MERCOSUL: LOOK AT PARAGUAY

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1. Introduction.

Using simple statistics and indexes, this Brief sheds a fresh light on recent trade developments in MERCOSUL. The four original members are analysed by different measures to evaluate trade flows and the overall result is not much encouraging.

Performance, according to the dimensions measured, has impoverished, with members showing a decreasing, negative trend, in many cases. The exception is Paraguay, a usually forgotten economy, which shows signs of collecting the results of clever policies (or sheer luck?). Its trend is the opposite of those in the other three members, signalling that –as regards trade- the country is moving up the ladder to become more competitive and diversified as an exporter.

If perhaps there is much to be done[1] the main message is *look at Paraguay*, prospects are promising.

To enlarge interpretation, the same statistics are computed for three more South American (SA) economies and seven ASEAN members. Data for the flows come from UN COMTRADE, and sector classifications use the latest version of SITC, at two, three and four digits.

An Appendix describes the formulas and other technical points related to the results presented.

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[1] Including a deeper analysis of the country's trade statistics, sometimes influenced by Brazilian export practices in specific products -a subject not addressed here.

2. Intra-industry trade.

Keeping in mind the old debate on the interaction between intra-industry indexes and the degree of disaggregation of the trade flows, Grubel-Lloyd (GL) indexes were computed for MERCOSUL members, plus Bolivia, Colombia and Chile, in SA, and seven ASEAN members (Cambodia, Indonesia, Laos, Malaysia, Philippines, Thailand and Vietnam). The inclusion of these ten countries helps to put in perspective the MERCOSUL results.

The results for 2017 and 2021, at the 2- and 3-digit levels of the SITC, are in Tables 1 and 2, respectively. As expected, values decrease with a higher disaggregation. Notwithstanding, the patterns in both tables are similar.

But for Paraguay, both sets of indexes decrease during the period –for Uruguay, at 3-digits, there is a small increase[2]. The country is still the member with the lowest values for the GL-index, but it is getting closer to Chile and distancing itself from Bolivia. Argentina presents a next to dismal performance: at 3-digits, in 2021, it approaches Cambodia and Chile, countries with a more restricted trade portfolio. Decreases, or non-increases, are also the rule for the other SA countries.

In the eight ASEAN members, a small decrease took place for Malaysia and, at the higher disaggregation, for Laos. The former presents the highest GL among all the ASEAN members considered, clearly showing the country's deep involvement in global value chains (GVC). Thailand remains stable, while Indonesia, Cambodia and Philippines present mixed performances that cannot be taken as negative. Vietnam is clearly improving.

It is worth highlighting that countries like Vietnam and Indonesia uniformly show higher intra-industry trade than Brazil, MERCOSUL's top achiever in this indicator. Though their higher participation in GVCs partially accounts for this, it also suggests, globally, the Southern group's less sophisticated trade patterns. Something to be addressed later.

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[2] Variations of 0.01, in whichever direction, may be considered as negligible.

Table 1: GL index (SITC 2 dig)

	Country	2017	2021	Change
1	Argentina	0.35	0.25	-0.10
2	Bolivia	0.09	0.09	-0.00
3	Brazil	0.44	0.36	-0.09
4	Cambodia	0.20	0.23	0.03
5	Chile	0.19	0.17	-0.01
6	Colombia	0.32	0.31	-0.01
7	Indonesia	0.48	0.49	0.01
8	Laos	0.28	0.28	0.00
9	Malaysia	0.76	0.74	-0.02
10	Paraguay	0.13	0.16	0.03
11	Philippines	0.56	0.55	-0.01
12	Thailand	0.68	0.68	-0.01
13	Uruguay	0.26	0.25	-0.01
14	Vietnam	0.53	0.56	0.03

Table 2: GL index (SITC 3 dig)

	Country	2017	2021	Change
1	Argentina	0.28	0.17	-0.11
2	Bolivia	0.05	0.04	-0.00
3	Brazil	0.32	0.28	-0.04
4	Cambodia	0.16	0.16	0.00
5	Chile	0.17	0.15	-0.02
6	Colombia	0.24	0.23	-0.01
7	Indonesia	0.36	0.36	-0.00
8	Laos	0.25	0.23	-0.02
9	Malaysia	0.69	0.68	-0.00
10	Paraguay	0.09	0.11	0.02
11	Philippines	0.46	0.48	0.02
12	Thailand	0.57	0.57	-0.00
13	Uruguay	0.22	0.23	0.01
14	Vietnam	0.44	0.47	0.03

3. Concentration/diversification.

It is generally agreed that diversified trade flows, beyond ensuring their robustness, testify to a more complex and sophisticated economy. Though for a deeper analysis, diversification must be coupled with the ubiquity, or rarity, of the products exported, its measurement is unavoidable.

