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RESEARCH PAPER

Unemployment-GDP Growth Nexus and Labor Market Regulations: Evidence from Oil-Producing Countries

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Abstract

This paper examines the effect of labor market regulations (LMR) on the unemployment rate for 17 oil-producing countries from 2000 to 2019. The panel corrected standard errors (PCSE), and the panel autoregressive distributed lag (ARDL) estimators are employed in this regard. The negative effect of output growth on the unemployment rate was confirmed. This study shows that a more flexible or less protective labor market in oil-producing countries is generally associated with higher unemployment rates. This result was confirmed in the static PCSE estimation. However, both results indicated that increased GDP growth in more flexible labor regulations is associated with higher unemployment rates. These findings suggest that there is a need for more empirical evidence according to the hypothesis that higher labor market flexibility leads to decreases in the unemployment rate. Therefore, the implementation of labor market regulations, whether more flexible or more rigid regulations are needed, should be under consideration of the overall economic conditions.

Keywords: Labor Market Regulation, Oil Countries, Output Growth, PCSE, Unemployment.
JEL Classification C29, J40, J64.

1. Introduction

In some oil-rich countries, natural resource discovery is a curse rather than a source of sustainable socio-economic advantages. According to a study by Adams et al. (2019), corruption permeating oil-rich developing countries impedes transparency and accountability, resulting in a resource curse. The mix of weak institutions and resource abundance causes the resource curse and harms the country's economy (Khanna et al., 2006). Besides, labor market effects on output growth are an issue of ongoing academic and political concern. While economic growth was supposed to be the key to increasing labor demand and reducing unemployment, empirical evidence indicates a considerable association between LMR and growth across countries. Lee (2000) indicated that relatively high rigidities featuring European labor markets weaken the relationship between output growth and unemployment. Specifically, strict or costly hiring and firing procedures represent the main

component of labor regulations associated with the high rate of unemployment, low employment levels, and a segregated labor market with some excluded groups, such as women and youth (Heckman and Pagés-serra, 2000).

This is an additional issue that needs to be analysed in oil countries. Oil-rich countries have both a high and low unemployment rate, and there has been a widespread debate that the main reason for these diverging experiences is the differences in LMR. The labor regulations are already under pressure with the persistent unemployment rate and are expected to be further stressed in the future (Gwartney et al., 2019). In oil-producing countries, oil contributes highly to the total GDP. Hence, for this increase in GDP to be an effective factor in reducing the unemployment rate, proper labor regulations are needed. Such a high level of unemployment in oil countries, apart from the impact of output fluctuations, is also driven by labor institutions and shocks.

In oil-producing countries particularly, there is a considerable variation in the LMR index.

Table ***1*** shows that most countries score above the average value of the LMR index. As shown, Nigeria and Brunei Darussalam come on top of the most flexible labor markets (LMR score above 8.5). On the other hand, Table 1 shows that only Iran and Venezuela have a slightly lower score than 5, representing the most rigid labor regulations among oil-producing countries.

Table 1. The Evolution of the LMR Index in Oil-Producing Countries

Country	2000	2005	2010	2015	2019
Algeria	4.83	5.16	4.99	5.28	5.65
Angola		3.99	4.01	4.56	5.34
Azerbaijan		6.51	6.69	6.40	6.54
Brunei Darussalam			9.01	8.69	8.79
Chad	6.22	5.95	5.99	5.36	5.37
Congo	6.01	6.29	6.48	5.66	5.66
Gabon		7.08	8.71	7.45	7.33
Iran	3.98	4.53	4.63	4.97	4.74
Kazakhstan		7.35	7.08	7.53	7.56
Kuwait	5.69	7.78	7.16	6.69	5.52
Nigeria	7.37	8.11	8.02	8.92	8.96
Oman	8.63	8.91	8.75	5.99	6.69
Qatar			7.75	6.51	6.03
Saudi Arabia			8.20	7.33	7.10
Syria	5.37	5.65	5.58	5.66	5.49
United Arab Emirates	7.55	7.48	8.50	6.97	6.72
Venezuela	3.35	3.06	3.61	2.10	2.24

Source: Research finding, based on LMR index dataset.

In general, the empirical evidence provided in recent studies analysing the effect of composite indicators of LMR on unemployment has controversial

outcomes and remains far from conclusive. For instance, a stream of the literature has confirmed that more rigid labor markets are associated with a higher level of unemployment (Bernal-Verdugo et al., 2012; Bertinelli et al., 2020; Feldmann, 2009). According to Dixon et al. (2017), the GDP growth rate could not help decrease unemployment due to other factors in that specific economy. In this respect, Economou and Psarianos (2016) indicated that the inverse impact of output growth on the unemployment rate is more persistent with less rigid labor regulations.

