



Factors Affecting Unemployment Rate in Canada and Denmark

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ABSTRACT

This study investigates the impact of labor force, government expenditure, gross capital formation, foreign direct investment, energy and domestic credit to private sector on unemployment in Canada and Denmark. Annual data is collected from 1980 to 2021 from world development indicator. Johansen Cointegration approach is used to identify the relationship between dependent and independent variables. The results show that labor force and government expenditure positively and significantly impact unemployment in long run in the case of Canada. While the gross capital formation, energy and domestic credit to private sector have negative but significant impact on unemployment. In short run labor force, GCF, energy and domestic credit to private sector has positive and significant impact on unemployment. On the other hand, in the case of Denmark, labor force and government expenditure have positive and significant impact on unemployment. Whereas gross capital formation, energy, FDI and domestic credit to private sector have significant and negative impact on unemployment while in short run FDI shows negative and significant impact on unemployment.

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1. Introduction

All nations worldwide both developing economies and advanced nations, frequently face unemployment. Christianto, Prasetyani, and Putro (2022) As it is considered that the unemployment rate is one of the metrics to assess a nation's success or development. (Christianto et al., 2022). The extent of the surging unemployment rate in a nation can indicate the competence or limitation of the national or regional economic condition. In the sense that declining economic conditions are indicated by increased jobless rates. The issue of unemployment is among the most crucial ones that a nation should focus on. Various crimes, social politics, and poverty will be affected if unemployment in a nation keeps rising (Mirza, 2012). According to a multitude of economists, foreign direct investment (FDI) has the potential to decrease the rate of unemployment. In a study conducted by Tegep, Suratman, and Indra (2019), the researchers aimed to examine macroeconomic variables and their impact on the correlation between unemployment and foreign direct investment (FDI) in Indonesia. The analysis incorporates panel data from a span of 17 years, encompassing 36 provinces in Indonesia. In the study as a mediating factor, macroeconomic variables are being used. In the article the bootstrapping method to determine the inter-variable direct effects is used. This study effectively demonstrates the mediating role of GDP and provincial minimum wages in the relationship between FDI and the reduction of unemployment rates.

Unemployment and finance sector unrest have always been closely related. Production decreased by 25%, prices dropped below 30%, the unemployment rate rose to 25% of the work force, and approximately 9000 banks stopped doing business during the Great Depression of 1929 to 1933. Bordo (2000) The current global financial crisis, has plunged the industrialized nations into a severe economic downturn, resulting in unemployment, increased debt, financial

losses, and asset depreciation, Sasi,K (2009). Due to the global financial system meltdown, there has been widespread unemployment recently. So, the study's primary goals are to ascertain the financial sector's contribution to unemployment and to investigate the relationship between growing financial sector and that country's high unemployment rate. The significance of using renewable energy has significantly increased in recent years. The need to decarbonizes economies around the world and ensure growth can both be addressed with renewable energy (IRENA, 2016). Since the sustainable development aim includes renewable energy, it is essential for job creation and societal well-being. Less attention is being paid that how renewable energy effect the unemployment. Due to their labor-intensive nature compared to non-renewable energy sources, the adoption of renewable energy technologies such as solar, wind, and hydro power has the potential to generate a significant rise in global employment. (I. IRENA, 2011). Jobs in raw material processing, manufacturing, and plant construction could be created by renewable energy technology.

Theoretically, domestic investment—also referred to as GCF—is essential for fostering economic expansion and unemployment (Overseas Development Institute2016). According to Keynes, fresh and increased investment raises the demand of total economy (Tobin, 1965). When existing companies amplify their investments or when fresh entrants engage in the market, it leads to an increase in domestic investment (Faulkner, Loewald, & Makrelov, 2013). An upsurge in fresh capital infusion should result in more jobs or a higher level of employment. The primary aim of this study is to examine the correlation between unemployment and various independent variables (such as labor force participation, government expenditure on education as a percentage of GDP, domestic credit to the private sector, gross capital formation and foreign direct investment as a percentage of GDP, and energy consumption) in both the long and short run. This analysis will be conducted using the Johansen Multivariate Cointegration Technique

1.1. Research Significance

Unemployment is a major concern for governments and policymakers worldwide, and it is affected by various macroeconomic factors such as Labor force, Govt expenditure, Gross capital formation, Foreign direct investment, Domestic credit to private sector, and Energy consumption. Denmark and Canada are two countries that have different economic structures and policies, which may lead to different impacts on their unemployment rates. Denmark has a highly regulated labor market, while Canada has a more flexible labor market. Hence, comprehending the influence of macroeconomic factors on the unemployment situation in these two nations is vital for policymakers to formulate effective strategies aimed at mitigating unemployment rates. This study adds to the current body of literature on the relationship between macroeconomics and unemployment by offering fresh perspectives and empirical evidence. In this study, our objective is to examine the effects of labor force, government expenditure, gross capital formation, foreign direct investment, energy consumption and domestic credit to the private sector on the phenomenon of unemployment. We will analyze the impact of these variables on unemployment and investigate their relationships. Therefore, publishing this study can help to disseminate the findings to a wider audience, including policymakers, academics, and the general public. It can also contribute to the academic literature and inform future research on the topic. This research endeavor will offer valuable insights into the influence of macroeconomic factors on the issue of unemployment specifically in Denmark and Canada. The findings can be used by policymakers to develop effective strategies to reduce unemployment rates in these two countries. Additionally, the research can be used as a basis for further studies in other countries with different economic structures and policies.

2. Literature review

Alalawneh and Nessa (2020) study indicate that FDI has a positive impact on lowering the long-term unemployment rate for both men and women, as well as the overall unemployment rate. However, no direct causal relationship between FDI and short-term unemployment is observed in any form. Panel data spanning the years 1990 to 2018 are utilized for analysis. Instead, the study reveals a causal association between exports and FDI. These results provide valuable insights into the complex dynamics between FDI, unemployment, and other economic factors, emphasizing the importance of considering long-term effects and indirect relationships in understanding the impacts of FDI on unemployment. GCF, which makes up majority of domestic investments, is viewed as a crucial factor which could hasten the economic growth in terms of macroeconomic policy. This study explores the interconnections among the economic

expansion, domestic investment, and employment levels, employing data from South Africa. It aims to provide fresh insights into the intricate relationships between these factors within the specific context of the country. While the relationship between investment and employment is still mostly unclear, it has been assumed traditionally that investment leads to economic expansion. The study's findings reveal a cause-and-effect relationship between the expansion of the economy, investments made within the country, and the levels of job opportunities. Moreover, the research demonstrates a sustained correlation between the growth of the economy, investments made within the nation, and the state of employment. Additionally, the findings demonstrate a positive and enduring effect of investments on employment over the long term. Furthermore, the study provides support for a unidirectional causal association between investment and employment, as well as a bidirectional causal relationship between economic growth and employment. Based on the study's findings, it concludes that implementing policies that foster investment, such as maintaining low borrowing rates and cultivating a favorable business environment, can effectively stimulate employment.

