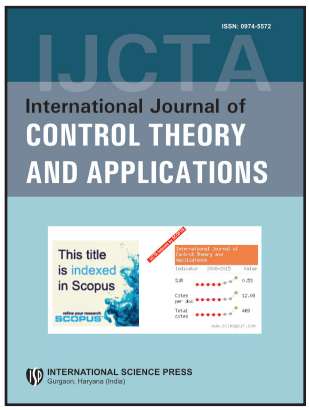

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Intra-industry Trade in Colombia (1974-2014)

Carolina Henao-Rodríguez[a], Jenny-Paola Lis-Gutiérrez[b], Amelec Viloria[c] and Mercedes Gaitán-Angulo[d]

[a]*Corporación Universitaria Minuto de Dios, Bogotá, Colombia. Email: linda.henao@uniminuto.edu*
[b,d]*Escuela de Negocios de la Fundación Universitaria Konrad Lorenz, Bogotá, Colombia. Email: [b]jenny.lis@konradlorenz.edu.co; [d]mercedes.gaitana@konradlorenz.edu.co*
[c]*Universidad de la Costa, Colombia, Barranquilla, Colombia. Email: aviloria7@cuc.edu.co*

Abstract: In this paper, the Grubel and Lloyd indices (4 and 10 digits of CIUU), Greenaway & Milner (10 digits of IUU), and Fontagné and Freudenberg were estimated using Colombian exports and imports data from 1974 to 2014. This made it possible to identify printers, publishers and related industries, the manufacture of plastic products, nep, the manufacture of clay products for the construction and manufacture of soaps and cleaning preparations, perfumes, cosmetics and others are the only economic activities in The country where it was possible to confirm the existence of important levels of intra-industrial trade.

Keyword: Trade, intraindustrial trade, economies of scale, factor endowments, Grubel and Lloyd index, Greenaway & Milner index, Fontagné index and Freudenberg index.

1. INTRODUCTION

Trade can be divided into two types: the inter-industrial, in which goods of different sectors of economic activity are interchanged and the intra-industry in which the same product is traded, slightly differentiated. One of the first indices used for CII measurement was the one suggested by [2]. In the opinion of [3] that index is a simple arithmetic mean of the index of each industry and does not take into account the correction of global trade imbalances. These authors propose a new index ([3]), whose initial version presents bias to a low measure of the IIC in case of a commercial imbalance, as they themselves exposed it, because the index can not reach its maximum value because the exports and the Imports can not be matched in all industries. In order to correct this problem, they proposed a new adjusted index, however, [4] asserted that this measure is also biased downward, and [5] stated that it is a measure of similarity in the trade composition and shows no relation With the pattern of trade that actually occurs at that specific level, since it depends on the intersectoral composition of trade flows ([6]).

The index of [4] seeks to correct the general imbalance at the elementary level, but [7], [8], [9] argued that there is no justification for approaching equilibrium with the multilateral equilibrium on manufactured

trade; In addition [10] concluded that with the Aquino adjustment the IIC is overestimated and posed the correction allowing industrial specialization between primary and manufactured goods [6]. [11] is in favor of this correction to Aquino and proposed an iterative process of adapting bilateral disaggregated trade flows to make them consistent with the multilateral global trade balance, nevertheless, [12] argued that if all countries are in equilibrium in The current account, no possible provision is made for the profits of the trade over time.

The unadjusted IGL is the most used by the literature, although the above mentioned shortcomings presents a problem of categorical aggregation, [7] proposed to calculate IGL for different levels of aggregation in a specific classification and perform a weighted average. [13] detected a problem of geographic bias in the index posed by Greenaway and Milner since in applying this measure at the multilateral level the values of exports and imports are added before making the calculations. As a corrective measure to geographical bias these authors propose to always calculate on a bilateral basis and then add the results of the indicator.

In this scenario, the purpose of this paper is to measure the indices of Grubel and Lloyd, Greenaway & Milner, and Fontagné and Freudenberg for exports and imports from Colombia between 1974 and 2014.

2. METHODOLOGY

Grubel and Lloyd (G & L) [3] presented a highly recognized index in the literature for the measurement of CII flows; Although some criticism has been made of this index as to whether it is biased to a low IIC measure, in case of a trade imbalance and that there is a problem of categorical aggregation that overestimates the index, this index was used since it has been suggested That the adjusted G & L index is even more biased than the one initially proposed and for being one of the most used in the literature.

Taking into account the problems presented by this G & L index as mentioned above, the adjusted index of [7] between 2000 and 2014 was calculated for the sectors that presented medium-high G & L indices for the last decade, in order to assess the IIC taking into account the problem of categorical aggregation.