On the other hand, A wide range of analysts has indicated doubt and uncertainty about the effectiveness of the labor market flexibility in reducing the unemployment rates (Bassanini and Duval, 2006; Bayar and Maxim, 2020; Brancaccio et al., 2018; Ferreiro and Gomez, 2020; Liotti, 2022). Accordingly, the flexibility of the labor market can positively influence unemployment rates. In addition to its direct impacts, labor market flexibility indirectly inhibits employment and economic growth through many channels. For example, Liotti (2022) supports this argument with the Keynesian demand theory. That is, the effectiveness of labor market flexibility in reducing the unemployment rate depends on the economic expectation of firms. Also, Ferreiro and Gomez (2020) argue that the effect of labor market flexibility on unemployment highly depends on the sample of countries and years analysed. Therefore, a better understanding of whole economic conditions is necessary to establish the labor market policy to mitigate the negative effect of oil dependence on economic growth and employment outcomes in oil-rich countries.

Additionally, the effect of LMR on unemployment may vary according to the relative number of workers in a country, whether skilled or unskilled. The labor movement into the expanding sector depends on labor skills (Gupta and Dutta, 2010). Raising the minimum wage causes the employment of low-skill workers to decrease and the unemployment rate to increase (Chu et al., 2020). Based on those mentioned above, there is no consensus about the impacts of LMR on unemployment. In this concern, this work highlights at least two important aspects: the effectiveness of labor market flexibility in reducing the unemployment rate depends on the economic expectations of firms, and the effect of labor market flexibility on unemployment reduction highly depends on the sample of countries and years analysed. Consequently, this issue deserves further empirical analysis.

This study expands the literature by examining how the impact of output growth on the unemployment rate varies depending on oil-producing countries' labor regulations. Based on studies by Furceri (2012) and Selwaness and Zaki (2019), labor market rigidity has a strong impact on unemployment. However, the interaction term between the output growth and LMR was not included in these studies. Therefore, we make a novel contribution to the analysis of unemployment

and output growth by integrating labor regulations and output growth to explain the impact of these regulations on the unemployment rate.

Due to the evidence that labor-market efficiency improvements are likely to require reforms in more than one labor market field (Bassanini and Duval, 2009; Furceri, 2012), this paper focuses on the composite indicators of the LMR index. The composite indicators will provide better insight into the policy impact. The structure of labor market institutions is sometimes too complicated to be captured in a single or two indicators. Therefore, we focus on the LMR index by the Economic Freedom of the World (EFW), which accounts for a large, broad variety of factors that are also likely to impact labor market performance (Gwartney et al., 2005).

Labor market institutions are not only complex but also very heterogeneous, i.e., different types of workers exist within different countries. LMR will have a diverse effect on labor outcomes depending on the country's relative abundance of skilled or unskilled workers. Gupta and Dutta (2010) assumed that skilled labor moves from one sector to another, while unskilled labor does not. As a novelty in our analysis, the labor is divided into skilled and unskilled labor. In this sense, we use the education index to assess labor skill levels (calculated using mean years of schooling and expected years of schooling).

Eventually, this paper integrates LMR and output growth to explore the impact of these regulations on the unemployment rate. This research provides the policymakers with an insight into labor market policies and the effect of these policies across oil-producing countries. This objective could assist policymakers in adopting appropriate policy measures to improve the quality of labor regulations.

The remainder of this study is organised as follows. Section 2 describes the relative studies in the field. Section 3 discusses the empirical methodology and the data applied in the current paper. Section 4 presents the estimation results. Finally, the main conclusions are provided in section 5.

2. Relative literature

In general, LMR is developed to protect and improve workers' welfare. Labor institutions or laws are often cited in the literature as determining factors influencing the unemployment rate. Therefore, researchers and international organisations have been encouraged to develop various indicators of the institutional intensity of labor markets. For instance, the OECD (2006) introduced four types of labor market institutions: an index of employment protection legislation (EPL), unemployment insurance benefits, the ratio of expenditure on active labor market policies to GDP, and the total tax wedge on low wages. On the other hand, Gwartney et al. (2005) developed the Economic Freedom of the World index by using a composite measure based on five indicators: the impact of the

minimum wage, flexibility in hiring and firing, collective bargaining, unemployment benefits, and conscripts.

Numerous studies have used the indicators proposed by the OECD (2006). For example, Van Ours (2015) used three labor market institutions: unemployment benefits, unions and wage bargaining, and employment protection legislation (EPL). This study explores the implications of the Great Recession through an examination of labor market data from twenty OECD countries. As a result, young employees have been adversely affected by the Great Recession in terms of unemployment and employment. Labor market institutions do not seem to matter a lot. Bertinelli et al. (2020) consider three dimensions of LMR to investigate the impact of LMR on the response of the unemployment differential to relative labor productivity. The dimensions of LMR used are the replacement rate as a proxy for unemployment benefits, employment protection legislation (EPL), and worker bargaining power captured by the bargaining coverage. This study found that the unemployment differential is more responsive to the relative labor productivity where labor regulation is higher.