Herfindhal's concentration index and the entropy measure, both normalised to the [0 , 1] interval, have been used for the same set of countries as before, at the 2-digits level. As the former measures concentration and the latter diversity, their values have opposite interpretations and the pairs of Exhibit 1(a) and (b), Exhibit 2(a) and (b), Exhibit 3(a) and (b), showing then from 2017 to 2021, are the mirror image of each other.

Exhibit 1 shows a worsening situation for the three biggest MERCOSUL members, despite milder for Uruguay. Argentina repeats a rather poor performance, with exports already more concentrated than Uruguay's in 2021 and approaching Paraguayan levels. Brazil still shows a reasonably diversified portfolio, despite moving towards higher/lower concentration/diversity. Paraguay stands out in a positive way again: it has experienced a slight improvement (clearer in Exhibit 1(b)) though in a still poorly diversified portfolio.

The other three SA countries are broadly more concentrated than MERCOSUL members, and Chile and Colombia have not improved, while Bolivia seems to be slowly getting better, having slightly passed Chile in 2021. Notice that Paraguay lies between Colombia and Bolivia already, while Argentina and Colombia are quite close.

ASEAN countries are broadly better than MERCOSUL members, with the exception of Brazil. They show a roughly stable pattern during this five years period, with Thailand and Indonesia far more/less diversified/concentrated than Brazil. Laos presents a perhaps surprising level, close to Brazil.

Exhibit 1:

(a) Herfindahl index for Mercosul
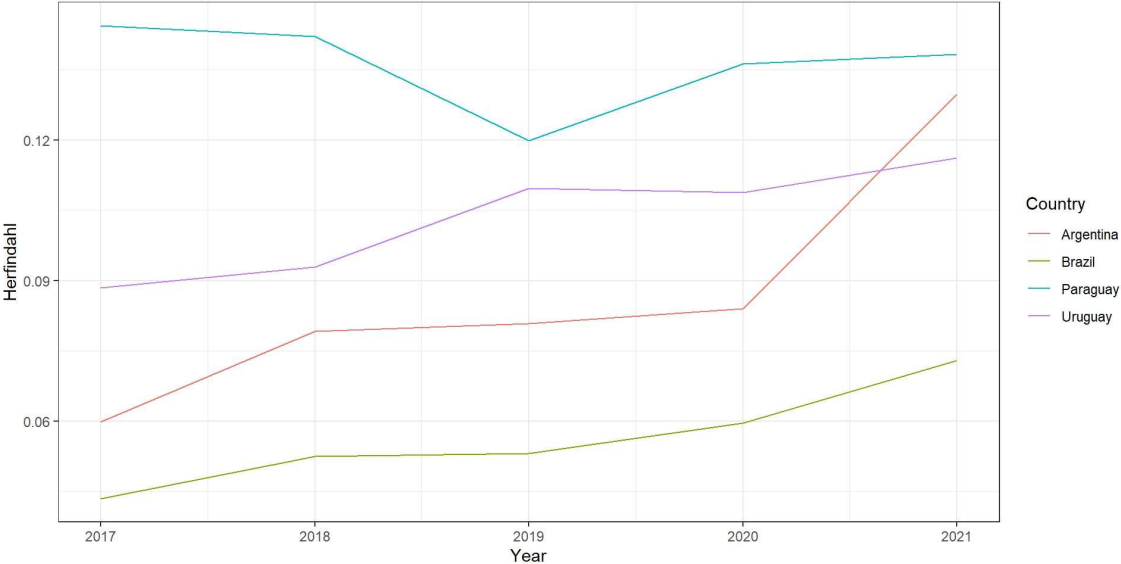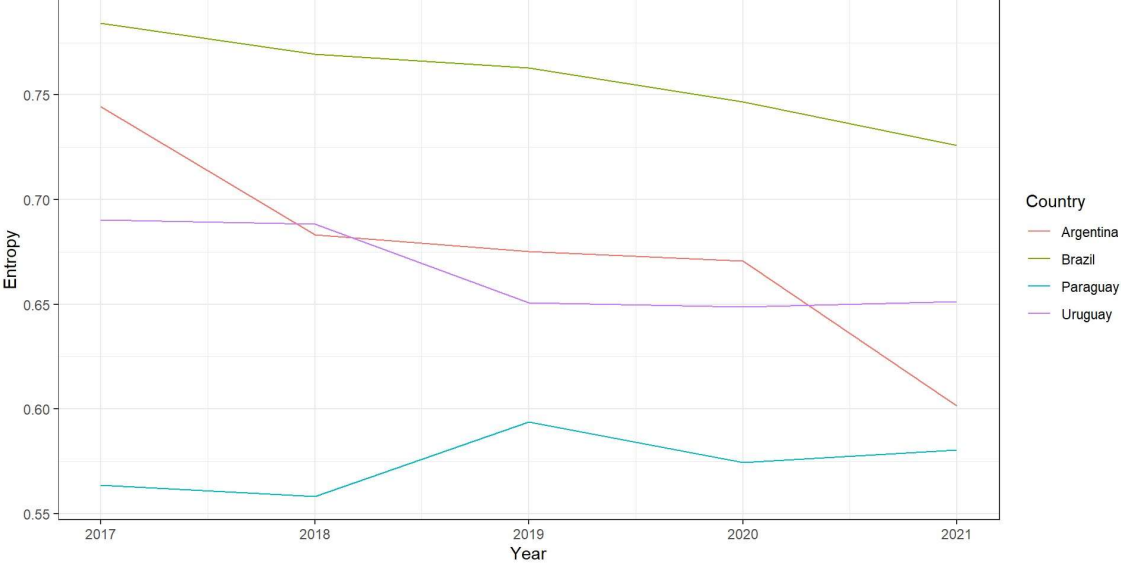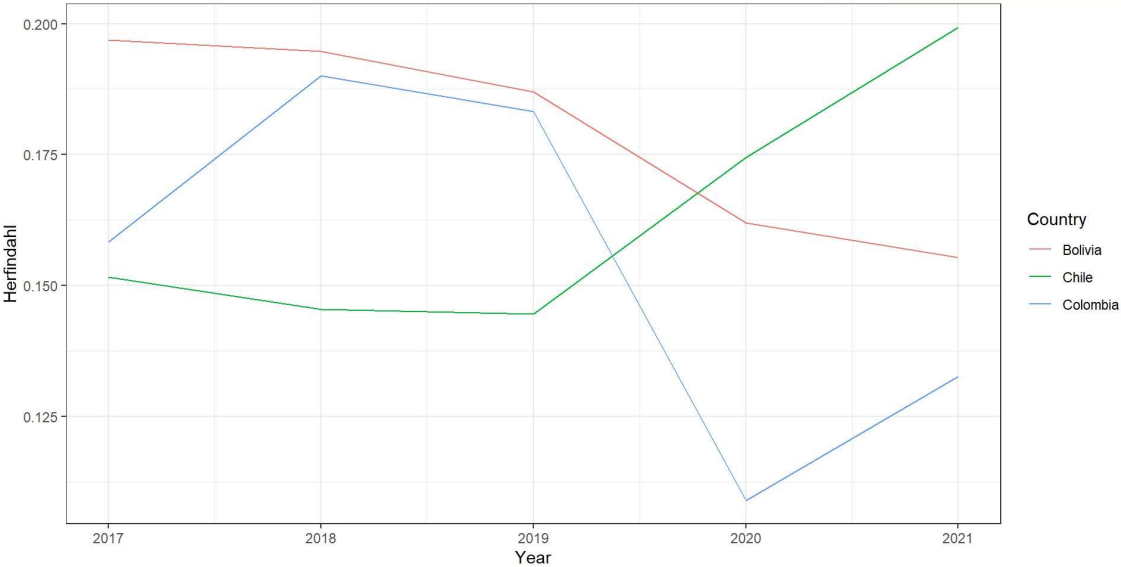

(b) Entropy measure for Mercosul

Exhibit 2:

(a) Herfindahl index for SA

(b) Entropy measure for SA

Exhibit 3:

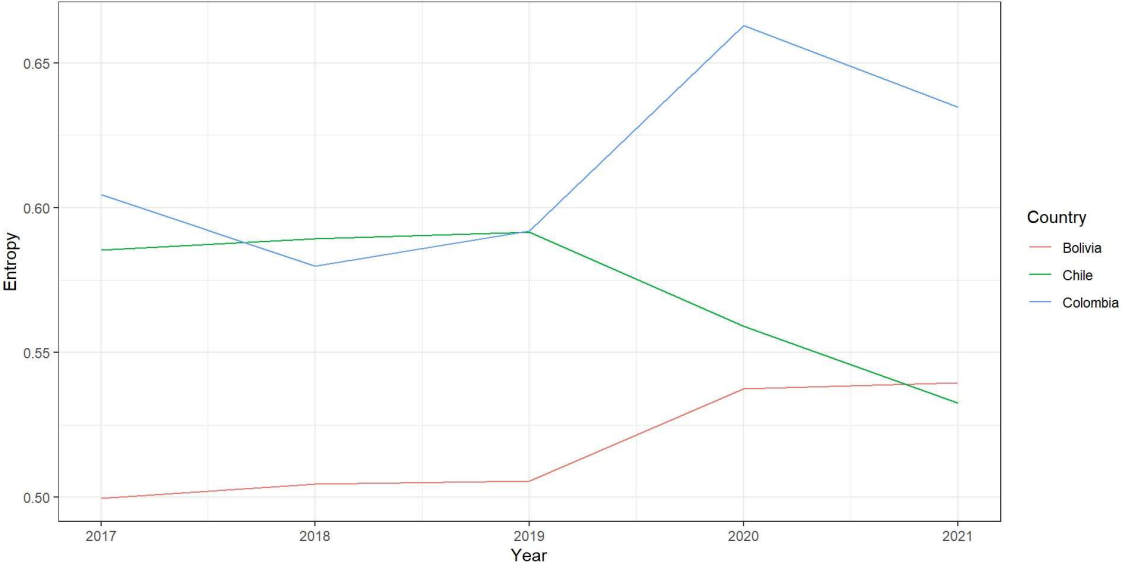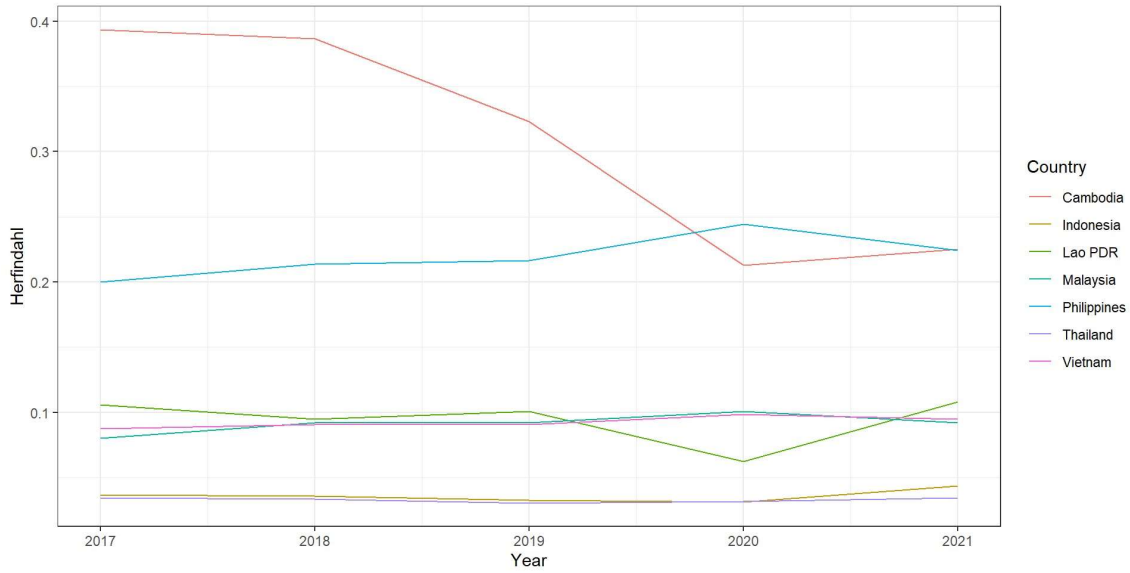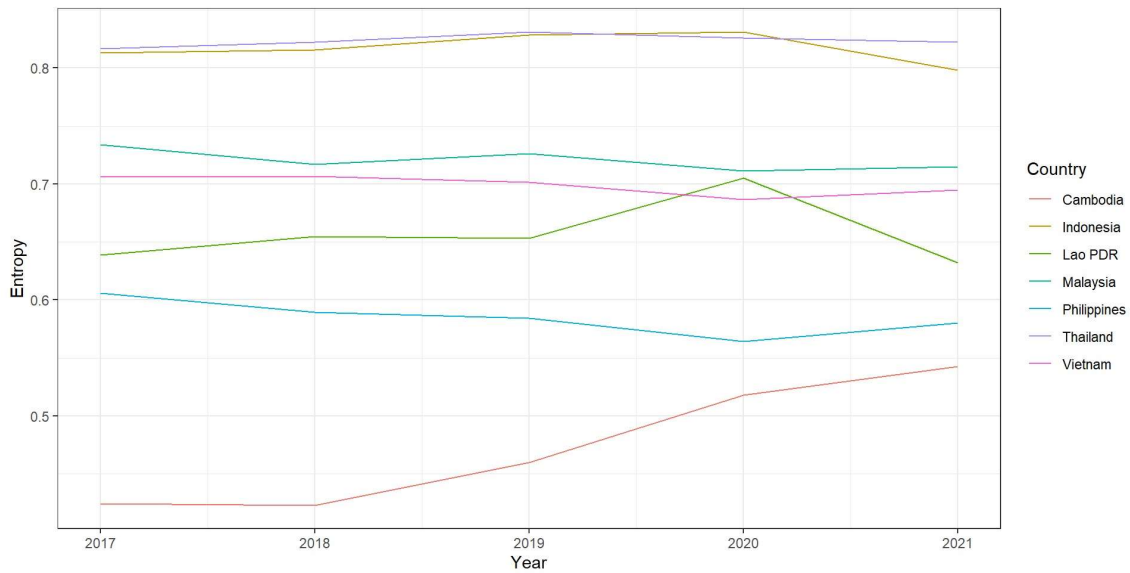## (a) Herfindahl index for ASEAN