According to Sköld (2020) the FMOLS regression's long-run coefficients, rising oil prices cause Denmark and Sweden's unemployment rates to rise. With the exception of Denmark, oil prices and unemployment all show evidence of causality, indicating a strong connection between these two variables. Khan, Xue, Zaman, and Mehmood (2022) This empirical study examines the effects of economic expansion, the process of industrialization, changes in population size, the accumulation of capital investment, and overall national income on the generation of employment opportunities. The results obtained from the ARDL model reveal that the process of industrialization, inflow of foreign direct investment (FDI), and the accumulation of gross capital significantly contribute to the expansion of employment opportunities in Pakistan.

Using Johansen for the error correction model's joint integration procedure, Nayyf, Ali, and Kareem (2021) conducted a study sought to determine how much the growth of Chile's financial sector contributed to lowering unemployment between 1991 and 2017. Additionally, the study estimated the immediate-term and extended-term elasticities and revealed a complementary relationship between the variables under investigation. The error correction factor's value and the model's variables had a long-term relationship of (-0.024). The near-term correlation between two variables representing the percentage of GDP allocated to domestic credit provided to the private sector and the market value of regional firms, was utilized to calculate the elasticities. From 1980 to 2018, the relationship between Nigeria's unemployment rate and trade openness is examined in the study of (Nwosa, Keji, Adegboyo, & Fasina, 2020). As a result, the study comes to the conclusion that Nigeria's unemployment rate is significantly influenced by trade openness.

According to the study, Nigeria needs thoughtful economic policies that would encourage foreign private investment, which would increase the country's overall investment volume and help create jobs. Lastly, the government must explore innovative strategies to attract foreign investors, tapping into emerging market opportunities. By doing so, it can generate employment and foster economic growth. Emerson (2011) examines the connection between unemployment and labor force participation using historical data from the US. The long-term association between these two variables is supported by Cointegration analysis, which makes us wonder the empirical applicability of the unemployment invariance hypothesis for the United States.

Shabbir, Anwar, Hussain, and Imran (2012) This empirical study seeks to investigate the long-term causal relationship between the growth of Pakistan's banking sector and the occurrence of unemployment. The indicators for the banking sector and unemployment have a stable long-term association. It has been demonstrated that increases in M2 less money in circulation/GDP have a negative impact on employment rates, raising the unemployment rate by 2.3 percentage points for every one percentage point increase. Both in the long and near terms, increasing financial sector activity helped to reduce unemployment. The Granger causality test also showed how important it is to give credit to the private sector in order to increase employment opportunities. Obisike, Okoli, Onwuka, and Mba (2020) analyze Government social spending which aims to improve human capital as well as lower unemployment in Nigeria. Statistics suggest that government social spending in Nigeria has been rising, although it is unclear if this has resulted in a decline in unemployment. Hence, from 1981 to 2016, this study looked at how government social spending affected unemployment in Nigeria.

The study used the Ordinary Least Square with secondary data. Economically, REXPH, REXPE, and CEXPEH did not match a priori expectations, according to the data. Government capital expenditure has a statistically significant impact on unemployment in Nigeria, whereas recurrent government spending does not. Additionally, aggregate statistics demonstrate that investments in health and education, both recurrent and capital, have a statistically significant impact on Nigeria's unemployment rate. As a result of the findings, the study. We can draw the conclusion that government spending on health, education, and other social and community activities, both of a capital and ongoing nature, intended to help Nigeria reduce unemployment, did not. Therefore, it is advised that the Nigerian government make sure that money set aside for health, education, and other social and community activities be used appropriately. Khobai (2020) the significance of using renewable energy has significantly increased in recent years. It is commonly known that using renewable energy can enhance environmental quality and stimulate economic growth. In this study, the employment rate in South Africa and utilization of renewable energy are compared. The study examined the relationship between the utilization of renewable energy sources and unemployment rates. The findings show that continued reliance on renewable energy has a detrimental and considerable impact on unemployment. Nevertheless, there is no immediate connection between the variables that makes sense. In order to enhance employment levels, the report advocates for increasing both the generation and utilization of renewable energy sources.

Emerson (2011); Khobai (2020); Obisike et al. (2020) conducted studies in which they examine the impact of energy consumption, Government social spending and labor force on unemployment in different countries but there is no study conducted in Canada and Denmark which include all these variable Labor force, Govt expenditure, Gross capital formation, Energy consumption, Foreign direct investment and Domestic credit to private sector, and investigate these variables impact on Unemployment. In this study, we will analyze the influence of the labor force, government expenditure, gross capital formation, energy consumption, foreign direct investment and domestic credit to the private sector on unemployment. The research aims to investigate the impact of these variables on the unemployment rate and understand their interconnectedness. And one more unique point of this study is that we are going to use large data set of 41 years in order to provide more accurate results.

3. Data Source and Methodology

3.1. Data source

This section provides information on the source of the data and how it was collected. For our analysis in the current study, we will utilize yearly data spanning the period from 1980 to 2021, sourced from the World Development Indicators (WDI) database and the British Petroleum website. Variables such as unemployment, labor force, government expenditure, gross capital formation, FDI (Foreign Direct Investment), and domestic credit to private sectors were collected from the WDI, while data on energy variables was obtained from the British Petroleum website. The goal of this study is to investigate and uncover the factors that contribute to unemployment in Canada and Denmark. To ensure consistency, all variables underwent a natural logarithm transformation.

