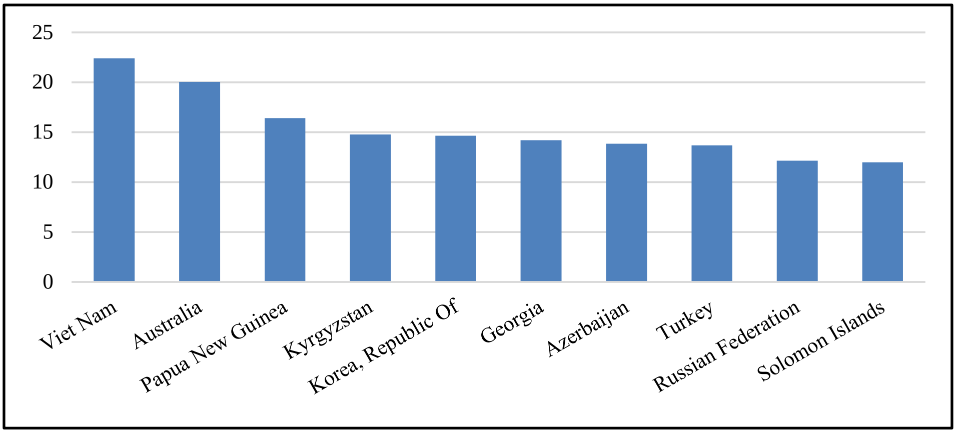
Table 2 lists the 10 most-integrated and the 10 least-integrated economies in the dataset as of 2013. Hong Kong, China; Singapore and Macao, China take the top three places at respectively 82.7, 80.7 and 71.5 points. The three least-integrated economies are Pakistan, Myanmar and the Islamic Republic of Iran. At a glance, two types can be identified among the top-placing economies: those that have large intermediate trade, finance and technology sectors for their size, and those that are relatively productive but hold lower positions on the global value chain. The former is perhaps best exemplified by Singapore and Hong Kong, China and the latter by Viet Nam. Note that while the idea of "integration" should differ for the two types, the index is not capable of making such a distinction.

Table 2. Most and least integrated economies in ESCAP, 2013

Hong Kong, China	82.7	Pakistan	26.9
Singapore	80.7	Myanmar	28.1
Macao, China	71.5	Iran, Islamic Republic	28.8
Viet Nam	66.1	India	29.0
Malaysia	63.1	Afghanistan	30.4
Mongolia	62.7	Turkey	31.9
Kyrgyzstan	60.2	Bangladesh	31.9
Azerbaijan	59.1	Japan	34.5
Korea, Republic of	56.6	Timor-Leste	37.2
Solomon Islands	56.2	Russian Federation	37.3

One question worth investigating is the extent to which economies have integrated within the timeframe covered by the dataset. Figure 14 displays the score changes of the 10 economies that have improved the most during the 2002-2013 period. Viet Nam, Australia and Papua New Guinea places top three at 22.4, 20.0 and 16.4 points improved. Scores for the 10 economies listed in figure 14 have increased 15.4 points on average between 2002 and 2013, more than three times that of the dataset average. Viet Nam alone contributes 0.6 points towards the 4.8-point improvement in average scores, and the 10 most-improving economies account for approximately 87% of the net index level change.

Figure 14. Most-Improved Economies with Regard to Integration, 2002-2013



On the other end of the scale, scores of 10 out of the 37 dataset economies decreased between 2002 and 2013. Timor-Leste and Myanmar, the two economies whose scores dropped the most, lost 14.9 and 26 respective points.[23] The variance of the annual index scores has also returned to 2002 levels following a 12% drop between 2002 and 2011.[24] These results suggest that while the region may be moving towards greater integration in aggregate, growth has thus far been *highly discrepant* across economies. A number of economies have rapidly

[23] This can be explained by the fact that both economies were closed to international transactions until recently due to war (Timor-Leste) or sanctions (Myanmar).

[24] The 2002 and 2013 variance figures are approximately 14.3, and the variance figure for 2011 is 12.6, the lowest in the dataset.

connected with the region both socially and economically, while others have shown little progress or even become much less integrated than they were a decade ago.

