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Comprehensive Analysis of Tariff Barriers Worldwide: A Composite Assessment Approach

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ARTICLE DETAILS	ABSTRACT
History <i>Revised format: February 2021</i> <i>Available Online: March 2021</i>	International trade has fundamental importance for all the countries and the analysis concerning international trade particularly concerning tariff barriers is high on the agenda of researchers in the field of economics, business and politics. Aim of the study is to assess the world tariff barriers of 158 countries. Overall design of the study comprises of a crisp literature review, data extraction and analysis. It is a study of one hundred fifty-eight countries that uses secondary data taken from World Development Indicators (WDI) 2020. It uses Grey Relational Analysis (GRA) as research methodology. Results of GRA show that Macao SAR, China, Hong Kong, Singapore, Montenegro, Mauritius, Brunei Darussalam, Myanmar, Chile, Peru and Australia have relatively highest grey relational grades meaning thereby, low tariff trade barriers whereas Grenada, Antigua and Barbuda, Belize, Central African Republic, Nepal, Guinea-Bissau, Fiji, Gabon, Barbados, Djibouti, St. Kitts and Nevis have lowest grey relational grade meaning thereby, these countries have high level of tariff based barriers of international trade. Interestingly, all the member countries of European Union occupy the rank of 27 (i.e. all countries have the same rank) which can be explained in the perspective of their union of tariff. Since, they have uniformed tariff policy as against rest of the world, therefore, have same rank. It is a study based on reliable real time data set. The study has value for all stakeholders i.e. international community, local governments, society at large, policy makers, researchers and international institutions.
Keywords <i>Business, GRA, GRG, international trade, Pakistan, Tariff barriers.</i>	
JEL Classification: <i>M40, M48</i>

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1. Introduction

In the era of globalization tariff and non-tariff barriers are being removed by most of the countries in general and at bloc level in particular. Certain groups of countries have been very successful in this regard e.g. European Union. Pinpointing and assessing the barriers in international trade at country levels is high on the agenda of main stream economists. Country level comparisons are also fertile topics being investigated by contemporary researchers. It is important and research worthy for effectiveness of coordinated improvement to facilitate cross border trade. Avalanche of published literature is available in the area viz non-tariff barriers in Syria (Chemingui & Dessus, 2008), trade liberalization and competition in China (Deng et al., 2020), trade policy of Uruguay (Estrades & Flores, 2020), challenges of non-tariff barriers in Japanese Market (Maguire, 2001), tariff & non-tariff barriers and examine of inequality and trade policy of India (Ural Marchand, 2019), challenges of regulating water and sanitation tariff in Brazil (Sampaio & Sampaio, 2020), non-tariff barriers on chicken import in Russia (Soon & Thompson, 2020), income inequality and tariff reform in Indonesia (Vadila & Resosudarmo, 2020), China's tariffs on U.S. hardware product (Zhang et al., 2020). From the context stated in the literature it can be learned that country level assessment of tariff related barriers is imperative to provide insights to the stake holders. It is an ever green issue for research. Particularly the composite assessment of tariff barriers is call of the day. Objective of the research is therefore to assess, rank and discuss position of 158 countries on tariff related trade barriers. The study has been built on mathematical methodology opted from wide array of methodological choices viz ANP, FANP, DEMATEL, AHP, PROMETHEE, TOPSIS, DEA, GRA, VIKOR, SWARA, ISM, TISM, MICMAC, FMICMAC, IPA, ELECTRE, NSGA-II, MADM, MAGDM, ARAS-F, FMEA-Model, ELECTRE-III, COPRAS-G, MULTI-MOORA, ARAS, WASPAS, MOORA, LP, IRP, SEM and Regression. To be more specific the study uses Grey Relational Analysis (GRA) as technique of data analysis. GRA is the most popular and applied part of grey systems theory. Rest of the paper is arranged as literature review, methodology, analysis & discussion and conclusion.

