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Unemployment – Corruption Relationship in OECD Countries: System GMM Approach

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Abstract: *Corruption, abuse of public office for private gain, is mainly found to impact macroeconomic indicators adversely in the long run. In this vein, this paper investigates the impact of corruption on unemployment in Organization of Economic Cooperation and Development (OECD) countries between 1996-2020. Utilizing World Governance Indicators (WGI) corruption data and implementing the system generalized method of moments (GMM) methodology to overcome endogeneity and reverse causality issues, the results indicate that corruption increases unemployment in all models when various variables are controlled for. The robustness checks with alternative econometric estimations (i.e., difference GMM, fixed effect, and ordinary least squares (OLS) regressions) and corruption index (i.e., Corruption Perception Index (CPI)) verify the conclusion of system GMM that higher corruption leads to higher unemployment. However, the magnitude depends on the model and specification. The results reveal that specific policies should be implemented to eliminate corruption in political and bureaucratic spheres so that the unemployment rate can be maintained around the natural rate of each country.*

Keywords: Unemployment, Corruption, OECD, System GMM, Fixed Effects

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1. Introduction

Unemployment is one of the most important determinants of macroeconomic stability, and it is also perceived to be one of the most heated social problems (Jahoda, 1982). Its economic, social, and political repercussions have been discussed throughout; however, developed and, more particularly, developing countries still struggle with high unemployment. Although there are different types of unemployment (e.g., frictional, structural), more particularly, youth unemployment has been debated. It is a known fact that being unemployed and its psychological consequences are quite destructive, individually and collectively (Jahoda, 1982).

Even though there have been regional and country-specific crises throughout history, the current economic paradigm experienced its first global crisis during the Great Depression. During the early 1930s, unemployment was soaring, suddenly capturing the entire world, starting with the US economy (Garraty, 1976). According to several studies, unemployment increased by 17 or 20 percentage points (Margo, 1993). After being controlled, unemployment went down during the 1940s. Following the great depression, unemployment again skyrocketed worldwide around the 1980s to combat double-digit inflation after two oil shocks of 1973-1974 and 1979.

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The OECD countries also struggled with high unemployment (McCallum, 1986). The reason for rising unemployment and inflation was falling productivity and increasing costs due to oil shocks. Although European inflation was controlled during the second half of the 1980s, unemployment became persistent, aggravating labor market conditions (Burgess, 1990). For OECD countries, there were various unemployment rates. For example, some countries had very high unemployment during this time (e.g., Belgium, Netherlands, Spain, and Turkey), while others experienced relatively lower unemployment (e.g., Switzerland and Iceland). The differences can be explained by the idiosyncratic characteristics such as geography, size, and economic conditions of each country (Burgess, 1990).

European OECD countries had higher unemployment rates than the US during the 1980s. During the 1990s, European countries also controlled their unemployment levels, but major countries, France, Spain, Italy, and Germany, still wrestled with unemployment (Nickell, 2003). If European OECD excluded these four major countries, the unemployment issue would disappear during the 1990s. After oil embargos and the 1980s passed, no major economic or financial crisis affected the entire world until 2008. The great recession of 2008 (mortgage crises) also affected all countries, again hindering the US economy first and then spread all major OECD countries.

Nevertheless, the effects of the great recession were not as devastating as the great depression. Maximum unemployment was around 10.5% during the great recession in the US (Kochhar, 2020) and about 9% in OECD countries (Guichard & Rusticelli, 2010). From 2008 until 2019, everything went under control until the COVID-19 pandemic hit. Within a short period, unemployment reached over 30% in the US due to a health shock and people being forced to live indoors. The structure of unemployment was the only difference between the previous two important crises (the great depression and the great recession) and the pandemic. COVID was a health shock; it was neither a macroeconomic nor a banking issue. Thus, its repercussions are being discussed separately, but in terms of unemployment, the pandemic increased unemployment more than the great depression.

Along with unemployment, corruption is also a central phenomenon in macroeconomic stability. According to the United Nations, 5% of the world's GDP goes to corruption annually (United Nations, 2018). Prominent international organizations, the World Bank and Transparency International, define corruption as abusing private office for private gain. There is literature through which corruption positively affects all economic variables, known as the grease-the-wheel hypothesis (Leys, 1965; Huntington, 1968). However, extensive literature finds that corruption negatively impacts macroeconomic indicators, known as the sands-the-wheel hypothesis (Shleifer & Vishny, 1993; Murphy et al., 1993; Kaufmann & Wei, 2000). Besides, another strand of literature finds a non-linear relationship between corruption and other variables. Corruption negatively or positively affects a variable until a certain threshold, and it does not affect after that point.

Considering the negative repercussions of the pandemic, such as the recent fight against inflation and the Russian invasion of Ukraine, unemployment will continue to adversely pressure developed and developing nations (Feldmann, 2013; Burya et al., 2022). Moreover, corruption is and will be an issue in the upcoming years due to its hidden nature. Both developed and developing countries are affected by the negative consequences of the corruption phenomenon - some studies mentioned how corruption may be one of the determinants of unemployment or vice versa. Still, a deeper analysis of the two variables has not been conducted theoretically or empirically.