The findings send mixed messages with regard to the future of Asia-Pacific integration. If we unreflectively assume that the current trends would continue indefinitely, at 4.8 points per decade the index average should improve by 19 points in the next half-century, moving the 37-economy average to the current 1st quartile economy average levels. If we further assume optimistically that the post-2008 drop in integration score is temporary and not representative of long term trends, the same goal could potentially be reached in 15-16 years. Regardless of the time frame, current projections of integration for the Asia-Pacific as an entity are positive: barring unforeseeable circumstances, the region is likely to become more integrated in the foreseeable future.

However, it is also likely that integration progress will remain unbalanced. In contrast to the EU situation, where the lowest-performing country (Greece) still posted nominal improvements between 2004 and 2014, a number of economies in the Asia-Pacific have become considerably *less* integrated over the past decade. Furthermore, the index in its current form excludes 21 Asia-Pacific economies because of a lack of published data. These missing economies have a high chance of being outliers to the Asia-Pacific region in both social and economic terms: they account for approximately 1.6% of the region's total population but only 0.6% of total GDP. If their integration progresses are taken into account, one would expect the index to show an even greater level of disparity.

V. MEASURING REGIONAL INTEGRATION EFFORT

The results of the integration index confirm the aforementioned tendencies towards integration: the top three best-integrated Asia-Pacific economies are without exception small city-states with massive external sectors compared to the size of the domestic economy. On the other hand, with the exception of Malaysia and the Republic of Korea, none of the largest Asia-Pacific economies are listed among the top ten. Hence, because of the natural tendency of social-economic proximity of certain economies, we must isolate the influence of exogenous factors from that of policy or regulatory factors in order to measure integration effort.

To this end, we employ a panel regression analysis to determine the impact of such factors in the integration index scores. We create a balanced panel dataset with each economy-year as a specific observation, or 37 groups over 12 time-units. This approach allows the full resolution of the dataset to be utilized in the regression analysis, but creates significant autocorrelation issues: observations within the same year are likely to be influenced by similar, exogenous macroeconomic conditions, and observations within the same group are found to display highly autoregressive behavior.

In consideration of the differences in the nature of between-group and within-group correlations, we select the generalized estimating equations (GEE) model along with a time dummy vector approach to yield more accurate results.[25] Table 3 presents results of regressing integration scores against a number of economy-specific factors, using GEE with AR1-type correlation, with indicators for fixed effects for years 2003 to 2013. Output for year effects are suppressed: the full table of results can be found in the appendix. The natural-log transformation is applied to all non-indicator response variables.

Table 3. Regression Output, GEE Model with Time Dummy Variable Output Suppressed[26]

Score	Coef.	Std. Err.	P>|z|	95% C.I
In GDP	-2.18	0.97	0.024	(0.28, 4.07)
In Populaton	-3.48	1.56	0.026	(-6.54,-0.42)
In Land Area	-2.39	0.90	0.008	(-4.17,-0.61)
Landlock	-0.06	4.16	0.99	(-8.20, 8.10)
Island	-4.67	3.76	0.214	(-12.04, 2.70)

As Table 3 indicates, the correlation between integration scores and GDP, population and an economy’s land area are all highly significant. Holding other factors constant, a doubling of GDP is associated with an index score improvement

25 It is assumed that by-year, macroeconomic fixed effects are somewhat discreet between periods and apply uniformly to different economies. On the other hand, observations of economies in a given time period are assumed to be highly correlated to observations of the same economies in the previous period.

26 Wald’s Chi^2 = 107.9. Normal (Gaussian) distribution assumed, standard errors are adjusted for within-group clustering with Huber-White estimators (semi-robust) reported instead of least-square errors.

of 2.18 points, and a doubling of population lowers the index score by approximately 3.48 points. An economy with the same GDP and population as another but with a land area twice as large is expected to score 2.39 points lower in comparison. Being landlocked has a small and not statistically significant effect on integration (p=0.99). Being an island, defined as having no natural territory on the main Asia continent, lowers the expected integration score by 4.67 points. The relationship is however also not statistically significant (p=0.214).