3.2 Methodology

The data was downloaded from the WDI and British Petroleum website, and in Excel, we applied a lag to the data. Subsequently, the data was transferred to Eviews, where we conducted unit root and Johansen tests. The details of these tests are discussed further in the Results and Discussion section.

$$UNEMP = \beta_0 + \beta_1(LABOUR FORCE) + \beta_2(GOVERNMENT EXPENDITURE) + \beta_3(GROSS CAPITAL FORMATION) + \beta_4(FOREIGN DIRECT INVESTMENT) + \beta_5(DOMESTIC CREDIT TO PRIVATE SECTOR) + \beta_6(ENERGY) \quad (1)$$

LOG Transformed Model is presented below.

$$LN(UNEMP) = \beta_0 + \beta_1 Ln(LFORCE)_t + \beta_2 Ln(GOVTEXP)_t + \beta_3 Ln(GCAPITAL)_t + \beta_4 Ln(FDI)_t + \beta_5 Ln(DCREDIT)_t + \beta_6 Ln(ENER)_t + \epsilon_t \quad (2)$$

Y= Unemployment, of Canada and Denmark

β = refers to each entity's unidentified intercept

LFORCE = labor force of Canada and Denmark
 GOVTEXP = Government expenditure on education of Canada and Denmark
 GCAPITAL = Gross capital formation of Canada and Denmark
 FDI = Foreign direct investment of Canada and Denmark
 ENER = Energy consumption of Canada and Denmark
 DCREDIT = Domestic credit to private sector of Canada and Denmark
 ε = refers to the error term

Table 1

Variable name	Log form	Proxy of variable	Data source
Unemployment	LNUNEMP	total (% of total labor force) (national estimate)	WDI from 1980 to 2021
labor force	LNLFORCE	Labor force participation (national estimate)	WDI from 1980 to 2021
Government Expenditure	LNGOVTEXP	Govt expenditure on education total (% of GDP)	WDI from 1980 to 2021
Gross capital formation	LNGCAPITAL	Gross capital formation (current)	WDI from 1980 to 2021
Foreign direct investment	LNFDI	Foreign direct investment	WDI from 1980 to 2021
Domestic credit to private sector	LNDLCREDIT	Domestic credit to private sector (% of GDP)	British petroleum from 1980 to 2021
Energy	LNENER	Energy consumption	British petroleum from 1980 to 2021

4. Result and Discussions

This section showcases the outcomes of our analysis, accompanied by a detailed explanation of the findings. We begin by providing the descriptive statistics tables for both Canada and Denmark variables. Tables 2 and 3 display the descriptive statistics for various factors in Canada and Denmark, respectively. Upon examining the descriptive statistics, we observed that in both Canada and Denmark, the mean values of variables such as unemployment, labor force, government expenditure, gross capital formation, FDI, energy, and domestic credit to the private sector were higher compared to their standard deviations. This suggests that there is an uneven distribution of these factors across the countries under examination.

Additionally, when considering the Jarque-Bera probability values for Canada, we found that the unemployment rate, government expenditure, gross capital formation, FDI, and domestic credit to the private sector all exhibited insignificant probability values. This suggests that these factors exhibit characteristics consistent with a bell-shaped distribution. Similarly, the Jarque-Bera test for Denmark revealed that the probability values for unemployment, government expenditure, labor force, gross capital formation, foreign direct investment, and energy was also insignificant, indicating that these factors follow a normal distribution pattern.

Table 2

Canada	LNUNEMP	LNLFORCE	LNGOVTEXP	LNGCAPITAL	LNFDI	LNENER	LNDLCREDIT
Mean	2.098279	4.183207	1.746797	25.68948	22.07149	6.001946	4.424637
Median	2.032738	4.186620	1.803555	25.59209	21.72593	6.007567	4.334424
Maximum	2.486572	4.213016	2.041773	26.85437	24.73622	6.060612	4.898741
Minimum	1.798404	4.103709	1.515136	24.49183	18.82292	5.878709	3.768273
Std. Dev.	0.182759	0.025564	0.154698	0.706702	1.368789	0.042093	0.336541
Skewness	0.571728	-1.325683	-0.130924	0.224143	0.052495	-0.834869	-0.062287
Kurtosis	2.319740	4.595418	1.599230	1.904534	2.255610	3.471975	1.782031
Jarque-Bera Probability	3.097933	16.75642	3.553763	2.451757	0.988994	5.268880	2.623191
Sum	88.12772	175.6947	73.36547	1078.958	927.0027	252.0817	185.8348
Sum Sq. Dev.	1.369436	0.026793	0.981196	20.47655	76.81689	0.072645	4.643663
Observations	42	42	42	42	42	42	42

Table 3

Denmark	LNUNEMP	LNLFORCE	LNGOVTE XP	LNGCAPITAL	LNFDI	LNENER	LNDCREDIT
Mean	1.860809	4.178121	1.922099	3.045303	20.94252	-0.204788	4.124035
Median	1.864061	4.182279	2.011371	3.044017	21.21226	-0.179851	3.799501
Maximum	2.372111	4.221271	2.147048	3.235307	24.30715	0.042676	5.304590
Minimum	1.302913	4.115127	1.397084	2.834016	16.54707	-0.379200	3.098066
Std. Dev.	0.279550	0.028131	0.197978	0.098574	1.969547	0.093505	0.853947
Skewness	-0.229514	-0.683193	-0.754582	-0.091175	-0.296840	0.124914	0.262296
Kurtosis	2.230753	3.091458	2.521360	2.457296	1.994947	2.704664	1.274409
Jarque-Bera	1.404284	3.281903	4.386674	0.573614	2.384529	0.261865	5.692505
Probability	0.495523	0.193796	0.111544	0.750657	0.303533	0.877277	0.058062
Sum	78.15397	175.4811	80.72816	127.9027	879.5860	-8.601110	173.2095
Sum Sq. Dev.	3.204088	0.032445	1.607003	0.398392	159.0438	0.358468	29.89824
Observations	42	42	42	42	42	42	42

After discussing the descriptive statistics now, we are discussing Correlation and VIF table 4 and 5 that are mentioned below. In the case of Canada, as we see table of correlation it shows that there is a weak and negative correlation exist between UNEMP and labor force. The correlation between unemployment and government expenditure is 0.7 while between the government expenditure and labor force is -0.6 which is weak and moderate relation. Unemployment and gross capital formation -0.5 shows moderate and negative relation.

Labor force and gross capital formation 0.71, show positive and strong correlation. If we talk about Denmark, the correlation between unemployment and labor force is weak and positive as the value is 0.2. The correlation between unemployment and government expenditure is 0.4 while between the government expenditure and labor force is -0.2 which is weak correlation. Unemployment and gross capital formation -0.75 shows strong and negative relation. Labor force and gross capital formation -0.04, show negative and weak correlation.