This study completes this gap in the literature by examining the impact of corruption on unemployment in OECD countries between 1996-2020, including all major economies and others from Latin America and Asia. Examining OECD countries may provide a holistic global picture of the nexus between corruption and unemployment. To the best of my knowledge, the relationship between the two variables has not been studied in OECD countries before with the estimation strategies carried out in this study. Knowing the consequences of corruption on unemployment may help governments to provide policies alleviating corruption in the long run to improve labor force participation. Moreover, eliminating corruption might have cumulative impacts on fostering macroeconomic stability. The subsections of the paper are the

following: The next section covers the literature review. Section 3 provides the methodology. Section 4 shares the results, and section 5 runs some robustness checks. Lastly, section 6 evaluates the paper and concludes.

2. Literature Review

This section categorizes the literature on the direct effects of corruption on unemployment, indirect effects through various channels, corruption being a determinant of unemployment, and unemployment being a determinant of corruption. On the direct nexus of corruption and unemployment, Dimant et al. (2013) find that corruption increases unemployment. Pappa et al. (2015) verify the results of Dimant et al. (2013) and analyzes the fiscal consolidation plans in Italy, Greece, Portugal, and Spain. They find that tax evasion and corruption affect fiscal multipliers, increase the informal economy's size and unemployment, and cause productivity losses. Higher corruption further exacerbates the losses and increases taxes to reduce debt. In a New Keynesian Dynamic Stochastic General Equilibrium (DSGE) model, the empirical evidence shows that tax evasion and corruption play essential roles in understanding the effects of fiscal consolidation. Thus, along with tax evasion, corruption increases unemployment.

Bouzid (2016) finds that after controlling for numerous macroeconomic and institutional variables, an increase in corrupt practices increases youth unemployment using the GMM approach. Nnaemeka (2021) shows a positive relevance between corruption and unemployment, and corruption causes unemployment. On the other hand, unemployment positively responds to corruption. Using the logistic regression model, the author finds that bribery, nepotism, and favoritism explain why unemployment is high in Nigeria.

Moreover, Zumba et al. (2021) investigate the corruption and unemployment nexus with one and two-step GMM estimations for 39 Sub-Saharan African (SSA) countries. They find that corruption positively but insignificantly affects unemployment. They find unemployment is a persistent phenomenon in SSA; however, corruption in the public sector does not explain this persistence. Sanz et al. (2022) investigate whether corruption intensifies the political outcomes of economic crises. The authors employ municipal-level Spanish data with a difference-in-difference methodology. They first find that unemployment shock increases political fragmentation, and they also show that political fragmentation increases in municipalities with unemployment shocks where local corruption is higher. Thus, they show that higher corruption increases the negative impacts of unemployment.

There is another strand in the literature that finds either unemployment as one of the determinants of corruption or the other way around. In the first group, Gould and Amaro-Reyes (1983) count unemployment as one of the contributors to corruption in developing countries, along with poverty and social and economic inequalities. Mocan (2008) finds determinants of corruption, and he counts the unemployment rate as one of the factors working with microdata for 49 countries. Along with unemployment, gender, income, education, and marital status, the city size is among others to increase the risk of bribery.

In parallel work, Ajie and Wokekoro (2012) find unemployment must be tackled in Nigeria as one of the determinants of corruption. Saha and Gounder (2013) utilize unemployment as one of the control variables in their study on the impact of income levels on corruption. The unemployment coefficient is positive and significant, showing that higher unemployment levels increase corruption. In a statistical sense, they find that one standard deviation increase in unemployment increases corruption by 0.147 points. İnam et al. (2019) investigate the correlation between corruption and socioeconomic development in OECD countries. Using discriminant analysis, they find that OECD members with low human development index (HDI), GDP per capita, education expenditures, and high unemployment experience corruption at a higher level.

On the other hand, some studies find corruption as one of the determinants of high unemployment. In this vein, Kayode et al. (2014) see corruption as one of the determinants of unemployment. Broker et al. (2018) investigate the impact of corruption on economic activity, and they consider the gross domestic product, foreign direct investment, and unemployment rate. The unemployment rate results indicate that countries with low levels of corruption experience lower levels of unemployment, and countries with higher

levels of corruption experience higher levels of unemployment. Adjor and Kebalo (2018) examine corruption's impact on unemployment in nine Southern African Development Community (SADC) utilizing the panel vector autoregressive model. Education levels and income inequalities are the two most important determinants of the unemployment rate. For youth unemployment, corruption seems to be the primary explanatory variable in SADC countries after education. Thus, for total unemployment, policymakers should prioritize reducing income inequalities and increasing education levels. For youth unemployment, corruption and all its forms should be eliminated for economic development.

In addition to several strands in the literature, there are channels through which corruption increases unemployment. Schneider (2015) finds that corruption leads to higher chances of emigration, especially among skilled labor employees, which lowers economic growth that increases unemployment. Thus, corruption increases unemployment through emigration channels where skilled labor leaves the countries. Furthermore, Dimant et al. (2015) also show unemployment as one of the reasons to leave the country. In a similar work, Cooray and Schneider (2016) find that higher corruption leads to higher unemployment and emigration.