For the most part, these results are within expectations. An economy with twice the GDP output and population of another economy-two times as "large" with the same GDP per capita-is expected to score 1.3 points lower. This suggests that larger economies do tend to be less integrated, even if their level of development may not necessarily be lower. Sparsely populated economies also tend to be less integrated. Note that while territory size is truly exogenous to the integration index and population at least somewhat exogenous, the relationship between GDP and the integration index is very likely to be reciprocal: being well-integrated also leads to higher rates of growth. This suggests that causal links to integration can be made for population and land area but not for GDP.

The case with indicators for being landlocked and an island economy can perhaps be explained by the size of the dataset. Of the 37 countries in the observation, only 9 and 13 are, respectively, landlocked and island economies. It is also possible that given the proliferation of air travel and technological development among various transit methods, being landlocked or having no natural territory on the main Asia continent is more of a historic impediment to integration. A third potential cause is that islands and landlocked economies in the Asia-Pacific are somewhat likely to be rich in natural resources and have large raw material export sectors, which balance out the various detrimental effects to being integrated. As evidence is inconclusive at this time, the issue perhaps merits further investigating.

We also consider an alternative model using, in lieu of GDP, a variable on economy-level labour productivity. This is also considered in a context of economies generally striving towards increasing productivity, in which it is relevant to discuss if such strategies will enhance integration prospects. For this purpose, we modify the aforementioned GEE model, removing the GDP variable and including a response variable for estimated productivity, natural-log transformed.[27] Table 4 presents regression output from the model with year dummy output suppressed.

Table 4. Regression Output, GEE Model with Estimated Labor Productivity[28]

Score	Coef.	Std. Err.	P>|z|	95% C.I
In Productivity	3.04	1.33	0.023	(0.43, 5.66)
In Population	-1.47	1.26	0.242	(-3.94, 1.00)
In Land Area	-2.32	0.93	0.013	(-4.14,-0.50)
Landlock	-0.35	4.39	0.94	(-8.94, 8.25)
Island	-3.83	3.98	0.34	(-11.63, 3.97)

As shown in table 4, the productivity variable is significantly correlated to integration score (p=0.023). Holding other factors constant, a doubling of productivity is associated with an integration score increase of 3.04 points. The population variable is no longer significant after the inclusion of productivity, while the land area variable retains similar significance and size (p=0.013). The landlock and island variables are still not significant at the 90% level or beyond. Note that the link between productivity and integration level is quantitatively robust. Putting the scale of the connection in context, the top quartile of Asia-Pacific economies in terms of productivity has an average labour productivity of $90918.5 per worker in 2013, 13.2 times higher than that of the bottom quartile: a difference that translates into an integration score gap of 11.3 points.

It certainly seems that growth, both in terms of gross output and labour productivity, is a highly powerful predictor of integration. Although the direction of the major relationship is uncertain, it is quite conceivable that long-term, robust growth in the real economy will be the primary driver of Asia-Pacific integration in the foreseeable future. Economy-level integration efforts should

[27] Productivity is defined as GDP per person employed and estimated using GDP and employment data retrieved from the ESCAP statistical database. Results may differ from official productivity figures because 2011 PPP is used instead of 2005 PPP for better coverage of data.

[28] Wald's Chi2 = 224.9. Normal (Gaussian) distribution assumed, standard errors are adjusted for within-group clustering with Huber-White estimators reported instead of GLS (semi-robust). Because of a lack of productivity data, figures for Myanmar are not included in this regression model.

therefore always be complemented with policies and efforts that drive economic development.

While there are several ways to qualitatively assess these models in regard to each other, here we employ a relatively impartial, "mechanistic" method of selecting the optimal regression model for the computing of final, integration effort index scores. This is not a trivial task: since GEE does not rely on the conventional concept of maximum likelihood estimators, traditional measures of goodness-of-fit such as R-square, Akaike Information Condition (AIC) and Bayes Information Condition (BIC) do not apply to GEE regressions.