2. Literature Review

The problem under investigation is espoused in the domain of economics in general and in international trade in particular. The literature of economics in the context of international trade is filthy rich. It is pertinent to set out the context of the study to account for the relevant contemporary literature. In this context, we explored wide range of literature from within the renowned data bases e.g. ScienceDirect, Emerald, Wiley Blackwell, Taylor&Francis, JStor, Ebsco Host, etc. Apart from the general literature on international trade, while exploring the literature, researchers found numerous studies carried in the context of tariff and non-tariff barriers (Chemingui & Dessus, 2008; Cheong & Tang, 2018; Daly et al., 2000; DaSilva-Glasgow, 2020; Fugazza & Maur, 2008; Grundke & Moser, 2019; Imbruno, 2016; Jørgensen & Schröder, 2003; Juust et al., 2020; Knobel et al., 2019; Liu et al., 2019; Magee et al., 2019; Maguire, 2001; Manzoor et al., 2019; Niu et al., 2018; Okumura, 2015; Santeramo & Lamonaca, 2019; Schuenemann & Kerr, 2019; Soon & Thompson, 2020; Toshimitsu, 2008; Winchester, 2009). Aisbett and Silberberger (2020) found that countries where tariff liberalization is higher, producers can adopt relatively cheaper standard and perform at top of the list. Cambini and Soroush (2019) proposed a grid tariffs to account for costs under mechanism of net metering and concluded that employing a multi-part tariffs (variable component that imitates net effect on operating cost together with fixed component that imitates cyclical grid-connection cost of distribution networks) there is possibility to mitigate the snags of optimize prosumption and net metering. Cary (2020) uncovered that tariffs implementation invoke inefficiency, furthermore it has no effect on carbon dioxide emissions but has direct positive relationship with carbon intensities. Giammetti (2020) bolstered that Brexit costs not only for UK but also for many Europeans countries, at worst, the 0.28 and 0.5 % of value added respectively and allowed countries and sectors to partially substitute the foreign products. Hayakawa et al. (2020) analyzed the relationship of import-tariff and export expansions and found a direct positive relationship between them. The study further reported that 1% decrease in importers' tariff escalate 0.8% import freight rates; reduce around 1.1% export freight rates and increase export by 0.6% to 1%. He et al. (2019) affirmed that optimal

tariffs significantly decrease by 26% globally on average after trade imbalance which is advantageous to the global trade liberalization. Juust et al. (2020) documented that confiscation of non-tariff industry specific barrier played a pertinent role in expediting European automotive exports. Kang and Dagli (2018) argued that high tariff has significant negative direct and indirect impact on trade. It is further highlighted that indirect negative effect has bigger impact than direct impact. Knobel et al. (2019) carried a comprehensive empirical study and bolstered that decrease in non-tariff barriers and decrease in time in trade costs of goods result in significant improvement in welfare gains as % of consumption of 1.7% for Kazakhstan, 4.8% for Armenia, 7.2% for Belarus and 3.6% for Russia. Nawaz (2019) proposed a dynamic model that originates an optimal tariff for specific import to curtail the efficiency losses during adjustment procedure. Ortiz Valverde and Latorre (2020) stated that removal of UK's tariff, advent of MFN tariffs and removal of restriction to migration broadly impacts on micro and macroeconomic of UK, China, US, EU and rest of the world. Slany (2019) revealed a significant negative impact of trade policies on foreign value added of charged tariff and positive correlated with telecommunication infrastructure. Tovar (2019) asserted that there is evident of tariff complementarity i) consumption rises, ii) greater reduction in import protection and iii) fall in imports from rest of the world. Vadila and Resosudarmo (2020) investigated that provinces having acquaintance to tariff liberalization experiencing relatively lesser income inequality, the study further highlighted that tariff cuts cause in decrease in poverty reduction. From the representation of the literature it is evident that there is enormous dispersed literature directly and indirectly related to the trade barriers. However, there is hardly any study that directly addresses the issue at global level. In order to specify the issue, it is not out of context to postulate the theoretical framework of the study.