On the other hand, several studies relied on the LMR index by the Economic Freedom of the World index (EFW). Overall, the empirical research on LMR is divided into two groups. The first group has focused on single indicators of LMR, while the second group has focused on composite indicators of LMR. A study by Siregar (2020) focused on the single indicator of LMR using panel data from 2001 to 2015. This study discusses the effect of minimum wages on the unemployment rate and their impact on employment in Indonesia's formal and informal sectors. The GMM estimator was used, and the results indicated that an increase in the minimum wage lowers formal and informal sector employment. Similar results were obtained by Chu et al. (2020). This paper discussed the dynamic impacts of the minimum wage in a Schumpeterian model with an endogenous market structure. The findings confirmed that increasing the minimum wage lowers the employment of low-skill workers and raises the unemployment rate.

On the contrary, Bonin et al. (2019) found no evidence that the minimum wage caused a decline in regular employment. By applying difference-in-differences approaches, this paper examines the impacts of the introduction of the minimum wage in Germany in 2015 on regional employment and unemployment. The results indicated that there was no proof of higher levels of unemployment. Moreover, a study by Wahba and Assaad (2017) investigated the impacts of labor regulation changes on the incidence of formal employment in Egypt. They focused on the impact of implementing more flexible labor regulations in 2003 on the probability of non-contractual workers being granted a formal employment contract. This paper used a difference-in-difference estimator that measures the difference between pre-and post-law and confirmed that less rigid LMR increase formal employment.

Otherwise, few studies have focused on the composite indicators of LMR (J. D. Gwartney et al., 2005). For example, Feldmann (2009) investigated the impacts of LMR on unemployment using the FGLS method in 73 economies from 2000 to 2003. This research found that rigid regulation generally appears to increase unemployment. Tight hiring and firing rules and military conscription seem to have negative impacts. Female unemployment appears to be increasing because of more centralised collective bargaining. Furceri (2012) examines the static and dynamic relationship between unemployment and labor market developments in Algeria. The results confirmed that a rigid labor market and relatively low output-employment elasticities are the main factors that explain the high level of unemployment. Also Selwaness & Zaki (2019) used the composite indicators of LMR. This study investigated the interaction between export performance and LMR on employment level. Using a random-effects model on MENA countries, the results indicated that rigid labor markets decrease the positive impact of exports on employment. Thus, labor market rigidity may limit job creation that satisfies the increased labor demand in expanding sectors.

In short, the theoretical and empirical arguments favour deregulating the labor market remain controversial and inconclusive, and there is no consensus regarding the effectiveness of labor market flexibility. For instance, Bayar and Maxim (2020) investigated the effect of the labor market and business regulations on the unemployment rate in a sample of 11 EU countries from 2000 to 2016. This paper confirmed that while higher labor market flexibility reduces unemployment in Bulgaria, Poland, and Romania, it increases unemployment in Hungary, Latvia, Lithuania, and Slovenia. Also, the empirical studies by Ferreiro and Gomez (2020); Herrero et al. (2020); Liotti (2020; 2022) have confirmed the doubts about the effectiveness of labor market flexibility in reducing the unemployment rate. In this respect, Liotti (2022) investigates the effect of the LMR index on youth unemployment in 28 European countries from 2000 to 2018. This paper applied a static fixed Effect and the dynamic PMG models and found that the higher labor market flexibility reduces youth unemployment only for a specific group. The results of this study raise doubts about the validity of the neoclassical economic theory regarding the effectiveness of labor market flexibility in decreasing the unemployment rate.

2. Empirical Strategy

To link the unemployment rate to labor regulations, we rely on a reduced-form unemployment equation that is consistent with a variety of theoretical models of labor market equilibrium, including wage-setting/price-setting (Nickell, 1998; Nickell and Layard, 1999) models, and later extended by Feldmann (2009);

Heckman and Pagés-serra (2000); Rovelli and Bruno (2007). Specifically, our econometric model is specified as follows:

$$UNEM_{it} = \alpha_i + \beta_1 GDP_{it} + \beta_2 LMR_{it} + \beta_3 GDP_{it} * LMR_{it} + \beta_4 LMR_{it} * D_{it} + \gamma' X_{it} + \varepsilon_{it} \quad (1)$$

The subscript "i" designates oil-producing countries chosen for the current research, and the subscript "t" denotes time. The dependent variable $UNEM_{it}$ is the unemployment rate for a country i at a given time t, GDP_{it} represents the gross domestic product, LMR_{it} is the labor regulations index, while $GDP_{it} * LMR_{it}$ is the interaction term that captures the impact of LMR on GDP growth and unemployment. The interaction term $LMR_{it} * D_{it}$ represents the influence of labor regulations on unemployment based on the skilled of labor, where D_{it} represents dummy variables that take the value of 1 for countries whose cross-period average of skilled labor index exceeds the average value of the entire sample. X_{it} is the set of the control variables that consist of trade openness (proxied by the ratio of total exports and imports to GDP) and the size of government (measured as the ratio of government consumption to GDP), labor productivity growth, and the error term ε_{it}.

