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

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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&AP 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). Onwuchekwu 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 & Pistoresi, 2019), empirical findings of unemployment in an open economy of 18 OECD countries (Bertinelli et al., 2020; Khrais 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 (Cocks 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 (Kyrrä & 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 (Kočašlan, 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 (Norrbäck 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 (Pierse & McHale, 2020), parental unemployment and child health in China (Pieters & Rawlings, 2020), unemployment in Europe before and after financial crises (Pompei & Seleznева, 2019), unemployment and property crime in Croatia (Recher, 2020), unemployment affects on self-perceived health in France (Ronchetti & Terriaux, 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. Paďoš 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. Dvoouleť 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

\[
x_1(k) = \begin{bmatrix} x_1(1) & x_1(2) & \cdots & x_1(m) \\ \vdots & \vdots & \ddots & \vdots \\ x_n(1) & x_n(2) & \cdots & x_n(m) \end{bmatrix} \tag{1}
\]

**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:

\[
x_0 = [x_0(1) \ldots \ldots \ldots \ldots x_0(n)] \tag{2}
\]

**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').

\[ x_i(k) = \frac{\max x_i^{(0)}(k) - x_i^{(0)}(k)}{\max x_i^{(0)}(k) - \min x_i^{(0)}(k)} \]  

(3)

Table 4. Normalization of Values

| S. No | Country          | 1     | 2     | 3     | 4     | 5     | 6     | 7     |
|-------|------------------|-------|-------|-------|-------|-------|-------|-------|
| 0     | Reference        | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 1     | Afghanistan      | 0.979 | 0.964 | 0.980 | 0.964 | 0.648 | 0.466 | 0.529 |
| 2     | Albania          | 0.409 | 0.754 | 0.320 | 0.635 | 0.586 | 0.323 | 0.436 |
| …    | …                | …     | …     | …     | …     | …     | …     | …     |
| 79    | Pakistan         | 0.926 | 0.910 | 0.912 | 0.899 | 0.898 | 0.839 | 0.806 |
| 80    | Panama           | 0.893 | 0.910 | 0.850 | 0.833 | 0.919 | 0.842 | 0.928 |
| …    | …                | …     | …     | …     | …     | …     | …     | …     |
| 112   | West Bank and Gaza | 0.000 | 0.000 | 0.149 | 0.000 | 0.278 | 0.143 | 0.000 |
| 113   | Zambia           | 0.717 | 0.875 | 0.684 | 0.791 | 0.679 | 0.538 | 0.810 |

To illustrate the calculation of Afghanistan 'unemployment male.'

\[ x_i^*(1) = \frac{\max x_i^*(1) - x_i^*(1)}{\max x_i^*(1) - \min x_i^*(1)} = \frac{25 - 1.10}{25 - 0.60} = 0.9795 \]

Step Four

Obtained absolute values by calculating deviation sequence.

\[ \Delta_{0i} (k) = |x_0^*(k) - x_i^*(k)| \]  

(4)

For the highest deviation following equation is used:

\[ \Delta_{max} = \max_{\forall j \in i} \max_{\forall k} \left| x_0^*(k) - x_j^*(k) \right| = 1 \]  

(5)

For the lowest deviation following equation is used:

\[ \Delta_{min} = \min_{\forall j \in i} \min_{\forall k} \left| x_0^*(k) - x_j^*(k) \right| = 0 \]  

(6)

Table 5. Deviation Sequence

| S. No | Country          | 1     | 2     | 3     | 4     | 5     | 6     | 7     |
|-------|------------------|-------|-------|-------|-------|-------|-------|-------|
| 0     | Reference        | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1     | Afghanistan      | 0.020 | 0.036 | 0.019 | 0.035 | 0.351 | 0.534 | 0.470 |
| 2     | Albania          | 0.590 | 0.246 | 0.679 | 0.364 | 0.413 | 0.677 | 0.563 |
| …    | …                | …     | …     | …     | …     | …     | …     | …     |
| 79    | Pakistan         | 0.074 | 0.089 | 0.087 | 0.100 | 0.102 | 0.161 | 0.193 |
| 80    | Panama           | 0.106 | 0.089 | 0.149 | 0.167 | 0.080 | 0.158 | 0.071 |
| …    | …                | …     | …     | …     | …     | …     | …     | …     |
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 \( \xi \) is distinguishing co-efficient between 0 to 1. Its usual value is 0.5 in literature.

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

**Table 6. Grey-Relational Co-efficient**

| 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 reckoning of “Grey Relational Co-efficient” for ‘Unemployment, female’ (2) To Albania

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

**Step Six**

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

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

\[ \sum_{k=1}^{n} \beta_k = 1 \]

**Table 7. Grey Relational Grades (GRGs)**

| S. No | Country              | GRGs |
|-------|----------------------|------|
| 0     | Reference            | 1.0000 |
| 1     | Afghanistan          | 0.7681 |
| 2     | Albania              | 0.5104 |
| ...   |                      | ...  |
| ...   |                      | ...  |
To illustrate grey relational grade for Albania

\[
\gamma(x^*, x) = \sum_{k=1}^{n} \beta_k \gamma[x_{k}^*(2), x_{k}(k)] = 0.1429 \times (0.4586 + 0.6702 + 0.4239 + 0.5784 + 0.5473 + 0.4247 + 0.4700) = 0.5104
\]

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 |
|--------------|-------|------|--------------|-------|------|
| Reference    | 1.0000| 0    | Switzerland  | 0.7936| 38   |
| Uruguay      | 0.6791| 77   |              |       |      |
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

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

*Grey Relational Grades=GRGs*
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.

| 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
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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