3. Theoretical Framework

The study follows theoretical framework as used in World Development Indicators (WDI-2020) for representation of data set. Since, the study has adopted the data set from WDI, therefore, the variables specifications, unit of measurement and the definitions have also been adopted from WDI (Table 1). However, the variables as specified have been explored and aligned with the existing literature. A brief representation of literature concerning the variables is herein accounted for. Suwanprasert (2020) asserted that trade restrictiveness index of non-tariff barriers can be achieved *weighted average mean of non-tariff* barriers and it is further claimed that aggregated of non-tariff barriers can exactly be measured unlike other indexes having persistent measurement errors. Ino and Miyaoka (2020) affirmed that in case of *homogenous products*, higher *domestic* welfare is evident than *import tariff* to maximize profitability of *domestic* industry; and in case of *differentiated products* production control mechanism is fluctuated depending upon the variability of the products. The study further argued that government has control over *domestic production* of foreign firms particularly for *homogenous products*. Kuenzel (2020) found a significant inverse relationship between *tariff overhangs* and trade policy activity. Different *share of tariff lines* result in alternate outcome; like lower tariff overhangs compel countries to increase Most-Favored Nation (MFN) applied rates without consideration of past tariff independent changes and legal ramifications. Lichtenberg and Olson (2020) buttressed that *tariff rates* put insignificant effects on anticipated intrusive pest introductions facing presently positive *tariffs*. It is further proclaimed that different *tariff lines share* may result in lower consumer welfare and weaken United States trade policy.

Table 1: Specification of Variables

Code	Variable	Measure	Criteria
1	All Products Binding Coverage	% MRV	Smaller is Best
2	All Products Weighted Mean tariff	% MRV	Smaller is Best
3	All Products Share of Tariff lines with International Peaks	% MRV	Smaller is Best
4	All Products Share of Tariff lines with Specific Rates	% MRV	Smaller is Best
5	Primary Products Weighted Mean Tariff	% MRV	Smaller is Best
6	Manufactured Products Weighted Mean Tariff	% MRV	Smaller is Best

The variables have been selected from the website of WDI on the basis of availability of the data and relevance to the phenomenon under investigation. Total six variables (Table 1) qualify for inclusion in

investigation. All variables possess the characteristic “smaller is best”.

4. Methodology

This quantitative research study follows positivism as research philosophy and deduction as research approach. It is a study of 158 countries using the secondary data extracted from the website World Development Indicators (WDI) 2020. Overall design of the study entails on review of literature, data elicitation and analysis. Traditional procedure of Grey Relational Analysis (GRA) has been applied to the data as a technique of analysis. GRA is unique methodology that has the capability to accommodate wide range of alternatives with multitude of different criteria. The scheme of symbols and the procedure has been adopted from Ertugrul et al. (2016); Qazi et al. (2021) and Niazi et al. (2021).

4.1 Grey Relational Analysis

Step 1: Created a data set and established decision matrix *Equation 1*.

$$x_i(k) = \begin{bmatrix} x_1(1)x_1(2) & \cdots & x_1(m) \\ \vdots & \ddots & \vdots \\ x_n(1)x_n(2) & \cdots & x_n(m) \end{bmatrix} \quad \text{Equation 1}$$

Table 2: Tariff Data of Countries

Sr.	Country	1	2	3	4	5	6
1	Albania	100	0.9	6.84	0	1.3	0.6
2	Angola	100	9.4	21.9	0	18	7.1
...		...	...	...	...	...	...
...		...	...	...	...	...	...
109	Pakistan	99	10	49.4	0	7.7	12
110	Panama	94	5.4	0.62	0.1	14	5.1
...		...	...	...	...	...	...
...		...	...	...	...	...	...
157	Zambia	18	6.2	27.1	0	4	7.4
158	Zimbabwe	24	5	18.9	6	5.5	4.5

Source of Data: (World Development Indicators (WDI), 2020)