The labor market regulations might be guilty of having caused the high unemployment rate as well as the slow economic growth among oil-producing nations. In this respect, hiring regulations and minimum wage represent the first sub-component of the labor market regulation index which is linked to the unemployment rates. Many researchers are interested in the "minimum wage" levels that governments have appointed since the 1980s to investigate unemployment issues in markets with a high regulatory level. Besides, our analysis included labor productivity growth as a control variable since it was found to have an impact on unemployment reduction (Bertinelli et al., 2020). Our model above shows that the responsiveness of unemployment to GDP is contingent upon the regulations of the labor market. It thus allows us to evaluate whether the impact of GDP on unemployment varies between countries with different values of LMR.

This study uses two basic tests to select the appropriate model between the Pooled model (P-OLS), the fixed-effect (FE), and the random effect (RE). First, we use the LM test (Breusch and Pagan, 1980) to choose the appropriate approach between the P-OLS and the RE model. The presence of the country or individual-specific term (λ) distinguishes the P-OLS model from the RE model. The rejection of the null hypothesis indicates RE is the appropriate model. Second, the Hausman (1978) test is used to differentiate the RE and FE models. Rejecting the null hypothesis implies that the FE is the suitable model.

Lastly, this study has provided an estimation with the panel corrected standard errors (PCSE) to assure an efficient estimation. Beck et al. (1995)

introduced that the PCSE is robust to cross-panel heteroskedastic, contemporaneously cross-sectionally correlated standard errors. In this respect, this research investigates the presence or absence of the cross-panel heteroscedastic and the serial correlation in the residuals to ensure estimation efficiency. With this concern, we apply the Modified Wald test (Greene, 2000) to examine the presence of group-wise heteroskedasticity and the Wooldridge (2010) test for serial correlation.

2.1 Robustness Analysis

For robust analysis, this study also estimates a dynamic model specification of Equation 1 to test whether LMR influences the change in unemployment over time. Several empirical studies assumed that the unemployment rate levels depended on their previous values and included the lagged unemployment rate in their models (Liotti, 2020; Sahnoun and Abdennadher, 2022; Sarkar, 2020). Therefore, to deal with the possible hysteresis of the unemployment rate, this paper investigates the impact of LMR on the unemployment rate in oil-producing countries by utilising the ARDL model. Thus, a dynamic panel model is formulated from Eq. 1 as follows:

$$\begin{aligned} \Delta UNEM_{it} = {} & \alpha_i + \beta_0 UNEM_{it-1} + \beta_1 GDP_{it} + \beta_2 LMR_{it} \\ & + \beta_3\, GDP_{it} * LMR_{it} + \beta_4 LMR_{it} * D_{it} + \gamma' X_{it} \\ & + \mu_i + \varepsilon_{it} \end{aligned} \tag{2}$$

where Δ is the change in the previous period, $UNEM_{it-1}$ is the lagged level of unemployment, and μ_i is the country-specific effect.

Furthermore, the dynamic panel specification of (2), which investigates the long-run and short-run relationships as suggested by Pesaran et al. (1999), can be written as:

$$\begin{aligned} \Delta UNEM_{it} = {} & \mu_i + \Phi_i[UNEM_{i,t-1} - \theta_i \chi_{it}] + \sum_{j=1}^{p-1} \Upsilon_{ij}^{*}\, \Delta UNEM_{i,t-j} \\ & + \sum_{j=0}^{q-1} \delta_{ij}^{*}\, \Delta \chi_{i,t-j} + u_{it} \end{aligned} \tag{3}$$

where $UNEM_{it}$ represents the dependent variable, χ_{it}denotes a vector of regressors, and Φ_i = - (1- $\sum_{j=1}^{p} \Upsilon_{ij}$), $\beta_i = \sum_{j=0}^{q} \delta_{ij}$, Υ_{ij}^{*} = - $\sum_{m=j+1}^{p} \Upsilon_{im}$, δ_{ij}^{*} = - $\sum_{m=j+1}^{q} \delta_{im}$, j = 1,2…,q-1. While the θ_i = - β_i/Φ_i which is defined as the long-run relationship and δ_{ij}^{*} is the short-run coefficient. The parameter Φ_i measures the error-correcting speed of the adjustment term. If Φ_i= 0, then there would be no evidence for a long-run relationship. The significantly negative of Φ_i is expected to support the evidence of the cointegration between the variables.

In this setup, Pesaran and Smith (1995) suggested three alternative estimators to estimate the above model. The first estimator is the mean-group estimator (MG).