A quantitative alternative can be found in the Quasi-likelihood information condition (QIC). Devised by Pan (2001), QIC redesigns the standard AIC procedure to accommodate for quasi-likelihood estimates. After adjusting for the penalty term, QIC values of GEE models can be regarded as analogous to what AIC values are for standard OLS models. In other words, QIC measures the effective explanatory power of a GEE model against the number of its parameters, providing an approach capable of comparing GEE model without involving human decision-making.

The QIC values for the two aforementioned models and their reduced alternate forms (removing the terms landlock and island) are presented in table 5. For comparison, a reduced model with no production term (only population, land area and year indicators) is included. The labour productivity model with island and landlock indicators included reports the lowest QIC value, and is therefore employed for the residual analysis to determine integration effort. Alternative models with the population, land area variable or one of the two indicators removed are also tested: none report a QIC below 47,600.

Table 5. Comparison of Model QIC Values

Model	GDP	GDP	Labor productivity	Labor productivity	Reduced
Island/landlock	Yes	No	Yes	No	No
QIC	47770.2	49540.5	**47600.2**	48319.3	54825.9

The residuals of the full labour productivity model are adjusted using percentile rank over 2002-2013 and scaled on 0 to 100. Normalized scores of the top ten economies with most integration efforts and the ten economies with least integration efforts, as of 2013, are presented in table 6. Viet Nam is the clear top performer at 99.3 points. Hong Kong, China and Singapore still rank within the top ten at 93.9 and 84.6 points. China and Thailand are not particularly well-integrated, but report very high integration effort scores at 96 and 80.5 points. The Islamic Republic of Iran, Armenia and Timor-Leste have the lowest integration effort performance, with scores of 5.5, 3.2 and 2.3 points.

Table 6. Economies with Highest and Lowest Integration Effort Scores, 2013

Viet Nam	99.3	Tajikistan	22.0
China	96.0	Bangladesh	14.1
Hong Kong, China	93.9	Afghanistan	12.5
Mongolia	93.0	Japan	9.0
Malaysia	86.0	Pakistan	7.8
Kyrgyzstan	84.9	Turkey	7.4
Singapore	84.6	Maldives	5.8
Thailand	80.5	Iran, Islamic Republic of	5.5
Cambodia	74.9	Armenia	3.2
Azerbaijan	73.7	Timor-Leste	2.3

With regard to integration effort index scores, several observations can be made. First, the economies that are best-performing in terms of integration effort have done so consistently: eight of the ten highest-scoring economies as of 2013 are among the ten highest-scoring economies in 2002. This is not surprising: trade-oriented and investment-driven economies have and will consistent push harder towards regional integration. However, this does not suggest a lack of improvement. In particular, many economies that were historically weakly associated the Asia-Pacific have experience robust growth in integration effort: the Russian Federation (26.9 points between 2002 and 2013), Papua New Guinea (41.5 points), Georgia (30.2 points) and Australia (52.2 points) are all examples. This suggests that as traditional trade-oriented economies such as China and Vietnam report steady and robust efforts, other large economies have also recently and significantly increased their efforts toward integration.

The view is however not all bright. 19 out of the 37 dataset economies have decreased their integration efforts between 2002 and 2013. There is no evidence of significant positive change in the average integration effort index score during the same period, with the simple average of all economies moving from 50 points to 51.5 points. A number of the largest Asia-Pacific economies (Turkey, India, Japan) do not score well in the index. It appears that similar to integration level, integration effort displays high disparity across economies. Given current rates of growth in integration effort, it would require more than seven decades (73.9 years) for the average economy to match current integration effort of economies in the top quantile even under optimistic assumptions about the 2007-2008 drop. Therefore, while the region has experience robust integration under current effort levels, it is unlikely that the rate of integration will pick up significantly in the near future.

VI. CONCLUSION AND POLICY DISCUSSION

In this paper, we provide an index measuring integration efforts of Asia-Pacific economies. The index, based on 12 input sources covering a variety of economic and social factors, suggests that the region as a whole has become moderately more integrated between 2002 and 2013, with index rising on average by 0.48 points per year. We conclude that, optimistically assuming that integration efforts continue unchanged and that the 2007-2008 slowdown is temporary and not reflective of long-term trends, it would take another 15-16 years for the region as a whole to reach an average level of integration achieved by the top quantile of high-scoring economies over the past decade. However, integration effort and outcomes remain highly unbalanced across economies. Economies such as Myanmar and Timor-Leste have actually becoming less integrated between 2002 and 2013.

