Trade Indicators Part I
Overall Measures of Integration

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Introduction

- A trade indicator is an index used to assess the state of trade flows the the pattern of trade for an economy or group of economies.
- A number of indicators can provide useful insights into the economic effects of a preferential trade agreement both *ex ante* and *ex post*.
- Trade indicators are usually the first step in evaluating potential regional trading agreements.
- In this session we will consider measures of overall trade integration, before turning to some sectoral measures in the next session.

Advantages

- Simple to construct.
- Based on data that is widely available for most countries.
- Straightforward interpretation.
- Many indices are available to shed light on different aspects of international trade patterns.

Disadvantages

- Subject to measurement error.
- Do not indicate causality.
- Cannot directly measure potential changes in economic variables of policy interest (i.e., are only used for inference).
- Care must be taken to apply indicators at an appropriate level of aggregation.

Notation

x_{irp} Exports of good i from reporter r to partner p.

m_{ipr} Imports of good i from partner p to reporter r.

t_{irp} Total of exports and imports of good i from/to reporter r to partner to/from partner p.

X_{ir} Total exports of good i from reporter r.

X_{rp} Total exports of from reporter r to partner p.

X_r Total exports of reporter r.

X_{iW} Total world exports of good i.

X_{Wr} Total exports of the world to reporter r.

X_W Total world exports.

Intra-Regional Trade Share

- A common statistic constructed to examine the regional trade pattern among members of a given group or region is the intrabloc or intra-regional trade share.
- The aggregate intra-regional trade share for a region B is defined simply as:

$$TS_B = \frac{T_{BB}}{T_{BW}} \times 100$$

- In words, it is the ratio of the total trade between economies in region B to the total trade of B with the world as a whole, expressed as a percentage.

Interpretation

- The index is increasing in the size of the members of the trade bloc in international trade.
- Hence, the intra-regional trade share for NAFTA, for example, is likely to be higher than for ASEAN in part purely because of the difference in size, and not necessarily because of a higher degree of integration.
- Hence, we want to be very careful making comparisons across different trade groups of divergent sizes.
- Nonetheless, high levels of intra-bloc trade is often interpreted as reflecting a 'natural' trading bloc, in which trade diversion effects are likely to be minimal, and *ex post* increases in intra-bloc trade over time are often interpreted as reflecting the results of a PTA where one exists (assuming that the membership is not also changing).

Application Example

- We will demonstrate using ASEAN trade data for 2014.
- For this application we need to download:
  - Total imports and export values for each ASEAN economy to the other ASEAN economies and to the world as a whole in 2014.
  - We use the data as reported.
- The data needs to be put into the same format as in previous examples.
- Exploring the Code: Open the files `05_TS.gms` (the code) and `05_TS_Data.gms` (the data).

Results

Table: Trade Shares for ASEAN in 2014 (reporter in rows, partner in columns)

	MMR	KHM	IDN	LAO	MYS	PHL	SGP	VNM	THA	BRN	ASEAN
MMR											
KHM	0.02		1.75	0.04	2.04	0.10	3.36	5.84	6.63	0.02	19.81
IDN	0.19	0.12	0.05	0.02	5.81	1.30	11.84	1.66	4.39	0.20	25.58
LAO											
MYS	0.22	0.10	4.10	0.01	0.03	1.19	13.42	2.04	5.52	0.25	26.87
PHL	0.03	0.08	3.04	0.00	3.37		7.07	1.33	4.59	0.07	19.59
SGP	0.33	0.18	7.36	0.02	11.34	1.53		2.08	3.07	0.27	26.18
VNM	0.16	1.11	1.80	0.43	2.73	1.00	3.28		3.53	0.05	14.10
THA	1.79	1.12	3.69	1.19	5.60	1.86	4.02	2.60	0.50	0.17	22.55
BRN	0.01	0.02	5.26	0.00	7.88	0.61	7.64	0.79	5.03		27.23
ASEAN	0.52	0.43	4.13	0.28	5.96	1.34	5.64	1.84	3.39	0.20	23.73

- We see that the intraregional trade share for ASEAN is estimated to be approximately 24 percent. The code also calculates all of the individual components – so we can also see that the shares range from a low of 14 percent for Viet Nam, to a high of 27 percent for Brunei.