The MG estimator produces consistent estimates based on the average of the parameters in the long run and short run, and it can be estimated for every single country. The second estimator is the pooling mean-group estimator (PMG), which assumes that the intercept, short-run coefficients, and error variances are heterogeneous across the groups while the long-run coefficient is constrained to be homogenous. Thus, the PMG estimator involves both pooling and averaging and captures the long-run and short-run effects among the variables (Pesaran et al., 1999). As a result, Pesaran et al. (1999) suggested that if the long-run homogeneity restrictions are valid, the maximum likelihood based on the PMG approach would be more efficient than the MG counterpart. The dynamic fixed effect (DFE) is the third estimator. The DFE estimator works like the PMG, which constrains the coefficient of the cointegrating vector to be the same across groups. Also, the speed of adjustment and short-run coefficients are constrained to be equal in the DFE estimator.

Lastly, the dynamic heterogeneous panel ARDL (PMG, MG, DFE)-method is applicable to a panel where both cross-sectional observations and time series are large, which is consistent with this study. A panel unit root test was conducted for all variables even though Pesaran et al. (1999) indicated that this method is suitable and can be applied to stationary and non-stationary regressors. In this regard, two specification tests are employed to check the stationarity of the panel data. The panel unit root test introduced by Im et al. (2003), and Fisher-type Choi (2001) test.

Furthermore, the Hausman test is performed to choose the appropriate method among PMG, MG, and DFE. The Hausman test is applied to select either (PMG or MG) or (PMG or DFE). For the selection between PMG and MG, the acceptance of the null hypothesis indicates that the PMG estimator is more appropriate than MG. In contrast, rejecting the null hypothesis implies that the MG estimator is more efficient than PMG. For the selection between PMG and DFE, if the null hypothesis is accepted, this indicates that the PMG estimator is preferred over the DFE. On the other hand, rejecting the null hypothesis means that the DFE estimator is favourable over PMG.

2.2 Data

The sample study of the present paper consists of an unbalanced panel of 17 oil-producing countries over the period 2000–2019. In this paper, oil countries where oil rents contribute 10 percent or higher of the total GDP are selected. Oil rents as a share of GDP with a threshold of 10 percent are used (Groce, 2020; Markowitz et al., 2020). To measure the degree of labor market flexibility, we use the composite indicator of the LMR index by the Economic Freedom of the World (EFW). The composite indicator is standardised on a zero-to-10 range, with the lower value of the indicator representing a more rigid labor market and the higher

value indicating a more flexible regulation. Prior to 2000, the main variable LMR index was released every fifth year; since then, it has been published yearly. However, the LMR data began later for a small sample of oil countries, resulting in our data being strongly unbalanced.

These data were sourced from statistics provided by the World Bank's World Development Indicators (WDI), Fraser Institute's Economic Freedom of the World (EFW) database, and the International Labor Organization (ILO). Table 2 shows the expected signs of coefficient estimates based on theoretical considerations and previous research.

Table 2. The Expected Sign of the Coefficients

Variable	Source	Expected sign
▪ Unemployment (UR)	▪ World Development Indicators (WDI)	
▪ Total output (GDP)	▪ World Development Indicators (WDI)	Negative
▪ Labor market regulations (LMR)	▪ World Economic Freedom (J. D. Gwartney et al. 2005)	Positive/ Negative
▪ Skilled labor (Dummy variable)	▪ UNESCO Institute for Statistics (2020)	Positive/ Negative
▪ Trade openness (TOP)	▪ World Development Indicators (WDI)	Negative
▪ Government size (GOVS)	▪ World Development Indicators (WDI)	Positive
▪ Labor productivity growth (LPG)	▪ International labor organisation database (ILO).	Positive/ negative
▪ The financial crisis (CR)	▪ Laeven and Valencia (2018), IMF	Positive

Source: Research finding.

3. Empirical Results

3.1 The Main Results

Table 3 shows the summary statistics of the variables used. As shown in Table 3, the mean value of the LMR index accounts for 6.5, while the average unemployment rate was 7.5.

Table 3. A Summary of Statistics

Variable	Observation	Mean	Std. Dev	Minimum	Maximum
UNEM	259	7.518571	5.889658	.11	29.77
GDP	259	3.764479	6.406531	-26.34	34.47
LMR	259	6.554981	1.370538	2.86	8.81
Gove cons (% of GDP)	259	13.80233	5.721829	.9517466	30.00
Trade (% of GDP)	259	83.40839	31.7253	20.72252	176.74
LPG	259	.3701158	6.335777	-23.83	33.49

Source: Research finding.

The selection between a RE or FE is based on the Hausman test. As illustrated in Table 4, the FE model was recommended over the RE. However, the

result of the Modified Wald test has indicated the presence of group-wise heteroscedasticity as reported in Table 5. Thus, the PCSE estimation results are the basic results.

Table 4. The Selection of the Appropriate Model

	P-(OLS) or RE	**RE or FE**
Breusch-Pagan LM test	11.69 (0.0003)	
Hausman test		23.72 (0.000)

Source: Research finding.

The last column of Table 5 presents the PCSE estimation. The results confirmed the negative effect of GDP growth on the rate of unemployment in all specification models. As shown in the PCSE estimation results, a one percent increase in GDP growth reduces the unemployment rate by 0.14 percent. Regarding LMR, these results indicate that the effect of LMR is positive and statistically significant, suggesting that in oil-producing countries, more flexible or less protective labor markets are generally associated with higher unemployment rates.