The predicted Table 3 results also display the size of the Variance inflation factor across all the independent variables, in case of Canada [e.g., VIF (LNUNEMP, LNLFORCE) = 1.03], VIF (LNGOVTEXP, LNUNEMP) = 1.98, VIF (LNLFORCE, LNGOVTEXP) = 1.60], VIF (LNGCAPITAL, LNUNEMP) = 1.34), VIF (LNGCAPITA, LNLFORCE) = 2.07and VIF (LNGCAPITA, LNGOVTEXP) = 3.56. In the case of Denmark [e.g., VIF (LNUNEMP, LNLFORCE) = 1.01], VIF (LNGOVTEXP, LNUNEMP) = 1.29, VIF (LNLFORCE, LNGOVTEXP) = 1.13], VIF (LNGCAPITAL, LNUNEMP) = 2.27), VIF (LNGCAPITA, LNLFORCE) = 1.00and VIF (LNGCAPITA, LNGOVTEXP) = 1.00.all values are found to be under 10. Advocates of the test contend that explanatory variables would not be significantly related to one another if the estimated value of VIF, calculated using the formula $[1/(1- R \text{ square})]$, is less than 10. Therefore, labor force, government expenditure, gross capital formation, FDI, energy and domestic credit to private sector no one shows the issue of Multicollinearity.

Table 4: Correlation and VIF

Canada Correlation	LNUNEMP	LNLFORCE	LNGOVTEXP	LNGCAPITAL	LNFDI	LNENER	LNDCREDIT
LNUNEMP	1						
LNLFORCE	-0.180196	1					
LNGOVTEXP	0.703703	-0.612797	1				
LNGCAPITAL	-0.508166	0.7193872	-0.8481406	1			
LNFDI	-0.523371	0.3385785	-0.722018	0.61545428	1		
LNENER	-0.348453	0.6744361	-0.5636877	0.56765025	0.414674	1	
LNDCREDIT	-0.439336	0.7555643	-0.8715061	0.93765443	0.655439	0.601246	1
VIF	LNUNEMP	LNLFORCE	LNGOVTEXP	LNGCAPITAL	LNFDI	LNENER	LNDCREDIT
LNUNEMP	1.0335605						
LNLFORCE	1.9809744	1.6013329					
LNGOVTEXP	1.3481319	2.0726159	3.56306096				
LNGCAPITAL	1.3772534	1.1294782	2.08903474	1.60974599			
LNFDI	1.1381999	1.8344047	1.4657252	1.47541982	1.207663		
LNENER	1.2391818	2.3303363	4.15839965	8.27785973	1.753156	1.566162	
LNDCREDIT							

Table 5: Correlation and VIF

Denmark Correlation	LNUNEMP	LNLFORCE	LNGOVTEXP	LNGCAPITAL	LNFDI	LNENER	LNDCREDIT
LNUNEMP	1						
LNLFORCE	0.116945	1					
LNGOVTEXP	-0.47969	-0.34287	1				
LNGCAPITAL	-0.74893	0.068701	0.055643	1			
LNFDI	-0.41468	-0.32242	0.788425	-0.02213	1		
LNENER	-0.48688	0.122786	0.484465	0.313522	0.319698	1	
LNDCREDIT	-0.4545	-0.48048	0.661282	0.068684	0.688446	-0.00974	1
VIF	LNUNEMP	LNLFORCE	LNGOVTEXP	LNGCAPITAL	LNFDI	LNENER	LNDCREDIT
LNUNEMP							
LNLFORCE	1.013866						
LNGOVTEXP	1.298881	1.133223					
LNGCAPITAL	2.277404	1.004742	1.003106				
LNFDI	1.207669	1.116018	2.6428	1.00049			
LNENER	1.310704	1.015307	1.306688	1.109011	1.113842		
LNDCREDIT	1.260347	1.300152	1.777128	1.00474	1.900991	1.000095	

Table 6: These are Following Hypothesis that are used in Unit Root Test

Null hypothesis for KPSS	Alternative hypothesis for KPSS
• Series is stationary	• Series is non stationary
Null hypothesis for NG-Perron	Alternative hypothesis for NG-Perron
• Series is non- stationary	• Series is stationary

After analyzing the VIF (Variance Inflation Factor) table, we proceed to examine the order of integration, as shown in Table 7 below. The results of the KPSS and NG-Perron unit root tests are presented. The LM (Lagrange Multiplier) statistic is utilized for testing the KPSS unit root, while the NG-Perron test is already identified in the table.

For both Canada and Denmark, the results of the NG-Perron test indicate that variables such as unemployment, government expenditure, gross capital formation, FDI, energy, and domestic credit to the private sector are non-stationary at the level. This conclusion is drawn based on the calculated values exceeding their respective critical values at a 10% significance level. Furthermore, the LM statistic provides additional evidence of non-stationarity, as the values for all variables exceed their critical values at a 1% significance level. Consequently, the null hypothesis of stationarity is rejected in favor of the alternative hypothesis of non-stationarity.

However, when considering the first difference of all variables in Canada and Denmark, we find that they exhibit stationarity. Therefore, we conclude that the data series used in our research possess the same order of integration. It is worth noting that the presence of a unit root problem can lead to inaccurate estimates in ordinary least squares regression. Consequently, we proceed to apply the Johansen co-integration method to the variables that share the same order of integration. To ascertain the suitable lag length, we refer to Tables 8 and 9.

Table 7: Unit Root Test

Variables	Unit Root test at level			First Difference			Unit root test at level			First Difference		
	LM stats	Ng-Perron	Decision	LM STATS	Ng-Perro n	Decision	LM stats	NG-perron	Decision	LM Stats	NG-Perron	Decision
LNUNEMP	0.88	-2.99	Non stationary	0.17	-22.4	Stationary	0.85	-5.88	Non Stationary	0.11	-	Stationary
LNLFORCE	0.90	-1.16	Non stationary	0.42	-11.2	Stationary	1.40	-2.48	Non Stationary	0.22	-	Stationary
LNGOVTEXP	1.91	-2.19	Non stationary	0.10	-18.2	Stationary	1.35	-4.85	Non Stationary	0.05	-	Stationary
LNGCAPITA	2.33	0.98	Non stationary	0.07	-14.6	Stationary	2.33	1.18	Non Stationary	0.05	-	Stationary
LNFDI	1.69	-1.08	Non stationary	0.30	-39.1	Stationary	1.72	-3.02	Non Stationary	0.02	-	Stationary
LNENER	0.84	-3.72	Non stationary	0.44	-21.7	Stationary	2.32	-5.91	Non Stationary	0.09	-	Stationary
LNDCREDIT	2.26	0.16	Non stationary	0.23	-33.1	Stationary	2.08	-0.81	Non stationary	0.09	-	Stationary

Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1) Asymptotic Critical Value at various levels of significance for LM statistic are 0.739 (1%), 0.463 (5%) and 0.347 (10%) level of significance. Asymptotic Critical Values for unit root test for NG-Perron are - 13.8 (1%), - 8.1 (5%) and - 5.7 (10%) level of Significance [Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)].