Using the Mirror

- Notice that there are no entries in the rows for Myanmar or Laos PDR.
- This is because neither of these countries reported merchandise trade data to COMTRADE in 2014.
- This fact is problematic if we are interested in evaluating the trade shares for these two countries, but it also implies that the estimates for the ASEAN intra-regional share will be inaccurate as they do not include the flows from those countries.
- We can improve the calculations by utilizing the mirror data.
- Exploring the Code: Open the files `05_TS_Mirror.gms` (the code) and `05_TS_Data_Mirror.gms` (the data).

Results

Table: Trade Shares for ASEAN in 2014 (reporter in rows, partner in columns)

	MMR	KHM	IDN	LAO	MYS	PHL	SGP	VNM	THA	BRN	ASEAN
MMR		0.01	1.58		2.23	0.07	5.96	1.08	17.64	0.00	28.56
KHM	0.02		1.75	0.04	2.04	0.10	3.36	5.84	6.63	0.02	19.81
IDN	0.19	0.12	0.05	0.02	5.81	1.30	11.84	1.66	4.39	0.20	25.58
LAO		0.05	0.42		0.23	0.00	1.22	10.32	46.78	0.00	59.03
MYS	0.22	0.10	4.10	0.01	0.03	1.19	13.42	2.04	5.52	0.25	26.87
PHL	0.03	0.08	3.04	0.00	3.37		7.07	1.33	4.59	0.07	19.59
SGP	0.33	0.18	7.36	0.02	11.34	1.53		2.08	3.07	0.27	26.18
VNM	0.16	1.11	1.80	0.43	2.73	1.00	3.28		3.53	0.05	14.10
THA	1.79	1.12	3.69	1.19	5.60	1.86	4.02	2.60	0.50	0.17	22.55
BRN	0.01	0.02	5.26	0.00	7.88	0.61	7.64	0.79	5.03		27.23
ASEAN	0.51	0.42	4.06	0.27	5.86	1.31	5.63	1.86	3.86	0.20	23.98

- Now we have some information on the missing economies. Intra-ASEAN trade shares are very high for Lao PDR.
- We also see that our original estimate of the overall intra-ASEAN trade share was slightly too low.
- Notice that we still do not have trade shares for the Myanmar-Lao PDR pairs.

Trade Intensity

- The trade share is that the measure will tend to be larger the larger the size of the group considered, both in terms of the economic size and number of members.
- If we want to compare the index across different countries or groups, we need to normalize it in a way that makes the indices comparable.
- A common correction is provided by constructing the trade intensity ratio. This is defined for region B as:

$$TI_B = \frac{T_{BB}/T_{BW}}{T_{WB}/T_W}$$

- In words, the simple intra-regional trade share is divided by the share of world trade directed to the region of interest.

Interpretation

- The trade intensity index normalizes the trade share by considering it relative to the world average for that region.
- In a sense, this statistic operates much like a rudimentary gravity model.
- The statistic takes on a value of unity when the intra-regional trade pattern does not differ from the expected level given the pattern of world trade.

Application Example

- We again demonstrate using ASEAN trade data for 2014.
- We can use the same basic data as before, but we also need to have total world trade in order to complete the computations.
- Exploring the Code: Open the files `05_TI.gms` (the code) and `05_TI_Data.gms` (the data).

Results

Table: Trade Intensity for ASEAN in 2014

	MMR	KHM	IDN	LAO	MYS	PHL	SGP	VNM	THA	BRN	ASEAN
MMR		0.07	1.49		1.56	0.15	3.85	1.13	15.39	0.03	4.13
KHM	0.12		1.64	1.25	1.42	0.19	2.16	6.10	5.74	0.40	2.84
IDN	1.50	1.56	0.05	0.48	4.05	2.54	7.59	1.73	3.81	4.18	3.67
LAO		0.66	0.40		0.16	0.01	0.79	10.85	40.76	0.00	8.52
MYS	1.70	1.22	3.85	0.18	0.02	2.33	8.60	2.13	4.78	5.35	3.86
PHL	0.20	1.03	2.85	0.01	2.35		4.53	1.39	3.98	1.42	2.81
SGP	2.54	2.24	6.90	0.54	7.91	3.00		2.17	2.66	5.84	3.76
VNM	1.24	14.12	1.69	13.02	1.90	1.97	2.10		3.06	1.09	2.02
THA	13.84	14.28	3.45	36.05	3.91	3.66	2.58	2.71	0.43	3.72	3.24
BRN	0.04	0.25	4.93	0.00	5.49	1.19	4.90	0.83	4.36		3.91
ASEAN	3.91	5.38	3.81	8.25	4.09	2.57	3.61	1.95	3.35	4.16	3.44

- Relative to the world average, trade within the economies of ASEAN is intense, an overall trade intensity ratio of 3.4.
- On the other hand, we can see that some of the other ties are quite weak. Lao PDR, for example, appears tightly integrated with Viet Nam and Thailand, but much less so with its other ASEAN partners.

