

Evaluating Unemployment through Grey Incidence Analysis Model: A Study of One Hundred Thirteen Selected Countries



Abdul Aziz Khan Niazi	Institute of Business & Management, University of Engineering and Technology, Lahore, Punjab, Pakistan.
Tehmina Fiaz Qazi	Hailey College of Banking and Finance, University of the Punjab, Lahore, Punjab, Pakistan.
Abdul Basit	Lahore Institute of Science & Technology, Lahore, Punjab, Pakistan. Email: abasisit_shahbaz@yahoo.com

Abstract: The purpose of the study is to gauge the unemployment level of selected one hundred and thirteen countries. The design of the study includes a survey of the literature, extraction of relevant data and analysis. The study follows a quantitative paradigm of research that uses secondary data set taken from the website of World Development Indicators (WDI). The analysis encompasses selected countries based on the availability of data. The data has been analyzed using Grey Incidence Analysis Model, commonly known as GRA. For interpretation of the results, the methodology has been augmented with the scheme of ensigns (i.e. classification of countries into Extremely Low, Very Low, Low, Moderate, High, Very High, Extremely High) of the level of unemployment. Results show that J&APR have an extremely low level of unemployment and member countries of SADC have an extremely high level of unemployment. Pakistan fall under the ensign of very low, therefore have a low level of unemployment. It is valuable to study equally useful for governments, academia and the international community. This study provides critical new information on the phenomenon.

Key Words: Unemployment, Grey Incidence Analysis Model, GRA, Pakistan

Introduction

Sustenance is the foremost on the list of human activities. Employment is one of the mediums to accomplish the activity of sustenance. The political governments being legitimate representatives of citizens of the country, are the most concerned stakeholders of the level of employment in a country. Unemployment is the direct question of deprivation of sustenance—higher the level of unemployment questions the very existence of political government. The phenomenon of unemployment attracts great attention of governments and is always a worthy research topic. Governments strive to keep the level of unemployment as low as possible. Evaluation of the country's unemployment level as against the rest of the world is an evergreen area of analysis. There is no dearth of research studies on unemployment; admittedly, there is an influx of literature. [Cappelli et al. \(2020\)](#) analyzed 248 European Union regions to investigate the impact on unemployment during the 2008 crises and measured economic and technological resilience; the study showed that technological resilience is a better predictor of unemployment

resistance. [Doppelt \(2019\)](#) proposed a macroeconomic model discussing in detail the human capital in relation to unemployment. [Hall and Zoega \(2020\)](#) bolstered that better bargaining power and unemployment benefits have a significant effect on escalating leisure enjoyment and dipping employment in Europe. In addition to this, the unemployment benefit has raised the 12% layoff probability ([Albanese et al. 2020](#)). [Onwachukwu and Okagbue \(2019\)](#) gathered data from 175 countries for the period of 1991-2017 and stated that the countries that joined World Trade Organization (WTO) between 2011-2017 had the lowest unemployment as compared to the countries joined between 1995-1999 and 2000-2010. [Pohlan \(2019\)](#) uncovered some social (life satisfaction & social integration perception) and economic (access to economic resources) consequences of unemployment. [Rhee and Song \(2020\)](#) concluded that nominal wage rigidities result in an increase in real wages and unemployment. [Sibande et al. \(2019\)](#) analyzed data from 1855 to 2017 and found it insignificant in the direction of

unemployment to UK stock market returns, significant in opposite and bi-direction. In view of the representation, the apropos aim of the study is to evaluate the level of unemployment of one hundred thirteen countries, compare it on the basis of grey relational grades, classify the countries according to the level of unemployment prevailing in thereof and discuss the results of the model. For achieving these objectives multitude of methodologies were considered that include SEM, GMM, ISM, DEA, GRA etc. Grey Incidence Analysis Model (commonly known as GRA) was found to be the most appropriate methodology. It was also considered to opt for different types of available data sets on the unemployment level, and the data set available on the website of WDI is considered to be most appropriate and reliable. Therefore, the study uses GRA as a methodology and data set of WDI for achieving its objectives. The study is arranged as section one 'introduction', section two 'literature review', section three 'methodology', section four 'results & discussion' and section five 'concluding remarks'.