To determine the optimal lag level, we refer to Tables 8 and 9 for Canada and Denmark, respectively. In the case of Canada, based on the lag order selection table, one criterion suggests that a lag order of 1 should be considered optimal. Additionally, the minimum value of the AIC further supports the selection of lag order 1 as optimal. Consequently, we conclude that lag order 1 is the most suitable choice for Canada.

Similarly, for Denmark, the lag order selection table indicates that one criterion recommends a lag order of 1 as optimal. Furthermore, the minimum value of the AIC confirms the selection of lag order 1. Hence, we determine that lag order 1 is the optimal choice for Denmark as well.

Table 8: Lag Order Selection

Canada						
VAR Lag Order Selection Criteria						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	236.5286	NA	6.94e-14	-10.43312	-10.14927	-10.32785
1	474.4818	389.3779*	1.33e-17*	-19.02190*	-16.75111*	-18.17978*
2	520.1222	60.16236	1.84e-17	-18.86919	-14.61146	-17.29022
3	570.8444	50.72226	2.78e-17	-18.94747	-12.70281	-16.63165

Table 9: Lag Order Selection

Denmark						
VAR Lag Order Selection Criteria						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	137.2040	NA	6.34e-12	-5.918363	-5.634515	-5.813099
1	329.8056	315.1663*	9.55e-15*	-12.44571*	-10.17492*	-11.60359*
2	364.0059	45.08222	2.22e-14	-11.77300	-7.515272	-10.19403
3	412.7014	48.69545	3.68e-14	-11.75915	-5.514490	-9.443332

The empirical results from Table 10 reveal the presence of a long-run co-integrating relationship between unemployment and its associated factors for both Canada and Denmark. The multivariate co-integration tests conducted include the trace test and the maximum eigenvalue test.

In the case of Canada, both the trace test and the maximum eigenvalue test indicate the existence of at least one co-integrating vector. The null hypothesis of zero co-integrating vectors is rejected, as evidenced by the calculated values exceeding the critical values (Trace Test: 156.7 > 125.6 and Maximum Eigenvalue Test: 51.8 > 46.2).

Similarly, for Denmark, both the maximum eigenvalue test and the trace test support the alternative hypothesis that there is at least one co-integrating vector at a 5% significance level. The null hypothesis of zero co-integrating vectors is rejected, as indicated by the calculated value of the trace test (134.8 > 125.6).

Based on the results presented in Table 10, we can conclude that in the case of Canada, both the maximum eigenvalue test and the trace test report the existence of one co-integrating vector at a 5% significance level. However, the trace test alone reports the existence of two co-integrating vectors at a 5% significance level. Meanwhile, in the case of Denmark, the trace test indicates the presence of one co-integrating vector.

Therefore, based on the Johansen table, we can conclude that a long-run co-integration exists between unemployment and its determinants in both Canada and Denmark, with two co-integration equations identified for Canada and one for Denmark

Table 10: Multivariate Co-Integration Approach

CANADA				
Trace test				
Null hypothesis	Alternative hypothesis	Trace test	Critical value 0.05 significance level	Probability value
r = 0	r = 1	156.7195	125.6154	0.0002
r ≤ 1	r = 2	104.8976	95.75366	0.0101
r ≤ 2	r = 3	67.49274	69.81889	0.0756
r ≤ 3	r = 4	42.55878	47.85613	0.1437
r ≤ 4	r = 5	22.6449	29.79707	0.264
r ≤ 5	r = 6	8.917757	15.49471	0.373
r ≤ 6	r = 7	0.886759	3.841466	0.3464
Maximum Eigenvalue Test				
Null hypothesis	Alternative hypothesis	Trace test	Critical value 0.05 significance level	Probability value
r = 0	r = 1	51.82187	46.23142	0.0115
r ≤ 1	r = 2	37.40487	40.07757	0.0971
r ≤ 2	r = 3	24.93396	33.87687	0.3895
r ≤ 3	r = 4	19.91388	27.58434	0.3471
r ≤ 4	r = 5	13.72714	21.13162	0.3879
r ≤ 5	r = 6	8.030998	14.2646	0.3756
r ≤ 6	r = 7	0.886759	3.841466	0.3464
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
Max-Eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
DENMARK				
Trace test				
Null hypothesis	Alternative hypothesis	Trace test	Critical value 0.05 significance level	Probability value
r = 0	r = 1	134.8665	125.6154	0.0121
r ≤ 1	r = 2	90.3053	95.75366	0.1118
r ≤ 2	r = 3	57.83625	69.81889	0.3078
r ≤ 3	r = 4	31.17758	47.85613	0.6569
r ≤ 4	r = 5	15.08922	29.79707	0.7743
r ≤ 5	r = 6	6.608541	15.49471	0.6236
r ≤ 6	r = 7	0.74766	3.841466	0.3872
Maximum Eigenvalue Test				
Null hypothesis	Alternative hypothesis	Trace test	Critical value 0.05 significance level	Probability value
r = 0	r = 1	44.56122	46.23142	0.0748
r ≤ 1	r = 2	32.46905	40.07757	0.278
r ≤ 2	r = 3	26.65867	33.87687	0.2821
r ≤ 3	r = 4	16.08835	27.58434	0.6583
r ≤ 4	r = 5	8.480684	21.13162	0.8719
r ≤ 5	r = 6	5.860881	14.2646	0.6311
r ≤ 6	r = 7	0.74766	3.841466	0.3872
Trace test indicates 6 cointegrating eqn(s) at the 0.05 level				
Max-Eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level				

Table 11 and 12 present the findings of the long-run and short-run analyses for both Canada and Denmark. For Canada, the results indicate that several factors have a significant impact on unemployment, including the labor force, government expenditure on education, gross capital formation, energy, and domestic credit to the private sector. In Denmark, similar significant factors include the labor force, government expenditure on education, gross capital formation, energy, foreign direct investment (FDI), and domestic credit to the private sector.

In Canada, the coefficient of the labor force suggests that a 1% rise in the labor force is associated with a 4% increase in unemployment. Government expenditure on education shows a positive coefficient, indicating that a 1% growth in government expenditure results in a 16% uptick in unemployment. On the other hand, gross capital formation has a negative coefficient, suggesting that a 1% increase in GCF decreases unemployment by 18%. Energy exhibits a negative coefficient as well, indicating that a 1% boost in energy results in a 2% reduction in

unemployment. Domestic credit to the private sector has a negative coefficient of -0.09, suggesting that a 1% rise leads to a 9% decrease in unemployment in the long run.