Arif et al. (2020) investigate the impact of corruption on Foreign Direct Investment (FDI) in BRICS (Brazil, Russia, India, China, and South Africa) countries. When looking at them in one unit, corruption positively and significantly affect FDI; however, looking at them separately, corruption negatively affects FDI substantially in Brazil, China, and India, whereas the relationship becomes insignificant for Russia and South Africa. Therefore, lowering corruption might be substantial, especially in countries where corruption has negative and significant impacts on FDI. Consequently, it can be inferred from Arif et al. (2020) that lower corruption is important for lower unemployment.

Continuing with different channels, Oueghlissi and Derbali (2021), the inconclusive relationship between democracy and corruption is extended with an interaction between democracy and unemployment. By using dynamic panel data for 80 developing and developed countries between 1990-2018, the paper finds that democracy reduces corruption; however, when unemployment is high, the impact of democracy on corruption becomes insignificant. The potential positive effect of democracy on corruption is depleted through high unemployment. The results are robust with alternative specifications.

Lastly, extensive literature investigates the complex nature of corruption and unemployment. In one of these studies, Schulze et al. (2016) find a strong non-linearity between the relative salary of public employees and the number of corrupt incidents that police recorded or convictions by the Russian courts. The results show that the duration of unemployment decides the level or the opportunity cost of corruption. Interestingly, Saha and Ben Ali (2017) show that increasing unemployment in the working-age population lowers corruption opportunities as MENA countries are primarily for public employment. Having higher unemployment means that there are fewer public offices available, or they are occupied; thus, there are fewer opportunities also for corruption.

Moreover, Lim (2019) builds an endogenous growth model with endogenous unemployment, heterogenous labor, and public sector corruption. The presented model does not separate public and private officials but takes public seats as an occupational choice. In an empirical sense, the model with endogenous corruption and unemployment is studied in middle-income African economies with high corruption and unemployment. The results indicate that a far-reaching infrastructure push does not affect increasing economic growth in an economy with rampant corruption. Nevertheless, if the economy has anti-corruption and other social policies to generate a change, that will affect growth.

As can be seen, there are different direct and indirect channels to explain the relationship between corruption and unemployment. There are also studies seeing corruption as one of the determinants of unemployment, whereas others find the opposite. Moreover, some studies find that corruption increases unemployment and vice versa. Taking this diverse literature into account, this study will investigate this relationship by overcoming the problem of reverse causality and endogeneity through a dynamic panel data approach.

3. Methodology

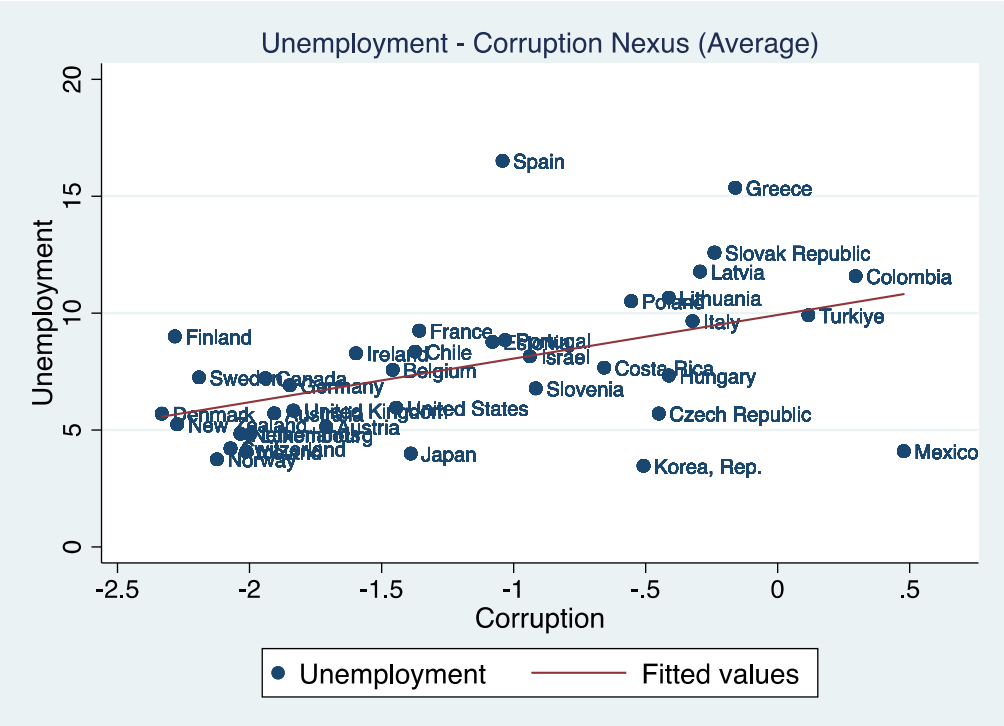
3.1. Data

As aforementioned, this study investigates the impact of corruption on unemployment in 38 OECD countries between 1996-2020[1]. Corruption data is from World Governance Indicators (WGI), standardized data varies between -2.5 and +2.5, where a higher number represents lower corruption. The corruption data is rescaled; therefore, higher values represent higher corruption. Also, Corruption Perception Index (CPI) data is used for robustness checks in section 5. CPI data varies between 0 and 100, where higher numbers represent lower corruption. To make the results more interpretable and to be in line with primary corruption data, WGI, the CPI data is also rescaled, and higher numbers represent higher corruption. Thus, the magnitudes of the two data sets differ, but the interpretation of the results is the same.