Literature Review

Avalanche of contemporary studies is available on unemployment across the globe including: unemployment and incubation center in Nigeria ([Akanle & Omotayo, 2020](#)), unemployment statistics in South Africa ([Alenda-Demoutiez & Mügge, 2020](#)), identified major determinants of unemployment in Colombia ([Arango & Flórez, 2020](#)), association of unemployment with human capital loss and suicide rate in Italy ([Bagliano et al., 2019](#); [Mattei & Pistori, 2019](#)), empirical findings of unemployment in an open economy of 18 OECD countries ([Bertinelli et al., 2020](#); [Khraief et al., 2020](#)), local unemployment and health in Ireland ([Briody et al., 2020](#)), coal-fired power stations closure and local unemployment in Australia ([Burke et al., 2019](#)), perseverance of unemployment rate over past century in US and UK ([Cho & Rho, 2019](#)), policy reforms of zero level unemployment benefits in Belgium ([Cockx et al., 2020](#)), unemployment benefits and experience in East Asia ([Hwang, 2019](#)), affects of financial development and energy sources on unemployment in Egypt ([Ibrahiem & Sameh, 2020](#)), examine technology perception and its relation to unemployment in Gulf ([Jaradat et al., 2020](#)), hysteresis in unemployment for G7 countries as of 1980-2017 ([Jiang et al., 2019](#)), effects of unemployment benefits in Finland ([Kyyrã &](#)

[Pesola, 2020](#)), impact of parental unemployment in educational transition in Germany ([Lindemann & Gangl, 2019](#)), impacts of oil prices variation on unemployment in US and Canada ([Kocaaslan, 2019](#); [Nusair, 2020](#)), impact of unemployment on infant health in Japan ([Kohara et al., 2019](#)), impact of obesity and mobility disability on unemployment in Sweden ([Norrback et al., 2019](#)), effects of oil price changes on unemployment in Spain ([Ordóñez et al., 2019](#)), impact of local unemployment on Presidential election in Qatar ([Park & Reeves, 2020](#)), unemployment rate in Great Depression in USA ([Petrosky-Nadeau & Zhang, 2020](#)), unemployment spells and local labour market conditions in different districts of UK ([Pierce & McHale, 2020](#)), parental unemployment and child health in China ([Pieters & Rawlings, 2020](#)), unemployment in Europe before and after financial crises ([Pompei & Selezneva, 2019](#)), unemployment and property crime in Croatia ([Recher, 2020](#)), unemployment affects on self-perceived health in France ([Ronchetti & Terriau, 2019](#)), unemployment rate trend in Turkey ([Sengul & Tasci, 2020](#)), unemployment in Switzerland during in time of COVID-19 ([Sheldon, 2020](#)), impact of lower wages on unemployment/employment in Indonesia ([Siregar, 2020](#)), unemployment causes overweight, obesity and over obesity in Brazil ([Triaca et al., 2020](#)), impact of unemployment on non-monetary quality of job in Europe ([Voßemer, 2019](#)).

[Bauer and Weber \(2020\)](#) stated that the shutdown in Germany during the COVID-19 period caused 60% (117,000 persons) unemployment in April as compared to inflows in employment. [Blustein et al. \(2020\)](#) highlighted the global unemployment crisis evoked by the COVID-19 outbreak and also uncovered how that unemployment catastrophe has been different from preceding unemployment phases.

Theoretical Framework and Variable Specification

Gender

[Albanesi and Şahin \(2018\)](#) stated that the male-female unemployment gap and disparity between their unemployment rates was positive till the early 1980s, and later in 1983, this gap moved out except during the period of recessions. [Fađoš and Bohdalová \(2019\)](#) analyzed gender inequality in relation to the unemployment rate for 27 countries of the European Union between 2005-2017 and found mixed results.

[Longhi \(2020\)](#) conducted a longitudinal study on ethnic unemployment differentials in the UK with a special focus on Pakistani, Bangladeshi, Indian black the Caribbean and black African men and women in comparison to white British men and women and revealed a higher unemployment rate in ethnic minorities as compared to white British men and women. Similar study and findings have also been carried out by Li & Heath (2020). [Tüzemen \(2019\)](#) asserted that gender, age and skill have changed the determinants of the unemployment rate in the US, which was declined by 0.5% in 1994, by 4.5% at the end of 2017 and project 4.4% more decline rate at the end of 2022. [Yavorsky and Dill \(2020\)](#) proclaimed that unemployment causes men to enter into a female-dominated job at the expense of occupational prestige and wages.