In Denmark, the coefficient of the labor force suggests that a 1% expansion in the labor force corresponds to a 3% increase in unemployment. Government expenditure on education shows a positive coefficient, indicating that a 1% increase in government expenditure leads to a 1.6% rise in unemployment. Gross capital formation has a negative coefficient, suggesting that a 1% increase in GCF reduces unemployment by 50%. FDI shows a negative coefficient of -0.06, indicating that a 1% growth in FDI results in a 6% decrease in unemployment. Energy exhibits a negative coefficient of -3, suggesting that a 1% increase in energy reduces unemployment by 3%. Domestic credit to the private sector has a negative coefficient of -0.26, implying that a 1% rise leads to a 26% decrease in unemployment in the long run. These findings align with previous studies conducted by (Emerson, 2011; Khobai, 2020; Meyer & Sanusi, 2019; Obisike et al., 2020; Shabbir et al., 2012).

Moving to the short-run analysis, the coefficient of the labor force in Canada suggests that a 1% expansion results in a 5% increase in unemployment. Gross capital formation shows a coefficient of 1.2, indicating that a 1% increase in GCF leads to a 1.2% uptick in unemployment. Energy exhibits a coefficient of 0.16%, suggesting that a 1% boost in energy corresponds to a 16% increase in unemployment. Domestic credit to the private sector has a coefficient of 0.9%, indicating that a 1% rise leads to a 9% decrease in unemployment. The error correction term (ECM-1) is significant and negative, with a coefficient of -1.7, implying that any macroeconomic shock causing disequilibrium would be reduced, and equilibrium would be reached within 1.7 years.

For Denmark, the coefficient of FDI suggests that a 1% increase leads to a 3% reduction in unemployment. The error correction term (ECM-1) is significant and negative, with a coefficient of -0.3, indicating that the disequilibrium caused by any macroeconomic shock would be reduced by 30% every year, and equilibrium would be reached within 3.3 years.

Table 11: Long Run Coefficients of Canada and Denmark According to Johansen Approach

Johansen Multivariate Cointegration Approach Long run results					
Normalized Coefficients (CANADA)			Normalized Coefficients (DENMARK)		
Dependent Variable: LNUNEMP			Dependent Variable: LNUNEMP		
Independent Variables	Coefficients	Decision	Independent Variables	Coefficients	Decision
LNFORCE	4.42766 -0.18211 [24.3126]	significant	LNFORCE	3.30152 -0.66672 [4.95187]	Significant
LNGOVTEXP	0.1694 -0.0855 [1.98128]	Significant	LNGOVTEXP	1.6718 -0.22839 [7.31988]	Significant
LNGCAPITAL	-0.184143 -0.01059 [-17.3934]	Significant	LNGCAPITAL	-0.587371 -0.23437 [-2.50613]	Significant
LNENER	-2.161571 -0.10556 [-20.4769]	Significant	LNENER	-3.073237 -0.28711 [- 10.7040]	Significant
LNFDI	-0.00413 -0.00426 [-0.96800]	Insignificant	LNFDI	-0.060398 -0.01924 [- 3.13927]	Significant
LNDCREDIT	-0.09106 -0.04801 [-1.89670]	Significant	LNDCREDIT	-0.266659 -0.03377 [- 7.89601]	Significant
Constant	-1.31672	-	Constant	11.6089	-

Table 12: Short Run Coefficients of Canada and Denmark

Johansen Multivariate Cointegration Approach Short run results					
Short run Coefficients (CANADA)			Short run Coefficients (DENMARK)		
Dependent Variable: DLNUNEMP			Dependent Variable: DLNUNEMP		
Independent Variables	Coefficients	Decision	Independent Variables	Coefficients	Decision
DLNFORCE	0.057395 -0.02741 [2.09422]	significant	DLNFORCE	-0.006921 -0.01818 [-0.38074]	Insignificant
DLNGOVTEXP	-0.22334 -0.19794 [-1.12835]	Insignificant	DLNGOVTEXP	0.111473 -0.16788 [0.66399]	Insignificant
DLNGCAPITAL	1.258951 -0.49294 [2.55394]	Significant	DLNGCAPITAL	0.019013 -0.11061 [0.17189]	Insignificant
DLNENER	0.165723 -0.09186 [1.80407]	Significant	DLNENER	-0.12106 -0.09942 [-1.21773]	Insignificant
DLNFDI	-1.477856 -6.05579 [-0.24404]	Insignificant	DLNFDI	-3.43026 -1.61537 [-2.12352]	Significant
DLNDCREDIT	-0.9395 -0.38329 [-2.45114]	Significant	DLNDCREDIT	-0.53292 -0.36681 [-1.45285]	Insignificant
Ect-1	-1.76148 -0.31364 [-5.61621]		Ect-1	-0.3961 -0.20361 [-1.94541]	

Table 13: (Hypothesis for Diagnostics Tests)

Serial correlation H0: Error term is not serially correlated	Normality test Ho: Error term is not abnormally distributed
Heteroskedasticity test Ho: variance of error term is not heteroskedastic.	Functional test Ho: functional form is not miss specified
CUSUM CUSUM tell us about stability of mean of error term if its line is in between confidence interval it means it is stable.	CUSUM SQUARE CUSUM SQUARE tells us about stability of variance of error term.

After addressing the long run and short run cointegration, diagnostic tests were conducted to assess the reliability of our projected results. Table 14 presents the summary of the diagnostic test results, including normality test, serial correlation test, heteroscedasticity test, and functional form test. In the case of Canada, the estimated probability values for normality, serial correlation, heteroscedasticity, and functional form were all found to be greater than 0.10, indicating insignificance. Therefore, we accept the null hypothesis for these tests, suggesting that the error term of the model is not abnormally distributed, there is no serial correlation in the model, the variance of the error term is not heteroskedastic, and the functional form is not misspecified. Similarly, for Denmark, we accept the null hypothesis for serial correlation, heteroscedasticity, and normality tests as their estimated probability values were also greater than 0.10, indicating insignificance. However, the functional form test was found to be significant with a value less than 0.1. Moving on from the diagnostic tests, we will now assess the stability of the estimated coefficients over time using the sum and CUSUM graphs. Table 10 shows that all estimated coefficients exhibit stable means and variance of error terms for both Canada and Denmark. Therefore, we can conclude that the estimated model in our study is reliable.