When it comes to other variables[2], unemployment (% total national estimate), the log of GDP per capita (constant 2015US$), trade (as % of GDP) as a proxy for openness, population (annual % growth), savings (as % of GDP), net FDI inflows (as % of GDP), oil rents (difference between the value of crude oil production at regional prices and total costs of production), general government final consumption expenditure (annual % growth), are obtained through World Development Indicators. The literature primarily uses these control variables to show the relationship between corruption and unemployment. For example, Dimant et al. (2013) control population size, per capita income, and trade openness to examine the relationship between unemployment and corruption. Likewise, Bouzid (2016) and Saha and Ben Ali (2017) utilize net FDI and government size controls for their studies. In addition, I employ saving rates and oil rent as control variables. By controlling all these variables, the impact of corruption on unemployment can be fully reflected.

Figure 1 below is the scatter plot of the unemployment corruption relationship. The averages are taken to better picture the relationship between two variables since scatter plots with raw data might be misleading in panel data settings. The figure illustrates the positive relationship between unemployment and corruption; that is, higher corruption increases unemployment which verifies most literature on corruption and unemployment studies[3].

Figure 1. Unemployment-Corruption Relationship



Tables 1 presents a summary of descriptive statistics. There are 38 countries in the study (Costa Rica recently became a member of the OECD). The data for WGI, the primary corruption variable, starts from 1996, and the latest data has been released for 2020. Thus, there is a maximum of 836 observations in total. Depending on the model, system GMM utilizes some of the observations as instruments. Only two observations are missing for unemployment data, and three observations are missing for FDI (inflows) and oil rents. Finally, just one observation is missing for log [GDP], and the rest of the variables have the complete number of observations. Unemployment, the response variable, varies between approximately 2-28%, whereas corruption is between -2.5 to 0.9.

Table 1. Summary Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Year	836			1996	2020
Unemployment	834	7.695	4.06	1.94	27.47
Corruption	836	-1.192	0.817	-2.47	0.855
Log [GDP]	835	10.173	0.733	8.284	11.63
Trade	836	91.621	53.635	18.254	380.104
Population	836	0.599	0.78	-2.258	2.891
Savings	836	25.341	7.592	7.383	62.3
FDI (Inflows)	833	4.902	11.01	-57.532	109.331
Oil Rents	833	0.503	1.398	0	10.961
Expenditure	836	2.135	2.566	-10.04	23.939

In Table 2, the correlation matrix illustrates a high positive relationship between corruption and unemployment, which is statistically significant at the 10% level. Unemployment has a negative and significant correlation with the other variables except for trade and FDI (inflows). This shows that the control variables are carefully chosen. In addition, the correlation matrix shows pairwise correlation, deletes missing observations, and then calculates the correlation. The pairwise correlation seems to be more accurate than the basic correlation matrix. Another important implication of the correlation matrix is that corruption has a negative and significant correlation with most variables. This verifies the information provided in the introduction section that corruption negatively impacts macroeconomic indicators.

Table 2. Matrix of Correlation

Variables	1	2	3	4	5	6	7	8	9
Unemployment (1)	1								
Corruption (2)	0.391*	1							
Log [GDP] (3)	-0.419*	-0.817*	1						
Trade (4)	-0.076	-0.098	0.204*	1					
Population (5)	-0.334*	-0.225*	0.264*	-0.048	1				
Savings (6)	-0.402*	-0.362*	0.469*	0.638*	0.253*	1			
FDI (7)	-0.036	-0.083	0.081	0.369*	0.054	0.268*	1		
Oil Rents (8)	-0.129*	0.069	-0.063	-0.193*	0.188*	0.059	-0.06	1	
Expenditure (9)	-0.223*	0.065	-0.126*	-0.015	0.298*	0.170*	0.034	0.075	1

*** p<0.01, ** p<0.05, * p<0.1

3.2. Model and Econometric Methodology

Following the literature review, the subsequent model will be utilized:

$$\text{Unemp }(\%)_{it} = \alpha_0 + \beta \text{Corr}_{it} + \gamma X_{it} + \omega Z_{it} + \theta_i + \mu_t + \varepsilon_{it}$$
$$\theta_i = \beta_0 + \alpha Z_i \quad (1)$$

In this model, unemp (%) is the unemployment (national estimate) for country i in time t. Corr is the measure of corruption for country i in time t. β is the coefficient of interest. If β is positive, corruption positively affects unemployment, and if it is negative, it negatively affects national unemployment estimates. X_{it} and Z_{it} are the vector of controls for observable variables which vary across country and time. The study controls variables: log (GDP), trade, population, savings, FDI inflows, oil rent, and general government expenditure. θ_i is an individual country effect that does not vary across time. Lastly, μ_t captures time fixed effects and ε_{it} is the iid error term. β_0 is the intercept, and Z_i is unobserved explanatory variables that vary across countries but not time.