Youth

[Clark and Lepinteur \(2019\)](#) examined the adult experience of unemployment from the age they left education up to 30 years age. [Dvouletý et al. \(2020\)](#) identified that along with ethnic background, education, age and gender, others factors such as the parental experience of unemployment, taking a risk, and religious attachment are pertinent determinants of young adults' unemployment. [Görmüş \(2019\)](#) argued that desire to work full time, lack of work experience & qualification, semi skill occupations are the major determinants of long-term youth unemployment.

[Liotti \(2020\)](#) concluded that economic crises had a severe impact on youth and adult unemployment from 2001-2006 in 20 Italian regions. [Johansson et al. \(2019\)](#) carried a study on adolescents in 27 countries across 2001/2002, 2005/2006, 2009/2010; and found lower adolescent life satisfaction in higher national unemployment rate countries. [Sansale et al. \(2019\)](#) asserted that the role of personality has a major determinant in employment/unemployment among young adults between 2008-2015 in the USA.

Education

[Lehti et al. \(2019\)](#); [Lindemann and Gangl \(2019\)](#); [Pieters and Rawlings \(2020\)](#) found that parental unemployment impacts siblings' educational outcomes, educational transition and child health. [Miettinen and Jalovaara \(2020\)](#) affirmed that education strongly modified the relationship between unemployment and parenthood transition both among men and women in a similar manner. [Schmillen \(2019\)](#) collected data from more than 800,000 graduates of vocational education over the period of 25 years and concluded that vocational education has a significant economic and statistical impact on unemployment that of professional career. [Wilczyńska et al. \(2020\)](#) proclaimed that occupational unemployment has no effect on permanent workers but has an adverse effect on temporary knowledge workers.

Table 1. Variables' Specification

Code	Variable to Assess Unemployment	Measure	Criteria
1	Unemployment Male	% of mlf	Minimum acceptable
2	Unemployment Female	% of flf	Minimum acceptable
3	Unemployment Youth Male	% of mlf * ages 15-24	Minimum acceptable
4	Unemployment Youth Female	% of flf ** ages 15-24	Minimum acceptable
5	Unemployment with basic education	% of tlf *** with basic education	Minimum acceptable
6	Unemployment with intermediate education	% of tlf *** with intermediate education	Minimum acceptable
7	Unemployment with advanced education	% of tlf *** with advanced education	Minimum acceptable

*Male labor force, **female labor force, and *** total labor force

Readers will find ensigns information extremely helpful in forming an informed opinion regarding a country's health system.

Methodology

The philosophical foundations of this study are more titled towards positivism. It is a deductive study using a cross-sectional time horizon based on archival

secondary data. It is a mono method mathematical type of research study. The design of the study consists of a critical survey of relevant literature available in the databases like ScienceDirect, Emerald, Wiley Blackwell, Taylor & Springer, Francis etc., extraction of data from the website of WDI and analysis. A complete data set of 113 countries on seven different variables were found available on the apropos website. Therefore, this study is envisaged on the analysis of

113 countries with 7 variables. The study employs Grey Incidence Analysis Model, commonly known as Grey Relational Analysis (GRA) (Uckun et al., 2012). GRA progresses stepwise (Hamzacebi et al., 2011; Kuo et al., 2008; Tayyar et al., 2014; Wu, 2002, Zhai et al., 2009). GRA has the capability to evaluate, analyze and compare alternatives against the cross-

sections. The data was extracted from the website in MS excel format, and GRA progressed stepwise using MS excel (formula prompt). However, since the analysis involves long tables, therefore, stepwise representation in this study is given by using the skip row technique.