Step 2: Created reference series and comparison matrix *Equation 2*

$$x_0 = [x_0(k) \dots \dots \dots x_0(n)] \quad \text{Equation 2}$$

Table 3: Reference Sequence and Comparable Sequences

Sr.	Country	1	2	3	4	5	6
0	Reference Sequence	0	0	0	0	0	0
1	Albania	100	0.9	6.84	0	1.3	0.6
2	Angola	100	9.4	21.9	0	18	7.1
...		...	...	...	...	...	...
...		...	...	...	...	...	...
109	Pakistan	99	10	49.4	0	7.7	12
110	Panama	94	5.4	0.62	0.1	14	5.1
...		...	...	...	...	...	...
...		...	...	...	...	...	...
157	Zambia	18	6.2	27.1	0	4	7.4
158	Zimbabwe	24	5	18.9	6	5.5	4.5

Step 3: Created a normalized matrix *Equation 3* and prepare Table 3:

$$\text{Smaller the best } x_i(k) = \frac{\max x_i^{(0)}(k) - x_i^{(0)}(k)}{\max x_i^{(0)}(k) - \min x_i^{(0)}(k)} \quad \text{Equation 3}$$

Table 4: Normalized Comparable Sequences

Sr.	Country	1	2	3	4	5	6
-----	---------	---	---	---	---	---	---

0	Reference Sequence	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	Albania	0.0000	0.9571	0.9055	1.0000	0.9658	0.9700
2	Angola	0.0000	0.5524	0.6975	1.0000	0.5263	0.6450
...		...	...	...	...	...	...
...		...	...	...	...	...	...
109	Pakistan	0.0100	0.5238	0.3177	1.0000	0.7974	0.4000
110	Panama	0.0600	0.7429	0.9914	0.9872	0.6316	0.7450
...		...	...	...	...	...	...
...		...	...	...	...	...	...
157	Zambia	0.8200	0.7048	0.6257	1.0000	0.8947	0.6300
158	Zimbabwe	0.7600	0.7619	0.7390	0.2308	0.8553	0.7750

For example, calculation of Albania, ‘all products binding coverage’.

$$x_1^*(1) = \frac{\max x_1^0(1) - x_1^0(1)}{\max x_1^0(1) - \min x_1^0(1)} = \frac{100 - 100}{100 - 0} = 0.0000$$

Step 4: Obtained absolute values by calculating deviation sequence from desires value *Equation 4*

$$\Delta_0(\gamma) = |x_0(\gamma) - x_1(\gamma)| \quad \text{Equation 4}$$

Table 5: Deviation Sequences

Sr.	Country	1	2	3	4	5	6
0	Reference Sequence	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	Albania	1.0000	0.0429	0.0945	0.0000	0.0342	0.0300
2	Angola	1.0000	0.4476	0.3025	0.0000	0.4737	0.3550
...		...	...	...	...	...	...
...		...	...	...	...	...	...
109	Pakistan	0.9900	0.4762	0.6823	0.0000	0.2026	0.6000
110	Panama	0.9400	0.2571	0.0086	0.0128	0.3684	0.2550
...		...	...	...	...	...	...
...		...	...	...	...	...	...
157	Zambia	0.1800	0.2952	0.3743	0.0000	0.1053	0.3700
158	Zimbabwe	0.2400	0.2381	0.2610	0.7692	0.1447	0.2250

For example, calculation of deviation for ‘all products weighted mean tariff’.

$$\Delta_{02}(2) = |x_0^*(2) - x_2^*(2)| = |1 - 0.5524| = 0.4476$$

Step 5: Established a co-efficient matrix of grey relation system *Equation 5*.

$$\gamma[x_0^*(k), x_i^*(k)] = \frac{\Delta_{min} + \xi \Delta_{max}}{x_{0i}(k) + \xi \Delta_{max}}, \quad 0 < \gamma[x_0^*(k), x_i^*(k)] \leq 1 \quad \text{Equation 5}$$

Table 6: Grey Relational Co-efficient

Sr.	Country	1	2	3	4	5	6
0	Reference Sequence	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	Albania	0.3333	0.9211	0.8411	1.0000	0.9360	0.9434
2	Angola	0.3333	0.5276	0.6231	1.0000	0.5135	0.5848
...		...	...	...	...	...	...
...		...	...	...	...	...	...
109	Pakistan	0.3356	0.5122	0.4229	1.0000	0.7116	0.4545
110	Panama	0.3472	0.6604	0.9832	0.9750	0.5758	0.6623
...		...	...	...	...	...	...
...		...	...	...	...	...	...
157	Zambia	0.7353	0.6287	0.5719	1.0000	0.8261	0.5747
158	Zimbabwe	0.6757	0.6774	0.6570	0.3939	0.7755	0.6897