Our paper further probes into the links between integration scores and domestic output, population, size of territory and productivity. Other factors constant, larger economies, both by population and by land-area, tend to be less integrated. We expect such economies to face greater challenges with regards to integration effort. For these economies, extra policy effort is required to introduce market-led integrative efforts that naturally exists in small, dense economies. These include policies that focus on building productive and exchange linkages across borders, and those that push for mobility of factors. Ideally, such policies should be coordinated with other economies in the region. Examples include increased intergovernmental quotas on labour mobility, liberalized movement of natural persons for services provision, and cross-border infrastructural projects.

We also estimate the link between labor productivity and integration scores to be approximately 3 extra points per doubling of productivity for Asia-pacific economies. While the degree of reciprocity in this relationship is unknown, the results suggest that economic growth and developments of labor markets are tightly linked to regional integration. Integration efforts and effort in generating growth, such as trade liberalization, investments in infrastructure, policies related to global value chains and the attracting of FDI, should always go hand-in-hand.

With regard to integration effort, we find a similar unbalance across economies. Most of the most robust growth in integration effort seems to come from the geographical periphery of the Asia-Pacific: Australia, Papua New Guinea, Georgia and Russia are examples. Yet there remain many large Asia-pacific economies with low and decreasing regional integration effort. While we note that the integration process would likely continue fairly well if current levels of effort are sustained, evidence is not in favor of major increases in region-level effort in the near future.

Economies with deep FTAs and those that participate in binding multilateral trading systems (being a member of the WTO, for example) also seem to be associated with high or increasing integration effort. Membership in multilateral trading systems could, conceptually, serve as a push for comprehensive domestic reforms while allowing for expansion of market-led integrative efforts. To facilitate regional integration, in particular that of low-income economies in the Asia-Pacific which are not yet WTO members, processes for introducing economies to such systems perhaps ought to be simplified and streamlined.