LMR positively affects the unemployment rate, suggesting that a more flexible LMR means more economic growth is needed to reduce unemployment. Also, through the interaction term, LMR has dampened the effect of GDP growth on the unemployment rate. In other words, increased GDP growth in more flexible labor markets in oil countries is associated with higher unemployment. Therefore, there is evidence that labor market flexibility may dampen the effect of GDP growth on the change in unemployment. In this sense, this result seems to be in line with those of researchers who have been critical of the advantages of labor market flexibility in decreasing unemployment rates. For instance, Herrero et al. (2020); Langot and Yassin (2015); Liotti (2020, 2022) argued that more flexible hiring and firing regulations (less rigidity) lead to a higher rate of unemployment.

In oil-producing countries, this finding might be explained by the increased oil dependence, which involves the movement of capital and labor from other sectors to non-tradable ones. Thus, the cost of production in the traditional tradable sector will increase (Omojolaibi and Egwaikhide, 2014). Hence, greater labor market flexibility reduces employment protection, making it easier for firms to carry out individual and collective dismissals. This is in line with Liotti (2022), who explains this finding by the substitution effect, in which firms continuously hire and fire workers to reduce the cost of production. With this respect, O'Higgins and Moscariello (2017) argue that there is no incentive for firms to improve the skills of labor who remain locked in a perpetual and expanding precariousness trap.

A further potential explanation of this finding comes from the theoretical aspect. According to the "neoclassical labor market theory," the higher flexibility of the labor market leads to hiring more workers and therefore lowers the hiring costs for firms (Blanchard and Summers, 1986). However, this condition works only with positive expectations of firms about the economy. Based on Keynesian effective demand theory, in an economic downturn, firms would have negative expectations about the economy, there would be an aggregate demand gap, and their hiring costs would increase. Thus, implementing higher labor flexibility to reduce unemployment will fail to achieve this goal.

Moreover, we include a dummy variable to explore whether the LMR produces different effects on the unemployment rate based on the country's skilled labor. The dummy takes the value of 1 for countries whose cross-period average of skilled labor index exceeds the average value of the entire sample. As shown in the result, the coefficient of the dummy variable takes a negative sign, indicating that more flexible labor regulations lead to a decline in the unemployment rate for countries with skilled labor. In this context, Gupta and Dutta (2010) assumed that skilled labor moves easily from one sector to another. This is in line with the findings of this study that more labor flexibility may lead to unemployment reduction if the country is dominated by skilled labor. Overall, these results are in line with the argument by O'Higgins and Moscariello (2017) that is no incentive for firms to improve labor skills. Thus, more labor flexibility leads to a higher unemployment rate.

Regarding the other control variables, this paper found that labor productivity growth has a statistically positive influence on the unemployment rate. This result is consistent with Siregar (2020), who shows that productivity growth has a significant and positive effect on the unemployment rate. Besides, findings obtained by Chen and Semmler (2018); Ferraresi et al. (2019) have indicated that labor productivity increases the unemployment rate in the short run. On the other hand, the effect of trade openness and government consumption is not statistically significant. Finally, the introduction of the crisis dummy, as presented has a positive and statistically significant impact on unemployment. This indicates that in a crisis period, unemployment seems to be higher.

Table 5. The Main Results of the Effect of LMR On Unemployment

Variables	**FE**	**RE**	**FGLS**	**PCSE**
GDP	-0.192***	-0.166***	**-0.147*** **	**-0.147*** **
	(0.0513)	(0.0501)	**(0.0500)**	**(0.0435)**
LMR	-0.0560	0.0728	**0.105***	**0.105*** **
	(0.164)	(0.0687)	**(0.0556)**	**(0.0358)**
GDP*LMR	0.0129	0.0124	**0.0113**	**0.0113***
	(0.00804)	(0.00791)	**(0.00789)**	**(0.00642)**
LMR*D-Skilled	-0.0194	-0.0337	**-0.0402***	**-0.0402** **
	(0.223)	(0.0301)	**(0.0221)**	**(0.0159)**

Gove cons (% of GDP)	0.00124	0.0142	**0.0125**	**0.0125**
	(0.0251)	(0.0147)	**(0.0122)**	**(0.00764)**
Trade (% of GDP)	-0.00602	0.00143	**0.00195**	**0.00195**
	(0.00507)	(0.00256)	**(0.00199)**	**(0.00174)**
LPG	0.110***	0.0788***	**0.0655*** **	**0.0655*** **
	(0.0230)	(0.0193)	**(0.0186)**	**(0.0140)**
CR	0.463	0.452	**0.472**	**0.472***
	(0.314)	(0.312)	**(0.314)**	**(0.243)**
Constant	1.135	-0.511	**-0.763***	**-0.763** **
	(1.079)	(0.517)	**(0.420)**	**(0.300)**
Observations	242	242	**242**	**242**
R-squared	0.172			**0.130**
Number of countries	17	17	**17**	**17**
Modified Wald test for GroupWise	14828.69			
heteroskedasticity	(0.0000)			
F-test	5.65(0.000)			
Wald test		37.67(0.000)	**36.14(0.000)**	**121.89(0.000)**

Source: Research finding.