Nonetheless, in the specification above, fixed effect regressions do not capture all time-variant heterogeneity that affects the outcome of interest, which creates omitted variable bias. Further, unemployment at time t-1 is the predictor of unemployment in time t, meaning that the dependent variable is time persistent. Therefore, adding the lag of the dependent variable leads to an endogeneity problem because outcome and treatment are persistently affected by the idiosyncratic error term (Blundell & Bond, 1998). Since lag values are incorporated into the model, fixed effects regressions are not ideal for the study. However, fixed effect regressions, difference GMM, and Ordinary Least Squares (OLS) are still used for robustness checks in section 5.

Besides the potential endogeneity issue, there is reverse causality, meaning corruption might cause unemployment, and high unemployment may further aggravate corruption. However, the GMM specification removes reverse causality and endogeneity issues (Li, Murshed, & Tanna, 2017). In addition, GMM circumvents the biases caused by pooled OLS and standard GMM. Standard GMM suffers from small-sample bias and does not consider country-specific fixed effects (Baltagi, 2021). Hence, the following system GMM model of Arellano and Bond (1991) is presented:

$$Y_{it} = \sum_{j=1}^{p} \alpha_j Y_{i,t-j} + X_{it}\beta_1 + z_{it}\beta_2 + \gamma_i + \epsilon_{it} \quad i = 1,\dots,N,\ t = 1,\dots,T \quad (2)$$

In the second equation above, α_j and p are parameters that are to be estimated. X_{it} is a $1 \times k_1$ vector of strictly exogenous covariates, β_1 is a k_1 x 1 vector of parameters that is to be estimated, z_{it} is a $1 \times k_2$ vector of endogenous covariates, β_2 is a $k_2\ x\ 1$ vector of parameters to be estimated, γ_i are the panel-level effects and ϵ_{it} is the error term for the whole sample with variance σ_ϵ^2. GMM allows adding lag variables of unemployment without causing any bias in the estimation but how many lags need to be added to the regressions is unknown. For that, unemployment lags are added one by one until it ceases to be significant, meaning unemployment is not affected by the lagged unemployment anymore. Until the second lag, unemployment is persistent and statistically significant.

According to Blundell and Bond (1998), adding lags of dependent variables violates the strict exogeneity assumption and makes the fixed effect estimator inconsistent. In addition, Arellano-Bond estimation becomes weak as the autoregressive process becomes persistent with lagged-level instruments. Since unemployment depends on lags, there would be autocorrelation and heteroscedasticity within countries. Independent variables would not be strictly exogenous, which means they are correlated with past and possible realizations of the error term. To eliminate these issues, using Arellano-Bond/Blundell-Bond (system GMM), the extension of Arellano-Bond is plausible. System GMM uses Arellano-Bond conditions with additional moment conditions, which make the results more efficient (Engblom & Oikarinen, 2015). The following section presents the results for system GMM. Subsequent sections convey robustness checks with different estimations and alternative corruption index.

4. Results

Table 3 below demonstrates the results for system GMM regressions. Depending on the model, one unit increase in corruption increases unemployment between 0.75-0.92 percentage points. In Model 1, the preferred specification, the corruption coefficient is 0.92. Starting from the second column, the control variables are added. After adding FDI in Model 2, the corruption coefficient does not alter much, which is 0.91. In Model 3, oil rent is also added, and the magnitude of the corruption coefficient goes down a little, but the sign is consistently positive. Model 4 adds government consumption expenditure as an important control variable. After adding the expenditure variable, the corruption coefficient is still positive and significant. However, none of the coefficients of control variables are significant in the regressions except expenditure in the last column. In the last column, the corruption coefficient goes down to 0.75, the lowest among the four models.

The results are statistically and economically in line with most of the literature that corruption increases unemployment. Considering the range of the corruption index being between -2.5 and +2.5, one unit increase is a big jump. Thus, for example, in the preferred specification, one unit increase in corruption increases unemployment by 0.92 percentage points seems to be a significant increase. Considering the repercussions of the pandemic that started in 2020, seeing an increase in unemployment rates among OECD members is reasonable; nevertheless, the coefficients need to carefully be examined as corruption scores vary within a small range of values. Under any circumstances, the outcomes indicate specific policies needed to alleviate corruption and all its forms to lower unemployment or at least keep it around the natural unemployment rate, depending on the member nation's macroeconomic outlook.

Lastly, regarding the main estimation strategy results, the number of instruments lowers the total number of observations. The point with dynamic panel data settings is that it utilizes more observations as instruments; therefore, the observations decrease to 639-642 from 836. However, system GMM uses less number of instruments as is seen in the difference GMM, total number of observations varies between 599-603.