Table 14: Diagnostics

Tests name	Canada Coefficients and Prob values	Denmark Coefficients and Prob values
Serial correlation	For Lag =1 50.71704(0.6994)	For Lag =1 43.66646(0.738)
HETROSKEDASTICITY	839.1077(0.5022)	826.1653(0.6267)
Ramsey RESET Test	T-value = 0.427956(0.6714)	T-value = 2.615325(0.0132)
Normality Test:	1.75993(0.4147)	2.03727(0.3610)
Joint Jarque-Bera Test		

Figure 1

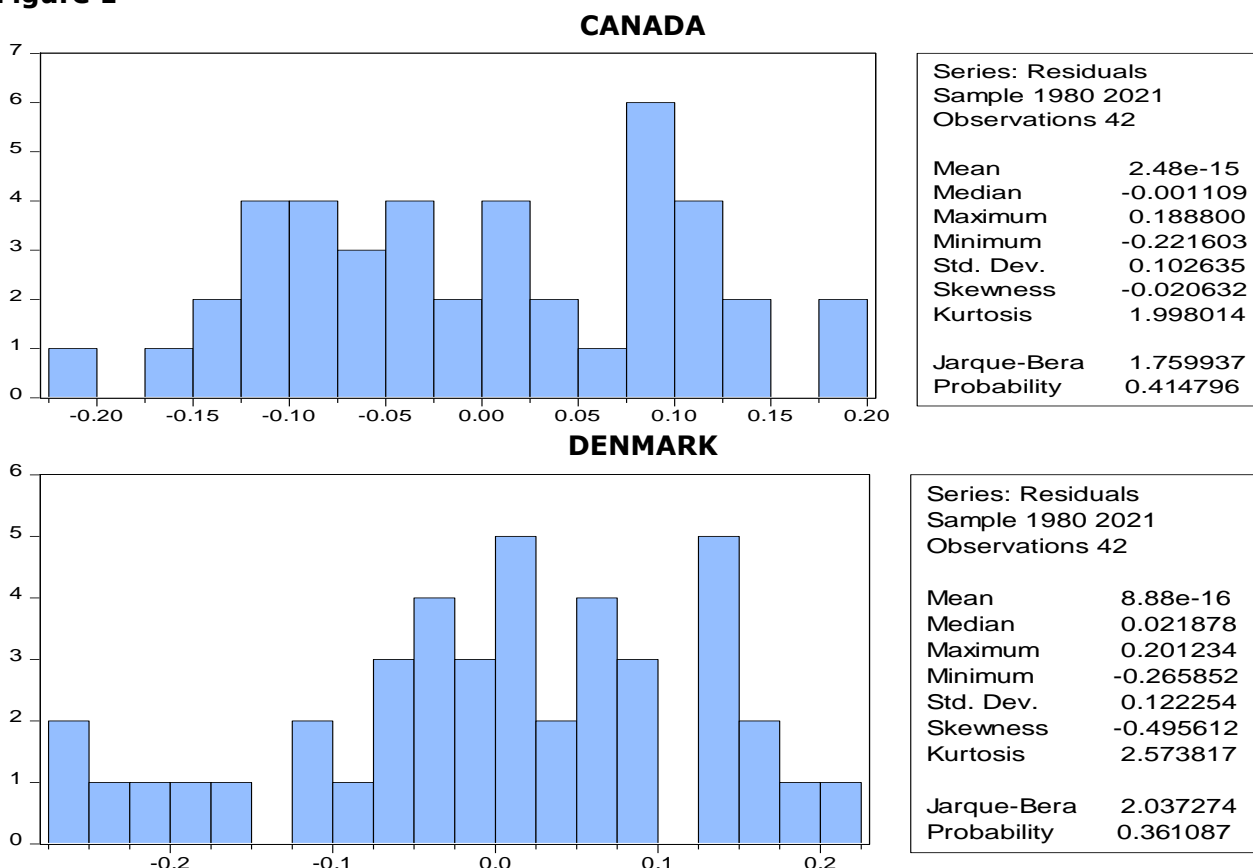
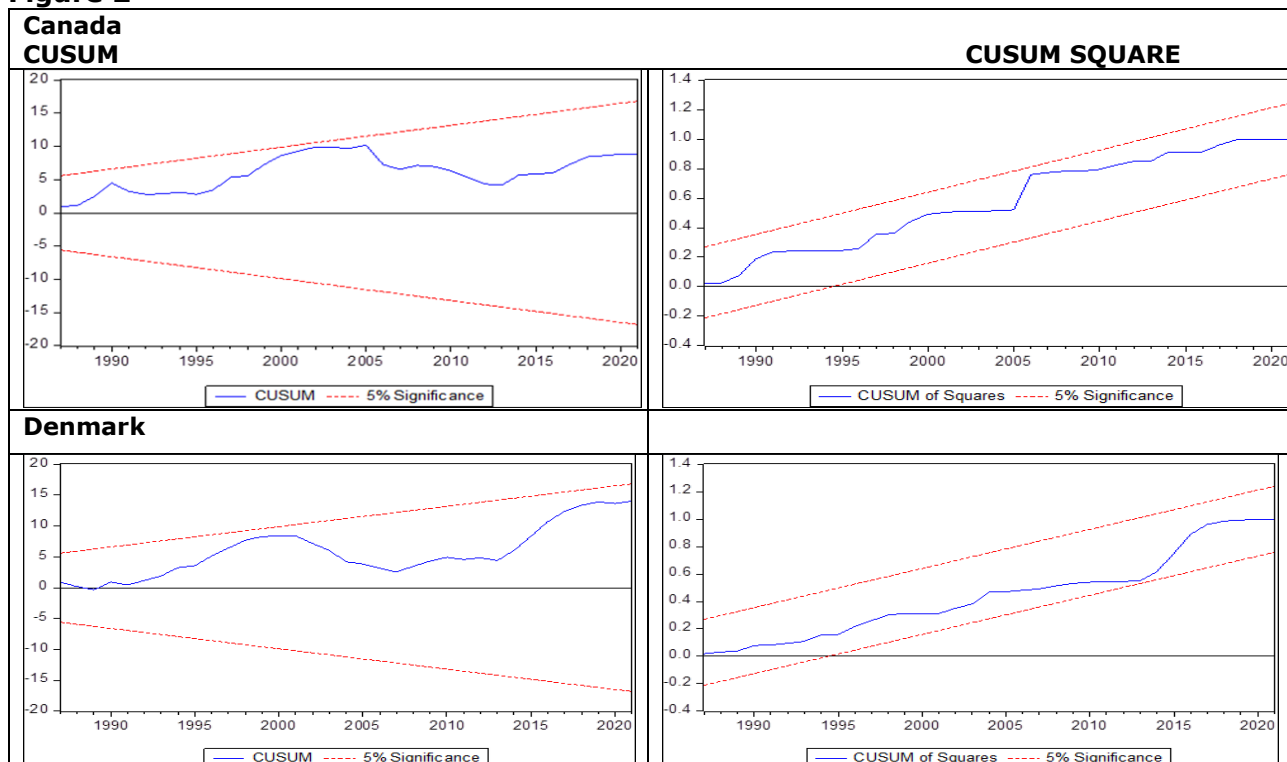


Figure 2



5. Conclusion

This study investigates the impact of various factors including the labor force, government expenditure, gross capital formation, foreign direct investment, energy, and domestic credit to the private sector on unemployment in Canada and Denmark. Annual data from 1980 to 2021 is collected from the World Development Indicators database. The Johansen Cointegration

approach is utilized to analyze the relationship between the dependent and independent variables.