Appendix

A1. Full Integration Index Score List of Dataset Asia-Pacific Economies

Economy	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Afghanistan	28.5	31.0	30.2	28.6	28.2	29.9	35.2	38.5	39.3	43.5	30.1	30.4
Armenia	42.8	46.2	44.9	41.6	43.7	43.7	49.1	43.4	45.0	45.7	43.3	37.4
Australia	29.7	30.8	43.7	47.0	48.8	51.3	57.3	60.2	56.9	55.8	52.9	49.7
Azerbaijan	45.3	50.7	55.6	54.5	51.9	52.4	56.0	56.8	56.4	54.9	56.7	59.1
Bangladesh	30.6	29.9	32.3	33.3	34.0	35.8	32.1	26.7	29.6	36.8	31.5	31.9
Bhutan	51.1	50.6	49.3	49.9	58.2	52.6	50.0	52.5	53.1	55.9	58.0	54.8
Cambodia	47.0	55.7	55.9	57.0	51.3	55.3	56.7	60.1	61.4	59.0	55.7	52.5
China	47.1	47.8	53.8	51.9	49.9	49.3	50.6	53.1	54.5	53.4	51.3	52.6
Fiji	46.6	48.6	47.3	48.3	53.0	55.4	60.2	55.4	54.2	54.5	56.0	55.9
Georgia	37.9	37.9	43.9	44.9	47.3	49.6	54.0	46.4	49.3	56.8	57.1	52.1
Hong Kong, China	84.1	83.0	83.1	84.9	85.0	83.2	84.3	85.7	84.4	83.1	82.6	82.7
India	23.9	24.5	23.3	23.5	25.8	25.1	23.3	22.8	23.0	29.2	27.9	29.0
Indonesia	32.1	33.3	39.1	40.1	39.7	39.0	41.8	38.2	39.7	42.0	40.9	38.6
Iran, Islamic Republic Of	23.2	26.2	27.0	27.6	24.2	26.8	36.7	40.1	37.4	36.6	32.7	28.8
Japan	39.9	41.3	42.2	42.3	39.3	41.0	43.7	44.7	44.8	45.1	43.9	34.5
Kazakhstan	46.3	43.7	43.4	43.0	44.2	50.4	54.6	45.0	45.1	50.2	49.2	47.3
Korea, Republic Of	41.9	46.5	47.2	46.3	51.1	55.2	54.1	55.0	57.4	57.5	55.9	56.6
Kyrgyzstan	45.4	45.3	50.2	57.2	64.6	65.4	71.2	58.1	58.3	59.9	60.2	60.2
Macao, China	73.5	79.8	71.7	74.3	80.1	78.4	78.6	71.7	75.9	69.3	74.5	71.5
Malaysia	53.8	62.5	65.2	65.2	65.5	60.6	66.0	69.5	69.1	67.8	65.7	63.1
Maldives	53.0	56.0	60.1	63.9	62.6	63.0	62.1	60.8	65.7	62.2	54.2	53.1
Mongolia	56.0	57.0	67.0	70.9	71.4	69.8	72.3	64.4	62.9	60.2	63.7	62.7
Myanmar	54.1	47.0	46.5	49.1	47.8	49.9	55.7	55.8	54.2	50.1	42.8	28.1
Nepal	36.5	38.5	40.6	41.4	46.5	42.2	38.9	37.3	38.4	44.1	46.6	47.1
New Zealand	54.9	58.0	55.5	54.1	47.7	50.3	60.9	58.2	54.3	61.3	61.6	53.0
Pakistan	29.8	31.5	29.9	35.9	40.1	39.8	35.8	34.7	36.2	34.6	31.2	26.9
Papua New Guinea	29.7	30.4	30.0	39.8	42.0	45.1	37.8	44.9	42.8	38.8	46.3	46.1
Philippines	41.3	44.7	47.4	49.1	49.1	47.3	50.0	48.6	40.8	44.2	42.8	38.4
Russian Federation	25.2	23.3	25.3	25.4	25.2	33.7	44.3	38.4	41.0	40.8	41.0	37.3
Singapore	76.7	80.6	82.1	84.6	85.7	84.1	83.1	85.1	83.9	80.6	75.2	80.7
Solomon Islands	44.2	49.0	51.0	49.8	51.9	55.3	60.7	56.4	64.4	61.2	60.9	56.2
Sri Lanka	31.4	34.2	42.3	42.3	49.1	48.1	43.8	43.3	48.2	48.8	43.2	42.9
Tajikistan	42.8	40.3	41.5	42.0	40.9	44.6	44.4	43.7	43.4	42.7	41.7	37.6
Thailand	51.5	53.7	54.0	53.2	53.5	55.3	58.4	58.6	60.2	58.1	57.9	55.8
Timor-Leste	52.2	54.3	53.2	55.2	52.9	50.7	44.1	43.8	41.4	37.1	35.2	37.2
Turkey	18.2	16.6	24.9	29.7	30.8	34.0	32.4	27.9	28.8	29.5	31.0	31.9
Viet Nam	43.7	50.8	53.4	54.5	54.6	55.2	60.6	58.6	57.7	63.7	65.1	66.1

A2. Full Regression Output (with Total GDP, without Productivity)[29]

GEE pupulation-averaged model		Number of obs		=	444
Group and time vars:	countrycode year	Number of groups		=	37
Link:	identity	Obs per group:	min	=	12
Family:	Gaussian	Obs per group:	avg	=	12.0
Correlation:	AR(1)	Obs per group:	max	=	12
		Wald chi2(16)		=	223.45
Scale parameter:	107.33	Prob > chi2		=	0.0000