For example, grey relational co-efficient for ‘all products weighted mean tariff’.

$$\gamma[x_0^*(2), x_2^*(2)] = \frac{\Delta_{min} + \xi \Delta_{max}}{\Delta_2(2) + \xi \Delta_{max}} = \frac{0 + (0.5) \times 1}{0.4476 + (0.5) \times 1} = 0.5276$$

Step 6: Calculated GRA grade Equation 6 and Equation 7

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^n \beta_k \gamma [x_0^*(k), x_i^*(k)] \quad \text{Equation 6}$$

$$\sum_{k=1}^n \beta_k = 1 \quad \text{Equation 7}$$

Table 7: Grey Relational Grades (GRGs)

Sr.	Country	GRGs
0	Reference Sequence	1.0000
1	Albania	0.8291
2	Angola	0.5971
...		...
...		...
109	Pakistan	0.5728
110	Panama	0.7006
...		...
...		...
157	Zambia	0.7228
158	Zimbabwe	0.6449

For example, calculation of GRG for Angola:

$$\gamma(x_0^*, x_2^*) = \sum_{k=1}^n \beta_k \gamma [x_0^*(2), x_2^*(k)]$$

$$= 0.1667 \times (0.3333 + 0.5276 + 0.6231 + 1.0000 + 0.5135 + 0.5848) = 0.5971$$

5. Results & Discussion

The phenomenon of tariff barriers has of fundamental importance in international trade. It is an evergreen area investigated by economists. Therefore, the study in hand has also taken it as object of investigation. This study has approached the issue in different way. It used secondary data and applied mathematical methodology from gray system theory to analyze compositely a multitude of cross sections and criteria. Study used GRA, the results of which are given below (Table 8). In order to provide logical and structured understanding to the readers the study has evolved scheme of classifying the countries on the basis of their performance on removing, eliminating or minimizing the tariff barriers.

Table 8: Results of Grey Relational Analysis

Country	GRG*	Rank	Country	GRG*	Rank	Country	GRG*	Rank
Reference Sequence	1.0000	0	United Kingdom	0.7770	27	Ecuador	0.6575	106
Macao SAR, China	0.9402	1	El Salvador	0.7728	54	Argentina	0.6569	107
Hong Kong	0.9167	2	Indonesia	0.7708	55	Uruguay	0.6555	108
Singapore	0.8972	3	North Macedonia	0.7697	56	Bangladesh	0.6458	109
Montenegro	0.8890	4	United States	0.7670	57	Zimbabwe	0.6449	110
Mauritius	0.8856	5	Mozambique	0.7666	58	Brazil	0.6353	111
Brunei	0.8823	6	Kyrgyz Republic	0.7616	59	Guyana	0.6322	112
Darussalam	0.8823	6						
Myanmar	0.8717	7	Nicaragua	0.7603	60	Ghana	0.6312	113
Chile	0.8683	8	Armenia	0.7602	61	Tonga	0.6278	114
Peru	0.8611	9	Kazakhstan	0.7557	62	Mauritania	0.6271	115
Australia	0.8564	10	Georgia	0.7517	63	Kenya	0.6224	116