To verify the validity of the results for the geographic bias presented by the Greenaway and Milner index (G & L), the index of [13] was calculated, for the sectors previously evaluated using a 4-digit UCPI classification and sub-disaggregation 10-digit tariffs with the eight most important trading partners in recent years by each of the selected CIUUs.

3. DATA

In order to calculate the IGL for Colombia, data on exports and imports were used from 1974 to 2014, classified according to CIUU to 4 digits, spliced to revision 2, whose source is the National Planning Department.

To calculate this same index to 10 digits of the IUU, data on Colombian imports and exports were used between 2000 and 2014, source DANE, by tariff subheading. Splices were made to the CIUU revision 2 classification of the respective tariff subheadings corresponding to each of the economic activities analyzed, for which the correlative tables were used. These data were also used for the calculation of the Greenaway and Milner Index (IGM) between 2000 and 2014.

Data on Colombian imports and exports between 2000-2014 by tariff subheading and commercial destination taken from DANE were used in the calculation of the index of [13] for the sectors to a 4-digit UIC

classification and a 10-digit tariff subheading disaggregation With the eight most important trading partners in recent years.

4. RESULTS

This section presents the results of calculations of the different indices.

A. Grubel and Lloyd Index to 4 digits of IUU

When computing the Grubel and Lloyd indices (0 there is no CII and 100 all trade is of intra-industrial type) for the CIUU classification all spliced to the 2 to 4 digit revision between 1974-2014 it was found that: sectors shown in Table 1 presented indices above 50 during most of the last decade and some of these during most of the period. However, one should be careful in the analysis of the indicator, since it can not be stated a priori that in the economic activities specified in table 1 there are high levels of CII due to which the aggregation bias presented by the IGL can cause a Overestimation.

[13] assert that the IIC should be evaluated at product level, since only exports and imports of products having the same technical principle and characteristic can be considered as two-way trade. In this context the IGL results for the tariff subheadings would be quite enriching for the proposed analysis. In order to compare the IUU results to 10 digits of IUU from the sectors listed in Table 1, the IGU was calculated at 4 digits of IUU with a disaggregation level of 10 digits of this classification. These indices were not calculated for the remaining CIUUs analyzed, since they presented IGL to 4 digits of the IUU (low to 50) during almost the whole period and if one considers that the overestimation of this index is suspected, Affirm that in these sectors there are very low or no levels of IIC.

B. Grubel & Lloyd and Greenaway & Milner Indexes to 10 digits of ICU

In calculating the G & L index by tariff subheading, it was found that the IUUs 1110, 1210, 2302, 3113, 3114, 3121, 3140, 3216, 3219, 3221, 3233, 3512, 3530, 3419, 3620, 3699, 3710, 3813 and 3909 do not present in most of the tariff subheadings that compose them, IGLs that remain above 50 during most of the period analyzed 2000-2014. As the results of this index are not maintained at different levels of aggregation. These results are corroborated by the low levels of the calculated IGM (Table 1), which show that there was indeed an aggregation problem and the 4-digit IGL of the IUU was overestimated. There is no evidence that there are significant levels of IIC in these economic activities.

With regard to articles made of textile materials, other than the manufacture of clothing, it was found that the only subheadings with IGLs above 50 for most years of the period analyzed are other tags, coats of arms and similar articles, Not knitted or crocheted (5807900000) and other bed linen, of man-made fibers (6302320000). The share of these two subheadings in the sector's total exports and imports ranges between 2% and 20% between 2000 and 2014 and an IGM of less than 50 is expected. However, the IGM is between 41 and 85 between 2000 and 2013 (Table 1). Since the IIC should be evaluated at the product level, the IGL results for the tariff subheadings were taken as the most approximate and it is concluded that there are indeed no significant levels of IIC in this sector as predicted by the 4 digit IGL.

The majority of tariff subheadings for printers, publishers and related industries, the manufacture of plastic products, nes, the manufacture of clay products for the construction and manufacture of soaps and cleaning preparations, perfumes, cosmetics and others presented IGLs by tariff subheading (Above 50) between 2000

and 2014. The G & M indices for these IUU codes range from 48 to 86 as of 2004, confirming the existence of significant levels of IIC, but not as large as I had estimated With the 4-digit IGL (Table 1) by the categorical aggregation bias.

C. Fontagné and Freudenberg Indexes

Since the IGM presents a problem of geographical bias, we compared the results found with the IFF at the bilateral level, for the eight most important trading partners in the last years of the analyzed sectors (Table 1). Described below.