Grey Incidence Analysis Model

The classical steps of GRA are used to implement the model

Step One

Original dataset for decision matrix

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

Table 2. Statistics of Unemployment

S. No	Country	1	2	3	4	5	6	7
1	Afghanistan	1	2	2	4	12	16	16
2	Albania	15	13	33	27	14	20	19
...
...
79	Pakistan	2	5	5	8	4	6	7
80	Panama	3	5	8	13	3	6	3
...
...
112	West Bank and Gaza	25	51	41	72	24	25	33
113	Zambia	8	7	16	16	11	14	7

Source: (WDI 2020)

Step Two

Incorporated reference and created comparison matrix:

$$x_0 = [x_0(k) \dots \dots \dots x_0(n)] \quad (2)$$

Table 3. Reference Series with Comparable Series

S. No	Country	1	2	3	4	5	6	7
0	Reference Sequence	0.6	0.60	1.2	1.2	0.6	1.1	0.9
1	Afghanistan	1.1	2.4	2.1	3.7	12	16	16
2	Albania	15	13	33	27	14	20	19
...
...
79	Pakistan	2.4	5.1	5.3	8.3	3.9	5.6	7.1
80	Panama	3.2	5.1	8.2	13	3.2	5.5	3.2
...
...
112	West Bank and Gaza	25	51	41	72	24	25	33
113	Zambia	7.5	6.9	16	16	11	14	7

Step Three

Normalized the data by using the following equation (3) (i.e., formula for normalization of data possessing the characteristic 'minimum acceptable'.

$$x_i(k) = \frac{\max x_i^{(o)}(k) - x_i^{(o)}(k)}{\max x_i^{(o)}(k) - \min x_i^{(o)}(k)} \tag{3}$$

Table 4. Normalization of Values

S. No	Country	1	2	3	4	5	6	7
0	Reference	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	Afghanistan	0.9795	0.9643	0.9808	0.9647	0.6481	0.4659	0.5296
2	Albania	0.4098	0.7540	0.3205	0.6356	0.5864	0.3226	0.4361
...
...
79	Pakistan	0.9262	0.9107	0.9124	0.8997	0.8981	0.8387	0.8069
80	Panama	0.8934	0.9107	0.8504	0.8333	0.9198	0.8423	0.9283
...
...
112	West Bank and Gaza	0.0000	0.0000	0.1496	0.0000	0.2778	0.1434	0.0000
113	Zambia	0.7172	0.8750	0.6838	0.7910	0.6790	0.5376	0.8100

To illustrate the calculation of Afghanistan 'unemployment male.'

$$x_1^*(1) = \frac{\max x_1^o(1) - x_1^o(1)}{\max x_1^o(1) - \min x_1^o(1)} = \frac{25 - 1.10}{25 - 0.60} = 0.9795$$

Step Four

Obtained absolute values by calculating deviation sequence.

$$\Delta_{0i}(k) = |x_0^*(k) - x_i^*(k)| \tag{4}$$

For the highest deviation following equation is used:

$$\Delta_{max} = \max_{j \in I} \max_{\forall k} |x_0^*(k) - x_j^*(k)| = 1 \tag{5}$$

For the lowest deviation following equation is used:

$$\Delta_{min} = \min_{j \in I} \min_{\forall k} |x_0^*(k) - x_j^*(k)| = 0 \tag{6}$$

Table 5. Deviation Sequence

S. No	Country	1	2	3	4	5	6	7
0	Reference	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	Afghanistan	0.0205	0.0357	0.0192	0.0353	0.3519	0.5341	0.4704
2	Albania	0.5902	0.2460	0.6795	0.3644	0.4136	0.6774	0.5639
...
...
79	Pakistan	0.0738	0.0893	0.0876	0.1003	0.1019	0.1613	0.1931
80	Panama	0.1066	0.0893	0.1496	0.1667	0.0802	0.1577	0.0717
...

S. No	Country	1	2	3	4	5	6	7
...
112	West Bank and Gaza	1.0000	1.0000	0.8504	1.0000	0.7222	0.8566	1.0000
113	Zambia	0.2828	0.1250	0.3162	0.2090	0.3210	0.4624	0.1900

To illustrate the calculation of deviation for 'unemployment, female.'

$$\Delta_{02}(2) = |x_0^*(2) - x_2^*(2)| = |1 - 0.7540| = 0.2460$$

Step Five

Grey relational co-efficient is determined on the basis of normalized sequences. The term ' ξ ' is distinguishing-co-efficient between 0 to 1. Its usual is value 0.5 in literature.

$$\gamma[x_0^*(k), x_i^*(k)] = \frac{\Delta_{min} + \xi \Delta_{max}}{x_{oi}(k) + \xi \Delta_{max}}, \quad 0 < \gamma[x_0^*(k), x_i^*(k)] \leq 1 \tag{7}$$