Table 3. System GMM Regressions

Variables	Model 1	Model 2	Model 3	Model 4
Corruption	0.922***	0.912**	0.833*	0.745*
	(0.288)	(0.461)	(0.452)	(0.421)
Log [GDP]	0.408	0.398	0.290	-0.0488
	(0.349)	(0.598)	(0.622)	(0.635)
Trade	-0.0107***	-0.0109	-0.0119	-0.0146*
	(0.00383)	(0.00782)	(0.00758)	(0.00775)
Population	0.00812	0.00426	0.0130	0.145
	(0.163)	(0.349)	(0.347)	(0.310)
Savings	-0.149***	-0.148***	-0.141***	-0.109**
	(0.0240)	(0.0447)	(0.0459)	(0.0438)
FDI [Inflows]		-0.00266	-0.00272	-0.00259
		(0.00413)	(0.00404)	(0.00426)
Oil Rents			-0.144	-0.111
			(0.137)	(0.125)
Expenditure				-0.184***
				(0.0569)
Unemployment [L_1]	1.219***	1.219***	1.223***	1.119***
	(0.0288)	(0.0557)	(0.0545)	(0.0694)
Unemployment [L_2]	-0.484***	-0.483***	-0.486***	-0.398***
	(0.0266)	(0.0399)	(0.0394)	(0.0487)
Constant	3.775	3.883	4.861	8.053
	(3.286)	(5.976)	(6.181)	(6.314)
Observations	642	642	639	639
Number of Country	38	38	38	38

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5. Robustness Checks

5.1. Alternative Econometric Methodologies

After getting consistent results with system GMM, this section tests the results for robustness. The first robustness checks are with the difference GMM methodology. Although difference GMM, Arellano-Bond estimation, is weaker due to the autoregressive process that becomes persistent with lagged-level instruments, it is still helpful to see the results.

Table 4 illustrates that the results are consistent with the system GMM that corruption increases unemployment in OECD countries. One unit increase in corruption score increases unemployment by 1.37-1.44 depending on the model. The coefficients of corruption seem to be higher than system GMM, which may be because system GMM is an updated version of difference GMM. For control variables, the savings coefficients are important in all models, and the expenditure coefficient is also significant in Model 4. Besides these two, none of the coefficients of other control variables is significant except log [GDP] in the last column.

Table 4. Difference GMM Regressions

Variables	Model 1	Model 2	Model 3	Model 4
Corruption	1.440**	1.422**	1.407**	1.368**
	(0.624)	(0.622)	(0.618)	(0.551)
Log [GDP]	-1.637	-1.630	-1.884	-1.978*
	(1.204)	(1.212)	(1.263)	(1.202)
Trade	-0.00630	-0.00700	-0.00736	-0.0131
	(0.00918)	(0.00970)	(0.00974)	(0.0114)
Population	-0.180	-0.183	-0.196	0.0237
	(0.284)	(0.283)	(0.285)	(0.227)
Savings	-0.164***	-0.163***	-0.155***	-0.120**
	(0.0563)	(0.0564)	(0.0582)	(0.0559)
FDI [Inflows]		-0.00516	-0.00503	-0.00515
		(0.00486)	(0.00482)	(0.00499)
Oil Rents			-0.203	-0.152
			(0.141)	(0.128)
Expenditure				-0.170***
				(0.0534)
Unemployment [L_1]	1.122***	1.121***	1.124***	1.040***
	(0.0659)	(0.0657)	(0.0650)	(0.0746)
Unemployment [L_2]	-0.448***	-0.446***	-0.450***	-0.371***
	(0.0378)	(0.0379)	(0.0372)	(0.0499)
Constant	25.86**	25.84**	28.37**	29.16**
	(12.19)	(12.26)	(12.73)	(12.12)
Observations	603	603	599	599
Number of Country	38	38	38	38

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The next robustness check is the fixed effect[4] regressions. Fixed effect regressions are important to capture country-specific time-invariant unobserved heterogeneity. However, it does not capture all time invariance as lagged values are employed. Still, as in difference GMM, the fixed effect is an important estimation strategy that can be used for robustness. Table 5 below demonstrates that the corruption index varies between 1.78-2.3. That is, one unit increase in the WGI corruption index increases unemployment by 1.78-2.3 percentage points, depending on the model.

For control variables, the coefficients of log [GDP] are negative and significant throughout. The coefficients of trade are positive and significant in all models except the last column. For population, the coefficients are negative and significant in all models. The savings coefficients are negative and significant except in the last model. The coefficients of FDI and oil rents are insignificant. Lastly, the coefficient of expenditure is significant in Model 4.

Table 5. Fixed Effect Regressions

Variables	Model 1	Model 2	Model 3	Model 4
Corruption	2.225**	2.248**	2.271**	1.781*
	(0.972)	(0.979)	(0.971)	(0.903)
Log [GDP]	-7.144***	-7.001***	-6.966***	-7.076***
	(1.926)	(1.914)	(1.922)	(1.958)
Trade	0.0399**	0.0360**	0.0367**	0.0286
	(0.0168)	(0.0173)	(0.0175)	(0.0177)
Population	-2.198***	-2.246***	-2.233***	-1.832***
	(0.717)	(0.716)	(0.719)	(0.671)
Savings	-0.152**	-0.153**	-0.160**	-0.0963
	(0.0597)	(0.0593)	(0.0613)	(0.0585)
FDI [Inflows]		0.00317	0.00317	0.00366
		(0.00745)	(0.00748)	(0.00821)
Oil Rents			0.135	0.108
			(0.143)	(0.158)
Expenditure				-0.322***
				(0.0472)
Constant	84.53***	83.51***	83.22***	83.35***
	(19.05)	(18.91)	(18.98)	(19.23)
Observations	833	830	827	827
R-squared	0.347	0.350	0.350	0.417
Number of Country	38	38	38	38