(b) Entropy measure for ASEAN

4. Export dynamics.

Given a time interval, say 2011 to 2021, and a classification level, say 4-digits STIC, one can decompose the increase (or decrease) in total exports during the period, for a given country, disregarding exchange rate effects, into three components:

the growth in the flow of those products exported in both years, *plus* the contribution of the exports of "new" products appeared during the period and present in 2021, *less* the exports in 2011 of products no longer exported in 2021.

Dividing these three quantities by the absolute value of the total growth (as total flows may have decreased), three numbers (in principle, though not necessarily) lower than one are found: subtracting the third from the sum of the first two the result is 1 (or -1, if growth was negative).

Table 3 shows the three ratios for the same fourteen countries.

Within MERCOSUL, Argentina displays a rather modest growth in the common set[3], unable to compensate for the considerable loss of export goods that make for a negative growth during the period. Brazil is rather stable, with no innovations (neither loss nor additions of products), though a certain dynamics is found in Paraguay, gaining 3% in new products and shedding 2% of old ones (both, of course, in value), and even more in Uruguay.

It is telling that, for Paraguay, the most significant new export was *milk and cream, concentrated or sweetened* (0222) while, in the losses, *milking machines and dairy machinery and parts thereof* (7213); suggesting a change in the production pattern. In the intensive margin, the largest growth was in *soya* (2222).

For the contrasts, Colombia experienced a performance perhaps worse than Argentina's, provoked by a unique loss in the set of common products.

The ASEAN countries were broadly rather stable, with Indonesia and Thailand showing some dynamism, where new entrants and a good performance of the intensive margin compensated the 5% losses in products. Laos is again somewhat surprising, with

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[3] Also known as "the intensive margin".

a modest growth in the intensive margin –similar to Argentina's- but a significant contribution given by the entrance of new products.