The ICUs 1110, 1210, 2302, 3113, 3114, 3121, 3140, 3216, 3221, 3233, 3512, 3530, 3419, 3620, 3699, 3710, 3813 and 3909 showed low (less than 20) and decreasing IFF The most important trading partners during the last of the period analyzed (2000-2014). These results are corroborated by the low levels presented by the IGM and the IGL at a 10-digit level of disaggregation calculated, thus confirming that in these economic activities there was indeed a problem of categorical aggregation in the IGL calculated to 4 digits of the CIUU was overestimated and the IIC is low or non-existent in these sectors.

Articles made of materials, textiles, except garments garment manufacturing (3212) showed the highest IFF with the US, Mexico and Panama, for the last years of the period worked presented a decreasing trend and for the rest of countries The IIC is practically non-existent. The results were corroborated with those found by the IGL by tariff subheading that predicted low CII levels in this sector. Although IGLs ranged between 50 and 99 between 2000 and 2013 (Table 1), and IGM was between 41 and 85 in this same period. It is concluded that in this sector there was a bias for aggregation and geographical bias that caused overestimation of these indices.

CIUUs 3420, 3560, 3691 and 3523 presented on average the highest IFFs with the most important commercial destinations of the IUUs analyzed, these are the same economic activities that had IGLs greater than 50 for most of the subheadings that compose them; Therefore, that the results of the 4-digit IGL were corroborated, results reaffirmed by the IGM; It is concluded that there is evidence of significant levels of IIC for these economic activities. In this context, it is important to note that the participation of these sectors in Colombian imports and exports in recent years ranges from 2% to 4%, indicating that their importance in total trade is low, evidence that in Colombia most Trade is of an inter-industrial type.

Gains from the IIC are generally higher than those arising from the CIN because they include benefits related to economies of scale and the expansion of activities with a high value-added content. It is evident that in Colombia, economies of scale were not developed to promote the IIC and, therefore, the production chains that drive the growth of the IIC are not generated and thus boost economic growth [14]. It is therefore corroborated that, as stated [15], Colombia has a biased export structure towards primary products and it is imperative to move to export more natural resource-based manufactures and incorporate medium technology to avoid the macroeconomic impacts brought about by the Such as the real exchange rate appreciation that generates greater competitiveness of the imports and greater volatility that brings the cycles of prices and/or quantities of exported primary goods. In this context the role of the State can not be limited to macroeconomic interventions that focus on the correction of market failures or passive research and development funding, as the neoclassical theory argues. The public sector is a vital economic agent in the different stages of technological innovation as demonstrated in the USA, Germany, Finland and China; Since state action must be aimed at promoting research and development in sectors considered essential for economic growth and development, mainly by taking risks that the private sector would not dare to consider [16], [17], [18], [19].