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. OLS Regressions

Variables	Model 1	Model 2	Model 3	Model 4
Corruption	0.641**	0.660**	0.702**	0.622**
	(0.282)	(0.285)	(0.282)	(0.276)
Log [GDP]	-0.738**	-0.710**	-0.737**	-1.126***
	(0.320)	(0.322)	(0.321)	(0.315)
Trade	0.0147***	0.0143***	0.0129***	0.0107***
	(0.00257)	(0.00272)	(0.00298)	(0.00303)
Population	-0.858***	-0.861***	-0.820***	-0.562***
	(0.172)	(0.174)	(0.171)	(0.174)
Savings	-0.201***	-0.201***	-0.190***	-0.157***
	(0.0249)	(0.0248)	(0.0263)	(0.0262)
FDI [Inflows]		0.00925	0.00854	0.00894
		(0.0129)	(0.0129)	(0.0134)
Oil Rents			-0.179**	-0.206***
			(0.0716)	(0.0729)
Expenditure				-0.265***
				(0.0683)
Constant	20.21***	19.96***	20.21***	23.87***
	(2.715)	(2.732)	(2.733)	(2.730)
Observations	833	830	827	827
R-squared	0.297	0.295	0.299	0.321

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Lastly, the robustness check is conducted with basic OLS regressions in Table 6. Depending on the model, one unit increase in corruption score increases unemployment by 0.62-0.70. percentage points. The coefficients of log [GDP], population, savings, and oil rents are all negative and significant. The trade coefficient is positive and significant in all regressions. The FDI coefficient is insignificant, whereas expenditure is negative and significant in the last model. Thus, the results starting from system GMM and continuing with difference GMM, fixed effects, and OLS regressions are all consistent and in line with the corruption sands-the-wheels hypothesis. When corruption is higher in OECD countries, that increases unemployment rates, an important outcome to implementing policies discussed in the last section of the paper.

5.2. Alternative Corruption Index

Checking the robustness of the results with different data sets is as important as testing with various estimation strategies. Transparency International's Corruption Perception Index (CPI) is an alternative corruption index widely employed in corruption studies. It is considered a survey of the surveys as it is compiled through several surveys conducted on businesspeople. The results in Table 7 also verify the conclusions of previous findings. One unit increase in corruption increases unemployment by around 0.04 percentage points in all models. It is imperative to note that the coefficients are much lower than WGI regressions since the CPI index varies between 0 and 100, meaning one unit increase exactly equals 1 point. Consequently, unemployment increases by 0.04 percentage points, a statistically and economically significant outcome, in line with the WGI corruption index.

To conclude, getting consistently positive and statistically significant results for the corruption coefficient infers that it is important to implement specific policies in OECD countries to eliminate corruption and all its forms to combat high unemployment. In the next and last section, this is discussed in detail. The results are compared with other findings in the literature to provide a holistic picture of corruption and unemployment studies.

Table 7. System GMM Regressions: CPI Corruption Index

Variables	Model 1	Model 2	Model 3	Model 4
Corruption	0.0398*	0.0398*	0.0369*	0.0365*
	(0.0239)	(0.0239)	(0.0213)	(0.0214)
Log [GDP]	-0.576	-0.586	-0.670	-0.540
	(0.727)	(0.739)	(0.741)	(0.668)
Trade	-0.00739	-0.00784	-0.00747	-0.00808
	(0.00995)	(0.0102)	(0.00958)	(0.00933)
Population	-0.350	-0.362	-0.369	-0.263
	(0.306)	(0.303)	(0.302)	(0.281)
Savings	-0.0797	-0.0782	-0.0720	-0.0575
	(0.0639)	(0.0641)	(0.0645)	(0.0630)
FDI [Inflows]		-0.00190	-0.00221	-0.00208
		(0.00350)	(0.00344)	(0.00356)
Oil Rents			-0.0698	-0.0441
			(0.152)	(0.137)
Expenditure				-0.106**
				(0.0419)
Unemployment [L_1]	1.409***	1.408***	1.419***	1.344***
	(0.0731)	(0.0737)	(0.0742)	(0.0771)
Unemployment [L_2]	-0.653***	-0.652***	-0.661***	-0.595***
	(0.0683)	(0.0687)	(0.0668)	(0.0699)
Constant	13.55*	13.67*	14.17*	12.65*
	(8.062)	(8.165)	(8.076)	(6.978)
Observations	341	341	338	338
Number of Country	38	38	38	38

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

6. Discussion and Conclusion

Unemployment and corruption are two important determinants of macroeconomic stability. However, the impact of one another has not been studied much in the literature. Trying to close this void, the current study examines the effects of corruption on unemployment in OECD countries between 1996-2020. To overcome potential endogeneity and reverse causality problems, the system GMM approach is utilized. The results show that there is a positive relationship between corruption and unemployment. That is, higher corruption leads to higher unemployment. The results are robust with alternative econometric estimations (i.e., difference GMM, fixed effect, and OLS regressions) and alternative corruption index (i.e., CPI).