The findings reveal that the labor force has a notable and positive influence on unemployment. This suggests that when more individuals enter the labor force and actively seek employment, the unemployment rate may temporarily increase due to a higher number of job seekers compared to available job openings. Government expenditure also shows a considerable impact on unemployment. This could be attributed to increased access to education, leading to temporary unemployment as individuals acquire new skills or transition between jobs.

On the other hand, gross capital formation exhibits a significant and favorable impact, indicating that higher levels of investment in capital goods and infrastructure can decrease unemployment. Domestic credit to the private sector also demonstrates a significant and favorable effect on unemployment, suggesting that increased access to credit for private businesses can contribute to job creation. Energy consumption is found to have a substantial and positive effect on unemployment, implying that greater utilization of energy resources can contribute to job creation and economic growth.

In the short run, the study reveals that the labor force, gross capital formation, energy, and domestic credit to the private sector have notable and positive influences on unemployment in both Canada and Denmark. However, in the case of Denmark, foreign direct investment (FDI) shows a noteworthy and negative effect on unemployment in the short run.

5.1. Policy Implication

The study suggests as the government expenditures in both countries causes to increase unemployment, government should make sure that funds designated for education are used effectively. Reduction in unemployment suggested that unemployment could be stopped by giving credit to the private sector, which would promote private investment in the economy. Hence, the private sector should be given preference when making decisions about the distribution of credit in order to boost job possibilities and accelerate the rate of economic development. The report consequently urges increased generation and utilization of renewable energy in South Africa, as doing so will help to eventually lower the country's high unemployment rate. In consequence, higher employment levels will spur economic expansion and raise living standards. FDI also causes to reduce the unemployment as it create new job opportunities. In future, Additional factors, like as labor market regulations, capital stock, trade, literacy rate etc., can be included. To obtain more credible research, the data might be expanded. Other nations may conduct this research.

References

- Alalawneh, M., & Nessa, A. (2020). The impact of foreign direct investment on unemployment: Panel data approach.
- Bordo, M. D. (2000). Sound money and sound financial policy. *Journal of financial services research*, 18, 129-155. doi:<https://doi.org/10.1023/A:1026582502799>
- Christianto, S. Y., Prasetyani, D., & Putro, T. R. (2022). The Effect of Inflation Rate, Economic Growth Rate and Minimum Wages on Open Unemployment Rate in East Java Year 2013–2021. doi:<https://doi.org/10.51505/IJEBMR.2022.61204>
- Emerson, J. (2011). Unemployment and labor force participation in the United States. *Economics Letters*, 111(3), 203-206. doi:<https://doi.org/10.1016/j.econlet.2011.02.022>
- Faulkner, D., Loewald, C., & Makrelov, K. (2013). Achieving higher growth and employment: Policy options for South Africa. *South African Reserve Bank Working Paper*, 13(03), 1-34.
- IRENA. (2016). *Renewable energy benefits: Measuring the economics*. Retrieved from <http://www.irena.org>
- IRENA, I. (2011). *Renewable energy jobs: Status, prospects & policies*. Retrieved from
- Khan, I., Xue, J., Zaman, S., & Mehmood, Z. (2022). Nexus between FDI, economic growth, industrialization, and employment opportunities: empirical evidence from Pakistan. *Journal of the Knowledge Economy*, 1-23. doi:<https://doi.org/10.1007/s13132-022-01006-w>
- Khobai, H. (2020). Renewable energy consumption and unemployment in South Africa. *International Journal of Energy Economics and Policy*. doi:<https://doi.org/10.32479/ijeep.6374>

- Meyer, D. F., & Sanusi, K. A. (2019). A causality analysis of the relationships between gross fixed capital formation, economic growth and employment in South Africa. *Studia Universitatis Babeş-Bolyai Oeconomica*, 64(1), 33-44.
- Mirza, M. (2012). The Development of Cultural Policy in the United Kingdom. In *The Politics of Culture: The Case for Universalism* (pp. 42-84): Springer.
- Nayyf, Y. S., Ali, Z. T., & Kareem, B. A. A. (2021). ESTIMATING THE IMPACT OF FINANCIAL SECTOR DEVELOPMENT IN REDUCING UNEMPLOYMENT IN CHILE (1991-2017). *Academy of Entrepreneurship Journal*, 27, 1-11.
- Nwosa, P., Keji, S., Adegboyo, S., & Fasina, O. (2020). Trade openness and unemployment rate in Nigeria. *Oradea Journal of Business and Economics*, 5(2), 52-62.
- Obisike, N. E., Okoli, U. V., Onwuka, I. N., & Mba, S. E. (2020). Impact of government expenditure on unemployment in Nigeria: Evidence from social expenditure. *International Journal of Social Sciences and Management Research*, 6(1), 65-76.
- Shabbir, G., Anwar, S., Hussain, Z., & Imran, M. (2012). Contribution of financial sector development in reducing unemployment in Pakistan. *International Journal of Economics and Finance*, 4(1), 260-268. doi:<http://dx.doi.org/10.5539/ijef.v4n1p260>
- Sköld, E. (2020). The Relationship between Unemployment and Oil Price, Oil Price Uncertainty, and Interest Rates in Small Open Economies: A study on Sweden, Norway, Denmark, and Finland. In.
- Tegep, J., Suratman, E., & Indra, S. (2019). The failure of foreign direct investment to explain unemployment rate and the mediating role of economic growth and minimum wage. *International Journal of Economics and Financial Issues*, 9(2), 154. doi:<https://doi.org/10.32479/ijefi.7524>
- Tobin, J. (1965). Money and economic growth. *Econometrica: Journal of the Econometric Society*, 671-684. doi:<https://doi.org/10.2307/1910352>