Albania	0.8291	11	Norway	0.7459	64	Cambodia	0.6199	117
Lao PDR	0.8218	12	Switzerland	0.7457	65	Rwanda	0.6164	118
Costa Rica	0.8213	13	Honduras	0.7443	66	Congo, Rep.	0.6157	119
Eswatini	0.8164	14	Turkey	0.7414	67	Togo	0.6150	120
Israel	0.8161	15	Papua New Guinea	0.7403	68	Cameroon	0.6132	121
New Zealand	0.8157	16	Moldova	0.7393	69	Burkina Faso	0.6126	122
Ukraine	0.8153	17	Japan	0.7370	70	Cote d'Ivoire	0.6104	123
Oman	0.8115	18	Korea, Rep.	0.7301	71	Sri Lanka	0.6082	124
Iceland	0.8091	19	Seychelles	0.7271	72	Dominica	0.6082	125
Mexico	0.8084	20	Saudi Arabia	0.7250	73	Mali	0.6024	126
Philippines	0.8064	21	Kuwait	0.7245	74	St. Vincent and Grenadines	0.5996	127
Guatemala	0.7983	22	Colombia	0.7244	75	Gambia, The	0.5985	128
Lesotho	0.7944	23	Qatar	0.7229	76	Angola	0.5971	129
Botswana	0.7941	24	Zambia	0.7228	77	Trinidad and Tobago	0.5927	130
Canada	0.7930	25	Malawi	0.7190	78	St. Lucia	0.5921	131
Namibia	0.7898	26	China	0.7187	79	Vanuatu	0.5920	132
Austria	0.7770	27	Vietnam	0.7171	80	Tunisia	0.5894	133
Belgium	0.7770	27	Mongolia	0.7167	81	Guinea	0.5862	134
Bulgaria	0.7770	27	Russian Federation	0.7132	82	Congo, Dem. Rep.	0.5842	135
Croatia	0.7770	27	Thailand	0.7098	83	Venezuela, RB	0.5837	136
Czech Republic	0.7770	27	Jordan	0.7079	84	Maldives	0.5822	137
Denmark	0.7770	27	Morocco	0.7076	85	Samoa	0.5750	138
Estonia	0.7770	27	Burundi	0.7060	86	Pakistan	0.5728	139
Finland	0.7770	27	Paraguay	0.7058	87	Chad	0.5709	140
France	0.7770	27	Malaysia	0.7056	88	Jamaica	0.5656	141
Germany	0.7770	27	Yemen, Rep.	0.7051	89	Cabo Verde	0.5648	142
Greece	0.7770	27	Panama	0.7006	90	Solomon Islands	0.5621	143
Hungary	0.7770	27	Dominican Republic	0.7001	91	Niger	0.5506	144
Ireland	0.7770	27	Madagascar	0.6956	92	Senegal	0.5487	145
Italy	0.7770	27	South Africa	0.6929	93	Sierra Leone	0.5466	146
Latvia	0.7770	27	Tajikistan	0.6927	94	Benin	0.5438	147
Lithuania	0.7770	27	Uganda	0.6863	95	Grenada	0.5430	148
Luxembourg	0.7770	27	Cuba	0.6817	96	Antigua and Barbuda	0.5386	149
Malta	0.7770	27	United Arab Emirates	0.6795	97	Belize	0.5368	150
Netherlands	0.7770	27	Suriname	0.6717	98	Central African Republic	0.5326	151
Poland	0.7770	27	Tanzania	0.6692	99	Nepal	0.5186	152
Portugal	0.7770	27	India	0.6682	100	Guinea-Bissau	0.5166	153
Romania	0.7770	27	Nigeria	0.6660	101	Fiji	0.5128	154
Slovak Republic	0.7770	27	Haiti	0.6654	102	Gabon	0.5040	155
Slovenia	0.7770	27	Bahrain	0.6651	103	Barbados	0.5017	156
Spain	0.7770	27	Bolivia	0.6650	104	Djibouti	0.4886	157
Sweden	0.7770	27	Egypt, Arab Rep.	0.6623	105	St. Kitts and Nevis	0.4810	158

*GRG - Grey Relational Grade

Results of GRA show that Macao SAR China, Hong Kong, Singapore, Montenegro, Mauritius, Brunei Darussalam, Myanmar, Chile, Peru and Australia have relatively highest GRGs, therefore have relatively low tariff trade barriers, whereas, Grenada, Antigua and Barbuda, Belize, Central African Republic, Nepal, Guinea-Bissau, Fiji, Gabon, Barbados, Djibouti, St. Kitts and Nevis have lowest GRGs, therefore, have high level of tariff based barriers of international trade. All the member countries of European Union occupy rank 27 (i.e. all countries have the same rank) which can be explained in the perspective of their union on tariff. Since, they have uniformed tariff policy as against rest of the world, therefore, and have same GRG as for as the tariff barriers are concerned, therefore, occupy the same rank.