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Furthermore, this analysis also considers the influence of the sub-components of the LMR index on the unemployment rate. In the previous analysis, only the average effect of LMR on unemployment was assessed, not considering the impact of sub-indicators on unemployment. According to Aleksynska and Cazes (2014); Liotti (2020), there is no empirical or theoretical justification for including the military conscription index; therefore, it was excluded from the estimation analysis. The definition of each sub-indicator is as follows[1]:

- Hiring regulations and minimum wage: This measure is based on the "World Bank's Difficulty of Hiring Index" (lower ratings are assigned to countries with greater difficulty of hiring).
- Hiring and firing regulations: This sub-component is based on the "World Economic Forum's Global Competitiveness Report" (this measure assigns a lower rating to state in which regulations impede the free hiring and firing of workers).
- Centralised collective wage bargaining: This sub-component is also based on the "WEF's Global Competitiveness Report", which gives ratings based on the centralisation of the bargaining process (this measure gives higher ratings if county wages are set by a more decentralised bargaining process).
- Hours' regulations: This sub-indicator is utilised based on the "World Bank's Doing Business" data (Employing Labor section); it includes the

[1]. The definition of each sub-component is adopted from Bernal-Verdugo et al. (2012) and Gwartney et al. (2020).

following elements: whether there are constraints on holiday work or night work; whether the length of the working days can be 5.5 days or more; whether there are restrictions on overtime work; and whether the average paid annual leave is 21 working days or longer. If there are no restrictions, countries tend to receive higher ratings.

- Mandated cost of work dismissal: This index is based on the "World Bank's Doing Business report" (this measure rates country according to the cost of the requirements for advance notice, penalties due when dismissing a redundant worker, and severance payments).
- Conscription: This index is based on the military duration (this measure gives a lower rating to countries with longer conscription periods).

Table 6 shows the PCSE estimation results of the influence of each of the sub-indicators on the unemployment rate. The results confirmed that all LMR sub-indicators positively affect the unemployment rate except lower dismissal cost, which was found to affect unemployment negatively. Specifically, more flexible labor regulations lead to a higher unemployment rate. Also, through the interaction term, Table 6 shows that hiring regulations, minimum wages, and decentralised collective wage bargaining have dampened the effect of GDP growth on the unemployment rate. In other words, with the higher flexibility of labor regulation, more GDP growth is needed. This finding is consistent with Langot and Yassin (2015); OECD (2016), who indicate that easy firing and hiring regulations may increase unemployment. It is also consistent with Bassanini and Duval (2006), who confirmed that higher decentralised bargaining increases the unemployment rate.

Table 6. PCSE Estimation Results of the LMR Sub-Indicator

Variables	(1)	(2)	(3)	(4)	(5)	(6)
GDP	-0.124***	-0.103***	-0.226***	-0.083***	-0.034***	-0.109***
	(0.0107)	(0.0125)	(0.0380)	(0.0183)	(0.0133)	(0.00564)
B_i	0.0500***					
	(0.00912)					
$GDP * B_i$	0.00609***					
	(0.00130)					
B_{ii}		0.0541***				
		(0.00918)				
$GDP * B_{ii}$		0.00432***				
		(0.00163)				
B_{iii}			0.131***			
			(0.0172)			
$GDP * B_{iii}$			0.0188***			
			(0.00474)			
B_{iv}				0.0338**		
				(0.0153)		
$GDP * B_{iv}$				0.000344		

				(0.00213)		
B_v					-0.038***	
					(0.0124)	
$GDP * B_v$					-0.004***	
					(0.00124)	
LPG	0.079***	0.072***	0.086***	0.072***	0.068***	0.094***
	(0.00686)	(0.00660)	(0.0101)	(0.00735)	(0.0101)	(0.00512)
Constant	-0.234***	-0.120***	-0.699***	-0.0998	0.381***	-0.00558
	(0.0835)	(0.0323)	(0.120)	(0.120)	(0.0975)	(0.0196)
Observations	257	232	232	257	243	257
R-squared	0.135	0.095	0.151	0.090	0.091	0.127
Number of countries	19	18	18	19	18	19

Source: Research finding.