Table 3: Exports growth decomposition 2011-2021 (4 digits)

	Country	ΔX (billion US$)	(a)	(b)	(c)
1	Argentina	-4.8	0.40	0.01	1.41
2	Bolivia	1.8	0.90	0.13	0.02
3	Brazil	27.9	1.01	0.00	0.01
4	Cambodia	10.9	0.85	0.15	0.01
5	Chile	12.9	0.93	0.09	0.02
6	Colombia	-14.9	-0.98	0.01	0.03
7	Indonesia	28.7	1.02	0.03	0.05
8	Laos	4.1	0.42	0.58	0.00
9	Malaysia	72.7	1.00	0.01	0.01
10	Paraguay	2.8	0.98	0.03	0.02
11	Philippines*	6.1	1.04	0.00	0.05
12	Thailand	38.5	1.00	0.05	0.05
13	Uruguay	1.6	0.94	0.10	0.04
14	Vietnam	240.0	1.01	0.00	0.01

(a) exports' growth of common products; (b) exports of new products; (c) exports of products that have disappeared: all values are in percentage (have been divided by the absolute value of ΔX).

(a) + (b) - (c) =+1 (export growth) or -1 (export decrease).

* No data available for 2011; 2017 has been used.

5. Openness.

The final exercise refers to trade openness, defined as the total trade flow in a given year (exports plus imports) divided by GDP. Using a panel of 31 countries and five years[4], different regression models were tested, the best one being shown in Exhibit 4.

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[4] The countries are Argentina, Bolivia, Brazil, Brunei, Cambodia, Chile, China, Colombia, Ecuador, Ghana, Indonesia, India, Japan, Kenya, South Korea, Myanmar, Mozambique, Malaysia, Nigeria, Paraguay, Peru, Philippines, Russia, Senegal, Singapore, Thailand, Uruguay, United States, Vietnam, South Africa and Zimbabwe. The years span from 2017 to 2021.

Results are statistically significant. The regression displays one of the existing interpretations for openness, namely that "bigger countries are more closed".

Residuals (namely, observed less expected values) computed, for all years, for the four MERCOSUL members are plotted in Exhibit 5. While in 2019 Argentina reverted an improving trend[5], Brazil steadily moved to perform better than expected by the model.

Paraguay, in this last case, does not do very well. Though variations are not too large, a declining trend is suggested.

Exhibit 4: Regression Openness

	Dependent variable: log (Openness)
Independent variables	Coefficients
log(gdp)	-0.402^{*} (0.224)
log(Population)	-1.683^{**} (0.645)
Constant	37.017*** (12.152)
(Dummies for *year* and *country* fixed effects)	
N = 155 R^2 = 98.1% R^2 (adj.) = 97.5%	
Residual std. error: 0.093 (df = 118)	
F (36, 118) value: 165.3***	

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[5] An increase towards positive values, in the residuals, is an improved trend, meaning that the observed performance is "better" –in terms of higher openness- than predicted by the model.

Exhibit 5: Residuals (Mercosul countries)
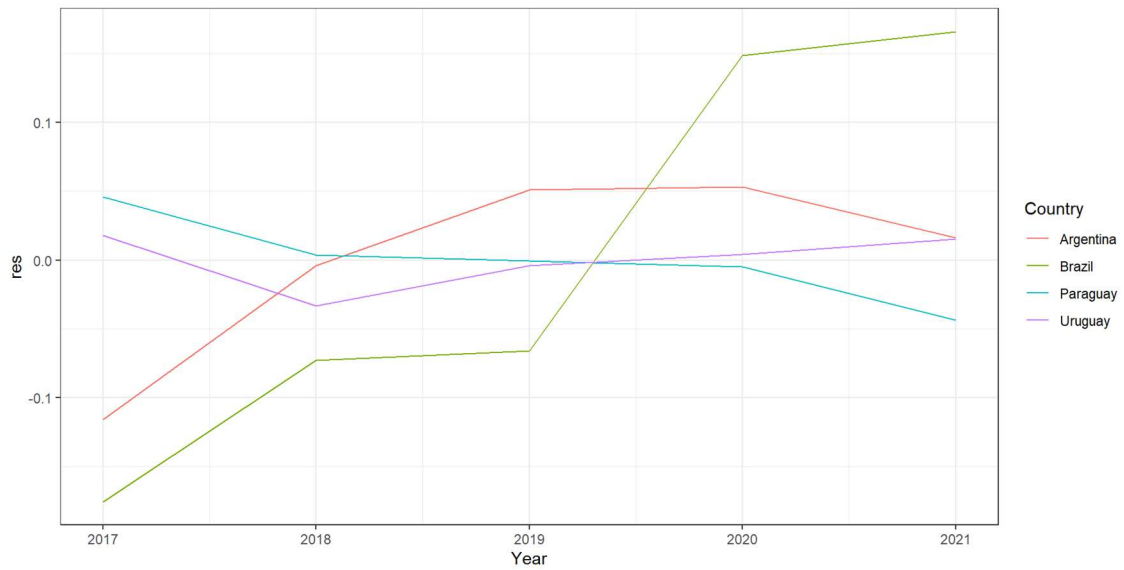
6. Conclusion.