With an aim of assessment of world tariff barriers and analysis of secondary data is performed in order to rank the countries. It is vital to evaluate countries' performance qua each other. Applying the procedure of GRA the data was normalized, compared with reference series, deviation were calculated, GRA coefficient was worked out and the coefficient were computed. On the basis of GRG, grades have

been computed and arranged in descending order. This methodology is different and unique and less applied in the area of economics. Hence, this study is different from contemporary studies; however its results are aligned with contemporary literature. The results of this study can be contrasted with that of some studies from existing literature (Table 9).

Table 9: Contrast of Results of the Study with Contemporary Literature

Studies	Focus	Variables/Factors	Methodology	Results
Current	Tariff barriers	Weighted average mean of tariff, products, tariff, share of tariff, tariff rates.	Grey relational analysis	China, Hong Kong and Singapore rank on top of the 158 countries having low tariff barriers. EU occupy at rank 27. Gabon, Barbados, Djibouti and Kitts & Nevis occupy bottom, hence, have high levels of tariff trade barriers.
Kuenzel (2020)	WTO tariff commitments and temporary protection	Trade policy, political economy motives, macroeconomic factors, import surges and terms-of-trade effects, retaliation	Fixed effects logit model, linear probability model	It is found a significant inverse relationship between tariff overhangs and trade policy activity.
Lichtenberg and Olson (2020)	Government-induced production commitment vs. import tariff Trade	Production control policy, domestic social welfare, import tariff	Empirical analysis	Different tariff lines share may result in lower consumer welfare and weaken United States trade policy.
Suwanprasert (2020)	Restrictiveness Index of Non-Tariff Barriers	Preference, production, non-tariff barriers, equilibrium	Simulation, statistics equation	Aggregated of non-tariff barriers can exactly be measured by using proposed model.

The studies: Kuenzel (2020), Lichtenberg and Olson (2020) and Suwanprasert (2020) are comparable with the study in hand and are in general aligned with it. However, our study is different in number of countries under study, variables under study, methodology used, results and information contributed towards the body of knowledge.

6. Conclusion

International trade is a reality and the tariff barriers are intertwined with international trade. Rationalization, changes, elimination and reduction in tariff barriers is a continuous process having fundamental importance. It remained high on agenda of research in every regime. Comparing countries on basis of tariff is natural. This study also has same agenda but it approaches it in novel way. It uses GRA to compare countries and contributes valuable information in form of grey coefficients and grey relational grades. Study compares selected 158 countries on basis of six variables (Table 1). Results show that Macao SAR China, Hong Kong, Singapore, Montenegro, Mauritius, Brunei Darussalam, Myanmar, Chile, Peru and Australia are the countries that have high Grey Relational Grades (GRGs) rank on top among 158 countries meaning thereby low levels of tariff trade barriers. The member countries of EU (viz Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and United Kingdom) have 0.7770 GRG and occupy rank 27 (i.e. the same rank). Since, EU is a union of European countries on tariff, therefore, they are graded identical qua rest of the world. Whereas, Grenada, Antigua and Barbuda, Belize, Central African Republic, Nepal, Guinea-Bissau, Fiji, Gabon, Barbados, Djibouti, St. Kitts and Nevis have low GRGs and occupy bottom ranks meaning thereby having high levels of tariff trade barriers. The study has theoretical and practical contributions towards body of knowledge that include grey relational coefficients and grades calculated for each country. It is useful for political governments for redressing policies, businessmen for rethinking and reframing the trade priorities, for researchers to refine the research frameworks. This study has some limitations as well. Firstly, it is based

on cross sectional secondary data taken from WDI 2020 therefore the contextual limitation exists. Future studies may use some other dataset to verify the results qua reality. Secondly, it uses GRA as methodology the results should be confirmed through equivalent methods. Thirdly all variables have been given equal weights by dividing 1 by six (number of variables) this scheme can be rationalized by using Entropy method or expert opinion method.

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