The corruption-unemployment literature also finds that corruption is one of the determinants of unemployment, and unemployment is an important explanatory variable for high corruption. These two phenomena feed each other, and sometimes it is uncertain which way the causality runs. In most other studies, it is found that corruption increases unemployment, not the other way around. The system GMM approach can tackle these issues. Other econometric specifications in this study also support the results of the system GMM approach. Thus, robust, and consistent results indicate that corruption must be confronted in political and bureaucratic scopes to eliminate unemployment and, more particularly, youth unemployment[5].

One issue here is about the nature of corruption data sets. WGI and CPI are subjective data sets that look into the corruption scores of countries by asking businesspeople who conduct business in foreign lands. Bardhan (1997) mentions that subjective data sets are problematic for different reasons, but the consensus is that subjective data sets are highly correlated with objective indexes; thus, they can also be used (Johnston, 2005; Chang, 2017).

Another issue is that OECD has 38 member countries; some are advanced nations while others are either developing or emerging. Because of this income and wealth variation among the countries, it is important to investigate the impact of corruption on unemployment in different country groups for future research. Clustering all countries in the same regressions might mislead the policymakers, forcing them to provide one-size-fits-all policies. To tackle this, future studies may categorize OECD members according to their growth and development patterns to investigate the impact of corruption.

Although there are potential limitations, this work helps provide policy implications. First and foremost, corruption needs to be eliminated to a certain extent since there is a consensus on the negative impacts of corruption, as Rose-Ackerman and Palifka (2016) count numerous adverse effects of corruption in their prominent book. To eliminate corruption, OECD countries' political and economic institutions should have high quality. Hence, maybe not the very advanced nations of the union, the developing members should focus on increasing their institutional quality, which will help control corruption in the long run in political and bureaucratic spheres.

The second policy recommendation is to increase labor force participation where public and private sector employees are paid generously, which will prevent corrupt transactions. Also, with the help of higher-quality institutions, the punishment-reward mechanism works appropriately, which increases the opportunity cost of initiating a corrupt behavior, especially in the public domain. In that case, unemployment will converge to the natural unemployment rate for each member of the OECD, reinforcing the importance of institutional quality and lowering corruption. These intertwined relationships will become self-perpetuating in the long run, and countries will not have to deal with lower institutional quality, particularly corruption and unemployment issues.

Despite the limitations in the data and the complex and hidden nature of corruption (Rothstein & Varraich, 2017), this piece concludes that corruption increases unemployment which is verified with different econometric techniques and alternative corruption data sets. The paper supports the corruption “sands-the-wheels” hypothesis, which is also in line with most literature. This study is essential to close the gap that exists in the literature. Corruption literature is extensive, but the impact of corruption on unemployment in

OECD countries has not been studied much. Henceforth, the results of this study can open the doors for further research to investigate the micro and macro effects of corruption on unemployment.

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End Notes

1. *The list of the countries is presented in Appendix Table A1.*
2. *Data definitions and sources are presented in Appendix Table A2.*
3. *The same relationship can be seen with CPI data, which is not shared to save the space, but it is available upon request.*
4. *Hausman test favors fixed effect with p<0.0000*
5. *When youth unemployment data is used, the results are still statistically significant in all models.*

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Appendix

Table A1. List of OECD Countries Under the Study

Austria	Japan
Australia	Korea
Belgium	Latvia
Canada	Lithuania
Chile	Luxembourg
Colombia	Mexico
Costa Rica	Netherlands
Czech Republic	New Zealand
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Slovak Republic
Germany	Slovenia
Greece	Spain
Hungary	Sweden
Iceland	Switzerland
Ireland	Turkey
Israel	United Kingdom
Italy	United States

Tablo A2. Data Definitions and Sources

Variable	Definition	Source
Corruption	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as the "capture" of the state by elites and private interests.	World Governance Indicators (WGI)
Unemployment, total (% of the total labor force) (national estimate)	Unemployment refers to the share of the labor force without work available for and seeking employment. Definitions of the labor force and unemployment differ by country.	The World Bank, World Development Indicators (WDI)
GDP per capita (constant 2015 US$)	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without deductions for the depreciation of fabricated assets or depletion and degradation of natural resources. Data are in constant 2015 U.S. dollars.	The World Bank, World Development Indicators (WDI)
Trade (% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of the gross domestic product.	The World Bank, World Development Indicators (WDI)
Population growth (annual %)	The annual population growth rate for year t is the exponential rate of growth of the midyear population from year t-1 to t, expressed as a percentage	The World Bank, World Development Indicators (WDI)
Gross domestic savings (% of GDP)	Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption).	The World Bank, World Development Indicators (WDI)
Foreign direct investment, net inflows (% of GDP)	Foreign direct investment is the net inflow of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital, as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors and is divided by GDP.	The World Bank, World Development Indicators (WDI)
Oil rents (% of GDP)	Oil rents are the difference between the value of crude oil production at regional prices and the total costs of production.	The World Bank, World Development Indicators (WDI)
General government final consumption expenditure (annual % growth)	Annual percentage growth of general government final consumption expenditure based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars. General government final consumption expenditure (general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security but excludes government military expenditures that are part of government capital formation.	The World Bank, World Development Indicators (WDI)

Source: World Development Indicators (WDI) and World Governance Indicators (WGI).

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