Indices tell part of the story: they raise signals and point out directions for further inquiry. The simple evidences gathered here suggest a picture of stagnation, if not deterioration in MERCOSUL's trade position. Within this scenario, the smallest economy –Paraguay- seems to be sorting itself out better than its three other partners.

A question deserving further attention.

Appendix – A few formulae

GL index

The representative Grubel-Lloyd (GL) index for country i in year t is defined as:

$$GL_{i,t} = 1 - \frac{\Sigma_n |X_{i,t} - M_{i,t}|}{\Sigma_n (X_{i,t} + M_{i,t})}$$

Where n indexes the product, X is total exports and M, total imports. It is bounded below by 0 and above by 1, and it increases with intra-industry trade (similar levels of total exports and imports for the products traded by country i in year t.)

Herfindahl and entropy

Herfindahl's index is a measure of exports concentration and is defined as $h1_{i,t} = \Sigma_n (s_{n,t})^2$; where $s_{n,t}$ is the share of product n in total exports from country i in year t. The index studied in Section 3 is normalized to the [0,1] set. Let $N_{i,t}$ be the number of products exported by i in t, i.e., $N_{i,t} = \Sigma_n \mathbb{I}(s_{n,t} > 0)$. Hence, the normalized Herfindahl index is:

$$h2_{i,t} = \frac{h1_{i,t} - (1/N_{i,t})}{1 - (1/N_{i,t})}$$

The entropy measures exports diversification and is defined as:

$$e1_{i,t} = - (\Sigma_n^{N_{i,t}} s_{n,t} \, log_2(s_{n,t}))$$

As $0 \leq s_{n,t} \leq 1$, $log_2(s_{n,t}) \leq 0$, and therefore $e1_{i,t} \geq 0$. The results presented in Section 3 come from the following normalization (making the measure bounded above by 1):

$$e2_{i,t} = \frac{e1_{i,t}}{log_2(N_{i,t})}$$

Exports decomposition

Let $N_{0,i}$ be the set of products exported by country i in the initial year and $N_{1,i}$, in the final year. The total change in exports ($\Delta X_i = X_{i,1} - X_{i,0}$), as explained in the text, can be decomposed according to the following identity:

$$\Delta X_i \equiv \Sigma_{n\in N_{0,i}\cap N_{1,i}}\Delta X_n + \Sigma_{n\in N_{1,i}\setminus N_{0,i}}X_n - \Sigma_{n\in N_{0,i}\setminus N_{1,i}}X_n$$

Dividing both sides by $|\Delta X_i|$:

$$\frac{\Delta X_i}{|\Delta X_i|} = \frac{\Sigma_{n\in N_{0,i}\cap N_{1,i}}\Delta X_n}{|\Delta X_i|} + \frac{\Sigma_{n\in N_{1,i}\setminus N_{0,i}}X_n}{|\Delta X_i|} - \frac{\Sigma_{n\in N_{0,i}\setminus N_{1,i}}X_n}{|\Delta X_i|}$$

Clearly, the left-hand side equals 1 if $\Delta X_i > 0$; and -1 otherwise. Following Table 3 (Section 4) notation, the first term on the right-hand side is (a); the second, (b); and the third, (c).

The Openness regression - residuals

As the dependent variable is in logs, the residuals are equal to the log of the ratio between observed and expected values. A residual of 0.1, for instance, means that the observed openness is roughly 10% higher than the one predicted by the model:

log (open obs) – log (open exp) = log (open obs/open exp) = 0.1   implies

open obs/open exp = $e^{0.1}$ so that   open obs = 1.1052 open exp   .