Table 1
Grubel and Lloyd and Greenaway and Milner Index

CIUU	*INDEXES*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
1110	Greenaway and Milner Index	3	3	2	2	91	92	3	4	3	3	2	2	2	2	3
	G & L not set	70	72	77	78	75	64	70	79	92	83	87	99	95	94	95
1210	Greenaway and Milner Index	33	37	29	29	91	72	31	34	20	13	9	7	11	7	7
	G & L not set	50	56	67	64	72	86	73	67	75	77	79	78	89	74	62
2302	Greenaway and Milner Index	0	6	4	2	86	88	1	1	0	0	6	13	5	10	7
	G & L not set	51	48	77	81	49	54	53	57	43	41	77	69	79	78	87
3113	Greenaway and Milner Index	11	15	16	17	85	90	20	22	21	23	20	19	20	19	16
	G & L not set	71	75	84	85	96	96	94	90	74	86	80	74	60	56	53
3114	Greenaway and Milner Index	13	10	15	18	87	84	29	30	27	15	16	17	20	27	20
	G & L not set	47	50	57	59	68	75	85	90	94	99	86	78	73	61	61
3221	Greenaway and Milner Index	14	24	27	24	64	34	26	30	28	24	23	23	26	22	23
	G & L not set	75	81	88	85	74	62	71	71	69	74	82	82	95	99	98
3140	Greenaway and Milner Index	66	73	83	59	76	54	71	70	56	44	38	26	17	16	13
	G & L not set	74	80	91	78	84	68	76	74	95	71	78	93	58	89	86
3212	Greenaway and Milner Index	41	40	54	56	85	68	48	29	38	67	47	59	24	47	14
	G & L not set	53	52	74	79	66	99	96	50	64	91	56	80	76	57	21
3216	Greenaway and Milner Index	34	32	28	32	82	87	36	29	41	40	44	45	41	28	21
	G & L not set	77	70	59	66	72	68	65	80	94	97	66	69	58	57	45
3219	Greenaway and Milner Index	28	28	38	34	92	68	22	21	23	21	24	20	27	31	27
	G & L not adjusted	98	85	59	66	78	74	72	67	79	94	81	64	60	56	57
3221	Greenaway and Milner Index	36	45	43	38	83	82	45	44	47	37	32	33	34	34	30
	G & L not set	89	88	96	83	77	78	72	64	64	88	86	73	73	70	62
3233	Greenaway and Milner Index	12	24	19	22	82	77	22	25	31	18	20	21	19	19	18
	G & L not set	43	51	57	52	55	68	80	83	92	96	96	80	71	67	64
3419	Greenaway and Milner Index	22	17	20	22	89	77	25	30	29	25	25	23	25	18	21
	G & L not set	85	97	93	93	90	98	100	41	93	88	99	100	98	100	66
3420	Greenaway and Milner Index	55	48	56	50	92	47	55	30	58	62	72	71	71	73	63
	G & L not set	60	54	62	61	55	61	63	91	68	75	95	94	95	89	79
3512	Greenaway and Milner Index	39	41	42	44	88	91	46	27	30	41	28	39	37	44	37
	G & L not set	98	98	97	92	88	81	70	38	53	77	72	58	61	80	79
3513	Greenaway and Milner Index	21	24	21	17	82	76	19	8	17	19	18	21	21	21	23
	G & L not set	75	71	77	84	95	90	87	20	88	85	83	78	79	81	76
3523	Greenaway and Milner Index	56	56	64	67	89	87	62	58	57	59	62	61	64	66	71
	G & L not set	84	91	100	96	88	83	82	82	74	76	82	86	86	83	90
3530	Greenaway and Milner Index	2	11	18	17	81	65	3	5	16	13	27	27	32	27	6
	G & L not set	60	54	55	52	50	55	56	58	75	76	77	76	92	83	57
3560	Greenaway and Milner Index	55	57	51	54	89	74	60	45	55	52	51	49	47	48	48
	G & L not set	88	92	99	99	98	99	97	69	100	92	82	74	68	69	65

CIUU	INDEXES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
3620	Greenaway and Milner Index	13	16	13	12	89	81	14	19	19	15	17	19	18	22	26
	G & L not set	88	82	72	67	71	77	74	86	96	84	90	97	91	98	90
3691	Greenaway and Milner Index	36	32	35	46	86	83	70	56	56	63	76	70	68	61	47
	G & L not set	76	77	68	82	80	81	87	75	75	86	84	75	72	65	51
3699	Greenaway and Milner Index	31	41	42	39	85	86	33	32	32	29	31	40	39	32	25
	G & L not set	79	84	93	89	90	93	92	93	90	96	86	75	71	62	53
3710	Greenaway and Milner Index	11	13	12	10	63	58	8	6	9	8	8	6	6	5	4
	G & L not set	89	97	99	94	94	97	90	91	72	83	83	61	65	57	49
3813	Greenaway and Milner Index	30	25	20	30	69	39	32	25	46	47	33	28	27	34	31
	G & L not set	49	55	41	52	45	98	57	49	78	97	74	82	84	81	98
3909	Greenaway and Milner Index	28	33	29	25	90	85	25	28	26	24	14	14	2	13	0
	G & L not set	80	87	81	76	67	73	80	87	97	86	96	96	55	100	2

Source: Own elaboration using the figures, using [20].

5. CONCLUSION

In the evaluation of the IIC in Colombia, it was found that printing, publishing and related industries, the manufacture of plastic products, the manufacture of clay products for the construction and manufacture of soaps and cleaning preparations, perfumes, cosmetics and others The only economic activities in the country where it was possible to confirm the existence of important levels of IIC. However, the participation of these sectors in Colombian imports and exports for the last years ranges between 2% and 4%; Indicating that its incidence is low in Colombian international trade, it is evident that in Colombia the majority of trade is inter-industrial.

In this context, the non-existence of the IIC does not allow the expansion of activities with a high value-added content inside and the benefits derived from this type of trade that are generally greater than those arising from the CIN because they include benefits related To economics of scale, on this point associating the increasing returns to scale to economic geography would lead to rethinking the localization theories that tend to processes of spatial agglomeration of the economic agents to enhance the competitive advantages.

Colombia has the export structure biased towards primary products and it is imperative to move to export manufactures that incorporate medium technology, to avoid the macroeconomic impacts brought by mining energy bonanzas, and thus to generate more opportunities for the IIC to lead to productive chains that can lead Economic growth. The role of the Colombian State should be aimed at fostering research and development in sectors considered essential for growth and economic development, taking risks that the private sector would not dare to consider, especially in the different stages of technological innovation.

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