Table 6. Grey-Relational Co-efficient

S. No	Country	1	2	3	4	5	6	7
0	Reference	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	Afghanistan	0.9606	0.9333	0.9630	0.9340	0.5870	0.4835	0.5152
2	Albania	0.4586	0.6702	0.4239	0.5784	0.5473	0.4247	0.4700
...
...
79	Pakistan	0.8714	0.8485	0.8509	0.8329	0.8308	0.7561	0.7213
80	Panama	0.8243	0.8485	0.7697	0.7500	0.8617	0.7602	0.8747
...
...
112	West Bank and Gaza	0.3333	0.3333	0.3703	0.3333	0.4091	0.3686	0.3333
113	Zambia	0.6387	0.8000	0.6126	0.7052	0.6090	0.5196	0.7246

To illustrate reckoning of 'Grey Relational Co-efficient' for 'Unemployment, female' (2) To Albania

$$\gamma[x_0^*(2), x_2^*(2)] = \frac{\Delta_{min} + \xi \Delta_{max}}{\Delta_2(2) + \xi \Delta_{max}} = \frac{0 + (0.5) \times 1}{0.2460 + (0.5) \times 1} = 0.6702$$

Step Six

Worked out the weighted sum of "grey relational co-efficient" commonly known in the literature as "Grey Relational Grade" (8) and (9):

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^n \beta_k \gamma [x_0^*(k), x_i^*(k)] \tag{8}$$

$$\sum_{k=1}^n \beta_k = 1 \tag{9}$$

Table 7. Grey Relational Grades (GRGs)

S. No	Country	GRGs
0	Reference	1.0000
1	Afghanistan	0.7681
2	Albania	0.5104
...
...

S. No	Country	GRGs
79	Pakistan	0.8160
80	Panama	0.8127
...
...
112	West Bank and Gaza	0.3545
113	Zambia	0.6585

To illustrate grey relational grade for Albania

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

$$= 0.1429 \times (0.4586 + 0.6702 + 0.4239 + 0.5784 + 0.5473 + 0.4247 + 0.4700) = 0.5104$$

Scheme of Classification of Countries

In order to appropriately express and represent the country-level results of the apropos analysis, a scheme of ensigns have been introduced (Niazi et al. 2020). This scheme is designed on a continuum of low to high distributed into 7 items (i.e. *extremely low, very low, low, moderate, high, very high and extremely high*). The scheme of ensigns makes the results of the grey incidence

analysis model more meaningful, understandable, interpretable and comparable. This scheme also facilitated by way of bearing brackets of grey relational grades against the scale item. The number of countries has been grouped into stakes by dividing the total number of countries into total scale items Table 8.

Table 8. Scheme of Classification of Countries under Ensigns

S. No	Ensign	Grey Relational Grade	Explanation
1	Extremely Low	0.8408 -0.9884	Extremely Low Level of Unemployment
2	Very Low	0.8081-0.8399	Very Low Level of Unemployment
3	Low	0.7637-0.8067	Low Level of Unemployment
4	Moderate	0.7146 -0.7534	Moderate Level of Unemployment
5	High	0.6419 -0.7086	High Level of Unemployment
6	Very High	0.5240-0.6398	Very High Level of Unemployment
7	Extremely High	0.3545 -0.5122	Extremely High Level of Unemployment

Approximately sixteen countries are grouped against every scale item on the basis of scheme readers can establish a more informed opinion about

Results and Discussion

Result

Unemployment is ever a current problem of political governments the countries. Sustenance is the foremost activity of human being, so; therefore, a country level evaluation, analysis and comparison of levels of unemployment is agenda of high importance. The contemporary literature is not much fertile in evaluation, analysis and comparison of unemployment

among countries. One can hardly find a comparative study. Therefore, this study aimed to investigate the phenomenon. It addresses the issue in a novel way using a secondary set of data of a multitude of criteria and with a different type of methodology. Using the GRA (i.e. mathematical technique of data analysis with the capability of handling a multitude of variables, cases and time periods), the study has categorized 113 countries into seven categories (Table 8).