(Std. Err. adjusted for clustering on countrycode)

score5	Coef.	Semirobust Std. Err.	z	p>|z|	[95% Conf. Interval]	
lagdp	2.176346	.9666533	2.25	0.024	.28174	4.070951
lnpoup	-3.480921	1.560633	-2.23	0.026	-6.539706	-.4221358
lnland	-2.389011	.9071165	-2.63	0.008	-4.166927	-.6110956
island	-4.670629	3.762493	-1.24	0.214	-12.04498	2.703722
landlock	-.055387	4.159012	-0.01	0.989	-8.2069	8.096126
y2	1.77494	.5324785	3.33	0.001	.7313015	2.818579
y3	3.580543	.8094526	4.42	0.000	1.994045	5.167041
y4	4.76658	.937881	5.08	0.000	2.928367	6.604793
y5	5.582168	1.145086	4.37	0.000	3.33784	7.826496
y6	6.284514	1.167188	5.38	0.000	3.996867	8.572161
y7	8.171772	1.340635	6.10	0.000	5.544176	10.79937
y8	6.658928	1.303684	5.11	0.000	4.103754	9.214101
y9	6.969524	1.368435	5.09	0.000	4.287442	9.651607
y10	7.311853	1.397828	5.23	0.000	4.57216	10.05155
y11	5.948233	1.526759	3.90	0.000	2.95584	8.940626
y12	3.805133	1.671833	2.28	0.023	.5284007	7.081865
_cons	85.04311	8.136392	10.45	0.000	69.09607	100.9901

[29] y2 – y12 denote year indicators for years 2003-2013.

A3. Full Integration Effort Index Scores of Dataset Economies, 2002-2013

Economy	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Afghanistan	24.8	25.9	16.2	9.9	6.7	8.5	16.4	33.6	35.9	50.1	8.1	12.5
Armenia	35.4	39.2	24.1	10.9	12	10.2	17.8	10.4	12.7	13.4	10.6	3.2
Australia	20.8	16.7	58.9	66.5	69.6	72.1	78.8	87.2	80.2	77.9	74.7	73
Azerbaijan	56.8	68.2	73.3	67.9	53.1	50.3	56.1	63.5	61.2	55.4	64.5	73.7
Bangladesh	29	18.7	21.1	19.2	17.6	23.2	7.1	2.5	5.1	22.2	9.7	14.1
Bhutan	62.6	54.7	40.8	38.2	65.6	41.7	23.8	39.6	40.1	49.4	60.7	56.3
Cambodia	75.6	88.1	84.2	83.7	71.9	76.7	76.1	85.3	86.7	81.4	77.7	74.9
China	97.4	96.5	98.3	96.9	91.4	87	85.8	94.6	95.5	92.3	90	96
Fiji	32.4	31.3	21.3	19.9	34.1	41.2	54	40.3	34.5	33.4	45.4	51.2
Georgia	27.8	20.6	35.2	32	38	44.3	53.5	28.5	39.4	64.2	69.3	58
Hong Kong, China	99.5	98.1	96.7	97.2	96.2	90.7	88.6	95.3	92.1	87.7	89	93.9
India	33.8	27.1	15.3	13.2	15.5	12.2	5.3	6.4	6	19	18	28.3
Indonesia	47.7	44.7	58.4	57	52.6	47	50.5	42.6	46.8	53.8	54.5	51.5
Iran, Islamic Republic Of	4.6	6.2	4.4	3.9	0.9	2	13.9	30.1	18.3	14.6	8.8	5.5
Japan	45.2	41.5	37.1	31.5	17.1	22.7	25.7	36.1	34.3	32.7	32.2	9
Kazakhstan	75.4	66.3	57.7	51.7	52.2	70.3	73.5	51	49.6	65.4	65.8	64.7
Korea, Republic Of	38.9	49.1	43.8	35	49.8	62.1	52.4	59.8	67.2	65.1	63.8	70.9
Kyrgyzstan	69.1	61.7	70.5	79.5	93.7	93.2	97.9	77.4	77.2	79.3	81.6	84.9
Macao, China	61.4	71.6	36.6	42.9	60.3	51.9	45.9	24.5	37.8	11.8	31.7	26.9
Malaysia	78.6	92.5	94.4	91.1	89.5	78.1	85.1	95.8	94.8	90.4	88.3	86
Maldives	15	18.5	26.2	38.7	27.6	26.4	16	17.4	36.4	20.4	4.8	5.8
Mongolia	91.8	89.3	98.8	100	99.7	98.6	99	94.1	88.8	82.1	91.6	93
Myanmar	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7
Nepal	48	48.2	48.7	46.6	61.9	43.1	23.6	22.9	25	46.1	59.3	67.5
New Zealand	74.2	75.8	68.9	60.5	31	39.9	71.2	68.4	55.2	72.6	74.4	57.5
Pakistan	29.4	28	14.8	32.9	47.3	43.6	21.8	23.4	26.6	19.4	12.9	7.8
Papua New Guinea	22.5	15.7	11.3	41	46.4	55.6	19.7	54.9	44.5	25.5	58.7	64
Philippines	63.1	67.7	70	70.7	68.6	59.6	62.8	63.3	30.6	45	43.3	30.3
Russian Federation	27.3	14.3	13.6	11.6	8.3	30.8	64.9	50.8	58.2	55.9	60	54.2
Singapore	86.5	90.9	89.7	92.8	93.5	87.9	82.3	90.2	85.6	78.4	72.3	84.6
Solomon Islands	42.2	52.9	53.3	44	47.5	57.3	69.8	61	77	71.4	72.8	66.8
Sri Lanka	9.2	11.1	29.2	25.2	48.9	40.6	16.9	21.5	37.5	36.8	20.1	24.3
Tajikistan	62.4	45.7	41.9	38.5	29.9	42.4	33.1	37.3	34.8	28.7	29.6	22
Thailand	83.2	83	80	76.3	75.1	76.5	79.1	82.5	84.4	79.8	81.2	80.5
Timor-Leste	66.1	67	56.6	59.1	48.4	35.7	7.6	9.5	4.1	0.6	0.4	2.3
Turkey	0.2	0	1.3	3.4	3.7	6.9	2.7	1.1	1.6	1.8	3	7.4
Viet Nam	74	81.9	83.5	82.8	80.9	80.7	87.4	86.3	83.9	95.1	97.6	99.3