Problems With Trade Intensity

- First, the reference group is the world as a whole, so we are comparing the regions trade with its relative to the world's trade with the region. However, the region is by definition a subset of the world, so the measure is biased for large regions in world trade.
- It can be argued that a better normalization would be to compare with the rest of the world's trade with the region (i.e., to form the ratio of the share of intra-regional trade to extra-regional trade).
- Second, the index is not symmetric around one. It's lower bound is zero, while it's upper bound is the inverse of the share of the region of interest in total world trade.
- This complicates making comparisons across regions and across time if a region's share of world trade is growing.

Trade Introversion

- To correct the first problem, we can change the denominator to use the extra-regional trade share as the reference.
- To correct the second we can transform the index such that it is symmetric around 0, and bounded between -1 and $+1$.
- If we make both of these corrections, we obtain the trade introversion index.

Computation

- The formula for trade introversion is given by:

$$TI_B = \frac{\frac{T_{BB}/T_{BW}}{(T_{WB}-T_{BB})/(T_W-T_{WB})} - \frac{1-T_{BB}/T_{BW}}{1-(T_{WB}-T_{BB})/(T_W-T_{WB})}}{\frac{T_{BB}/T_{BW}}{(T_{WB}-T_{BB})/(T_W-T_{WB})} + \frac{1-T_{BB}/T_{BW}}{1-(T_{WB}-T_{BB})/(T_W-T_{WB})}}$$

- This index takes a value of zero if intra-regional trade proportions exactly match extra-regional trade proportions, and ranges between -1 and +1.
- It can increase only if intra-regional trade is rising faster that extra-regional trade.

Application Example

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- We again demonstrate using ASEAN trade data for 2014.
- We can use the same basic data as before, but we also need to have total world trade in order to complete the computations.
- Exploring the Code: Open the files `05_TO.gms` (the code). The data file is the same as for trade intensity.

Results

Table: Trade Introversion for ASEAN in 2014

	MMR	KHM	IDN	LAO	MYS	PHL	SGP	VNM	THA	BRN	ASEAN
MMR		-0.87	0.19		0.22	-0.75	0.60	0.06	0.90	-0.94	0.67
KHM	-0.79		0.24	0.11	0.17	-0.68	0.37	0.73	0.72	-0.43	0.51
IDN	0.21	0.23	-0.91	-0.35	0.63	0.45	0.80	0.27	0.60	0.63	0.63
LAO		-0.21	-0.44		-0.73	-0.98	-0.13	0.85	0.97	-0.99	0.90
MYS	0.27	0.11	0.61	-0.70	-0.97	0.41	0.83	0.37	0.68	0.70	0.65
PHL	-0.66	0.02	0.49	-0.97	0.41		0.66	0.16	0.61	0.18	0.51
SGP	0.46	0.40	0.79	-0.30	0.83	0.53		0.39	0.48	0.74	0.66
VNM	0.11	0.88	0.26	0.87	0.32	0.33	0.36		0.52	0.05	0.35
THA	0.89	0.89	0.57	0.97	0.62	0.59	0.46	0.48	-0.40	0.59	0.58
BRN	-0.92	-0.60	0.67	-0.99	0.71	0.09	0.67	-0.10	0.64		0.64
ASEAN	0.69	0.79	0.68	0.90	0.71	0.52	0.67	0.39	0.63	0.71	0.68

- The trade introversion index in 2014 for ASEAN as a whole was approximately 0.7.
- Values for individual economies member economies ranged from a high of 0.9 for Laos PDR (driven almost entirely by its trade with Viet Nam and Thailand), to a low of 0.35 for Viet Nam.

Exercises

- How have the values of these indices changed? Let's construct indices for 2004, 10 years before the results presented here.
- If you have time, you might also consider comparing these indices to other agreements (e.g., NAFTA).