Table 9. Results of GRA

Country	*GRGs	Rank	Country	*GRGs	Rank	Country	*GRGs	Rank
Reference	1.0000	0	Switzerland	0.7936	38	Uruguay	0.6791	77

Country	*GRGs	Rank	Country	*GRGs	Rank	Country	*GRGs	Rank
Extremely Low			El Salvador	0.7913	39	Slovak Republic	0.6715	78
Cambodia	0.9884	1	Poland	0.7907	40	Finland	0.6691	79
Thailand	0.9715	2	Denmark	0.7872	41	Cyprus	0.6618	80
Myanmar	0.9418	3	Paraguay	0.7869	42	Very High		
Macao SAR, China	0.9148	4	Timor-Leste	0.7862	43	Zambia	0.6585	81
Vietnam	0.8902	5	Romania	0.7844	44	Nigeria	0.6557	82
Madagascar	0.8890	6	Austria	0.7810	45	Malawi	0.6459	83
Iceland	0.8665	7	Fiji	0.7753	46	Costa Rica	0.6455	84
Trinidad and Tobago	0.8656	8	Afghanistan	0.7681	47	Colombia	0.6419	85
Lao PDR	0.8597	9	Slovenia	0.7674	48	Ukraine	0.6398	86
Guatemala	0.8574	10	Moderate			Argentina	0.6351	87
United Arab Emirates	0.8515	11	Mozambique	0.7645	49	Croatia	0.6346	88
Liberia	0.8515	12	Rwanda	0.7640	50	France	0.6328	89
Czech Republic	0.8499	13	Honduras	0.7637	51	Mali	0.6207	90
Hong Kong SAR, China	0.8496	14	Indonesia	0.7534	52	Brunei Darussalam	0.6140	91
Mexico	0.8456	15	Estonia	0.7513	53	Samoa	0.6114	92
Cote d'Ivoire	0.8408	16	Bulgaria	0.7469	54	Turkey	0.6006	93
Very Low			Ghana	0.7422	55	Guyana	0.5994	94
Germany	0.8408	17	India	0.7411	56	Cabo Verde	0.5992	95
Moldova	0.8399	18	Luxembourg	0.7396	57	Italy	0.5939	96
Netherlands	0.8326	19	Bangladesh	0.7395	58	Extremely High		
Bolivia	0.8300	20	Mongolia	0.7379	59	Brazil	0.5688	97
Uganda	0.8291	21	Belarus	0.7333	60	Georgia	0.5463	98
Peru	0.8264	22	Dominican Republic	0.7332	61	Serbia	0.5446	99
Kazakhstan	0.8251	23	Russian Federation	0.7322	62	Iran, Islamic Rep.	0.5344	100
Singapore	0.8238	24	Ireland	0.7319	63	Egypt, Arab Rep.	0.5334	101
Malaysia	0.8229	25	Canada	0.7270	64	Montenegro	0.5240	102
Korea, Rep.	0.8218	26	High			Spain	0.5122	103
Pakistan	0.8160	27	Maldives	0.7266	65	Albania	0.5104	104
Malta	0.8157	28	Sri Lanka	0.7219	66	Tunisia	0.4943	105
United States	0.8149	29	Kenya	0.7189	67	Armenia	0.4740	106
Ecuador	0.8136	30	Lithuania	0.7146	68	Greece	0.4567	107
Panama	0.8127	31	Belgium	0.7086	69	Namibia	0.4458	108
Hungary	0.8112	32	Sweden	0.6999	70	Bosnia and Herzegovina	0.4438	109
Low			Senegal	0.6918	71	Eswatini	0.4342	110
Norway	0.8081	33	Portugal	0.6892	72	North Macedonia	0.4342	111
Nepal	0.8081	34	Mauritius	0.6883	73	South Africa	0.3964	112
Israel	0.8067	35	Chile	0.6870	74	West Bank and Gaza	0.3545	113
Philippines	0.8021	36	Latvia	0.6830	75			
United Kingdom	0.8000	37	Belize	0.6803	76			

*Grey Relational Grades=GRGs

The result of the analysis shows that there are a total of sixteen countries categorized as countries having *extremely low* unemployment. Most of the

countries under this ensign of classification are member countries of Japan & the Asian Pacific Rim (J&APR). Sixteen under the *very low* ensign, most of

which are member countries of APEC and OECD. Sixteen under the ensign of *low*, most of which are member countries of OECD. Sixteen under the ensign of *moderate*, most of which are member countries of APEC, Eastern Europe (EE), European Union (EU), OECD and South Asian Association for Regional Cooperation (SAARC). Sixteen under the ensign of *high*, most of which are member countries of OECD. Sixteen under the ensign of *very high*, most of which are member countries of EU, OECD and Union of South American Nations (UNASUR). Seventeen under the ensign of *extremely high*, most of which are member-countries South African Development Community (SADC). Pakistan fall under the ensign of *very low* therefore has low unemployment.