A4. Full Regression Output (with Productivity, without Total GDP)[30]

GEE pupulation-averaged model		Number of obs		=	432
Group and time vars:	countrycode year	Number of groups		=	36
Link:	identity	Obs per group:	min	=	12
Family:	Gaussian	Obs per group:	avg	=	12.0
Correlation:	AR(1)	Obs per group:	max	=	12
		Wald chi2(16)		=	224.87
Scale parameter:	109.9155	Prob > chi2		=	0.0000

(Std. Err. adjusted for clustering on countrycode)

score5	Coef.	Semirobust Std. Err.	z	p>|z|	[95% Conf. Interval]	
lnproduct	3.041629	1.333519	2.28	0.023	.4279796	5.655278
lnpoup	-1.472454	1.259557	-1.17	0.242	-3.941142	.9962327
lnland	-2.317447	.9279232	-2.50	0.013	-4.136143	-.4987512
island	-3.832489	3.981564	-0.96	0.336	-11.63621	3.971233
landlock	-.3450306	4.386748	-0.08	0.937	-8.942899	8.252838
y2	2.021676	.4925941	4.10	0.000	1.056209	2.987143
y3	3.932245	.766471	5.13	0.000	2.42999	5.434501
y4	5.10862	.9155795	5.58	0.000	3.314117	6.903123
y5	6.010816	1.107226	5.43	0.000	3.840693	8.18094
y6	6.642428	1.151464	5.77	0.000	4.3856	8.899255
y7	8.394635	1.37536	6.10	0.000	5.698979	11.09029
y8	6.840849	1.369396	5.00	0.000	4.156881	9.524816
y9	7.178158	1.455913	4.93	0.000	4.324621	10.0317
y10	7.631871	1.475874	5.17	0.000	4.739212	10.52453
y11	6.404941	1.571946	4.08	0.000	3.326983	9.4889
y12	4.612937	1.600906	2.88	0.004	1.475218	7.750655
_cons	57.28157	13.55506	4.23	0.000	30.71415	83.84899

30 y2 – y12 denote year indicators for years 2003-2013.

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