Discussion

The main objective of the study is to represent a country level comparative analysis of the unemployment of 113 countries. This study is different from contemporary literature on many different counts, e.g. in data set, in methodological choice, number of countries subject to analysis, in classification and presentation of results and selection of variables. The results of the study, in general, are pretty aligned with the results of contemporary research studies. For enrichment of understanding of the readers, a comparative analysis of relevant studies is given as Table 9.

Table 10. Comparison with Existing Literature

Study	Focus of Study	Factors/Variables	Methodology	Result
Current study	Evaluation of the level of unemployment in 113 countries.	Unemployment, gender, youth and education	GRA	J&APR countries have extremely low, SADC countries have extremely high whereas Pakistan has a low level of unemployment
Görmüş (2019)	Examine the relationship between youth and adult in relation to unemployment and demographic	Work experience, desire to work a full-time job, lack of qualification, inter-regional disparities in the context of economic development, semi-skill occupation, youth, adult and unemployment.	Logistic regression	Desire to work full time, lack of work experience & qualification, semi skill occupations are the major determinants of long-term youth unemployment.
Sansale et al. (2019)	Examine the role of personality among young adults in unemployment duration	Married female, female, married, age, black, high school degree, associate's degree and bachelor's degree	Competing risk model	Personality has a major determinant in employment/unemployment among young adults.
Miettinen and Jalovaara (2020)	Educational differences and employment uncertainty	Employment status, income and cohabiting union data	Constant exponential model	Education modified the relationship between unemployment and parenthood transition both in female and male in the same way.
Yavorsky and Dill (2020)	Men's entrance into female-dominated job and unemployment	Percent wage change, change in occupation prestige, unemployment and female-dominated occupation.	Logistic regression and linear regression	Unemployment causes men to enter into female-dominated job.

Contemporary studies use traditional statistical models and conventional variables to measure unemployment in the limited scope of one or few

countries on different archival data sets. The results of the study, therefore, give very limited insights into the phenomenon. The study in hand gives relatively more

compressive and precise insights, particularly on comparison of countries and blocs.

Concluding Remarks

The level of unemployment in a country is a deep concern of stakeholders. From time to time, country-level comparative analysis of the level of unemployment is the call of the day. Therefore, the problem under investigation is evaluation analysis and comparison of unemployment level in 113 countries. An extensive literature review has been done before embarking on any analysis. The analysis has been performed by stepwise implementing grey incidence analysis model on country level secondary data of variables like unemployment, gender, youth and education. The result shows that member countries of J&APR has *extremely low* unemployment and accordingly that of APEC & OECD *very low*, EE & SAARC *moderate*, some of OECD *high*, EU, OECD & UNASUR *very high* and member countries of SADC have an *extremely high* level of unemployment. Pakistan fall under the ensign of *very low*, therefore has low unemployment. This study has a novel theoretical and practical contribution to the literature. It has contributed a ranking of 113 countries along with grey relational grades. It also contributed a classification of

these countries on the continuum of an ordinal scale of low to a high level of unemployment and provided new insights and information. This study also has practical implications for political government, policymakers, society at large, and researchers in mainstream economist by way of developing an informed understanding of the country level position of unemployment. Firstly, it is a cross-sectional secondary data-based study and subjects the limitations attached to this type of designs. Longitudinal design and/or primary data set may be employed in future. Secondly, the study uses Grey Incidence Analysis Model based on normalized data that might have lost some properties; therefore,, it is recommended to validate the results through some statistical methodology. Thirdly, the study uses equal weights for the variables for simplicity; however,, future research can use an the analytical hierarchy process or entropy method for giving weights to the variables. Fourthly, the data set used has been taken from the website of WDI, and the generalization of the results are subject to the precision of data, therefore, it is recommended to validate the results by using different dataset in a similar type of model. Lastly, the study investigated the phenomenon with 113 alternatives and seven criteria; therefore, it is recommended to increase alternatives and/or a number of criteria.

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