Note: i, hiring regulations and minimum wage; ii, Hiring and firing regulations; iii, Centralized collective wage bargaining; iv, Hours' regulations; v, Mandated cost of work dismissal. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

3.2 Robustness Estimation

To check the robustness of the earlier findings, we investigate the impact of LMR on the unemployment rate in oil-producing countries by utilizing the ARDL model. In this respect, this study performs the panel unit root tests introduced by Im et al. (2003) and Fisher-type Choi (2001) to check the stationarity of the variables. As shown in Table 7, GDP, trade (% of GDP), and LPG are stationary at level for both IPS and ADF tests. However, the results also indicated that all variables are stationary at the first differences for both criteria. Thus, the result confirmed that these variables are integrated in the order I (1) and I (0); hence the panel ARDL model can be employed.

Table 7. Unit Root Test

	IM, Pesaran, and Shin (IPS)		**Augmented Dickey-Fuller (ADF)**	
Variables	**Level**	**First Difference**	**Level**	**First Difference**
UNEM	-0.8086	-7.8666 ***	-0.1182	-6.0394***
	(0.2094)	(0.0000)	(0.4529)	(0.0000)
GDP	-4.5725***	-10.3372***	-4.4191***	-8.9225***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
LMR	-0.0892	-5.7901***	1.1586	-4.0122***
	(0.4645)	(0.0000)	(0.8767)	(0.0000)
Gove cons (% of GDP)	-0.1927	-5.8836***	0.7776	-2.7389***
	(0.4236)	(0.0000)	(0.7816)	(0.0031)
Trade (% of GDP)	-1.4848*	-6.2634***	-2.3637***	-4.6036***
	(0.0688)	(0.0000)	(0.0090)	(0.0000)

LPG	-4.9539***	-9.8268 ***	-5.1052***	-8.8823***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Source: Research finding.

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Before the analysis results, we corroborated the existence of cross-sectional dependence among oil countries. The null hypothesis of the weak cross-sectional dependence in a panel data model was tested using the Pesaran (2015) test. The results in Table 8 revealed that the null hypothesis of weak cross-sectional dependence is rejected. This indicates that cross-country observations are influenced by common considerations.

Table 8. Cross-sectional Dependence

Variables	CD test
UNEM	9.430***
	(0.000)
GDP	4.202***
	(0.0000)
LMR	16.775***
	(0.0000)
Gove cons (% of GDP)	18.845***
	(0.0000)
Trade (% of GDP)	11.405***
	(0.0000)
LPG	1.984**
	(0.047)

Source: Research finding.

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Furthermore, we conduct the Hausman test to select the appropriate method. Firstly, to choose between PMG and MG, Table 9 shows that the null hypothesis is accepted; therefore, PMG is more appropriate than MG. Secondly, based on the Hausman test result between PMG and DFE, the null hypothesis is rejected, indicating that the DFE estimator is more efficient than the PMG. Thus, only the DFE estimator findings are presented due to its gain in efficiency and consistency compared to the PMG.

Table 9. The Selection of the Appropriate Model

	PMG or MG	PMG or DFE
Hausman test	0.75	
	(0.6871)	
Hausman test		123.59
		(0.0000)

Source: Research finding.

Table 10 shows the results of the DFE estimators based on the panel ARDL (1, 2, 2, 2). The lag length selection was according to the Akaike Information Criteria (AIC) and Bayesian Information Criterion (BIC). The DFE estimator is similar to the PMG estimator, which evaluates the long-run effects of explanatory variables on the unemployment rate. In this regard, the error correction coefficients (ECT) findings show that estimated coefficients are negatively significant, providing evidence of the long-run cointegrating relationship.

Concerning the long-run effects, the findings in Table 10 are consistent with the static results and confirm the inverse impact of GDP growth on the unemployment rate in the long run. Regarding the effects of the LMR on the unemployment rate, the findings indicate a non-statistically significant impact in

all specifications models. However, through the interaction term, these findings are in line with the static results, which are found to be positively and statistically significant. In other words, an increase in GDP growth in more flexible labor markets in oil countries is associated with higher levels of unemployment. Additionally, these findings show that the dummy variable, which considers whether the flexibility of labor regulations produces a different impact on unemployment based on labor skills, remains negative but not statistically significant.

Among the control variables, the results of Table 10 show that labor productivity growth has a statistically positive impact on the unemployment rate. These findings are in line with the results obtained by the PCSE estimator. In contrast, the results do not indicate any significant effect of trade openness and government consumption on the unemployment rate. Lastly, introducing the crisis dummy variable was found to have a statistically significant effect on the unemployment rate. The positive sign indicates that the economic crisis led to an increase in the unemployment rate.

Table 10. The Results of the Dynamic Heterogeneous Panel Estimation

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
GDP	-0.146**	-0.927***	-0.140*	-0.133*	-0.155**	-0.713***	-0.119*
	(0.0734)	(0.356)	(0.0736)	(0.0754)	(0.0762)	(0.262)	(0.0718)
LMR	0.500	-0.115	0.878	1.321	0.582	1.153	0.436
	(0.718)	(0.750)	(1.242)	(0.882)	(0.733)	(0.933)	(0.707)
GDP*LMR		0.135**					
		(0.0586)					
LMR*D-skilled			-0.565				
			(1.531)				
Gove cons (% GDP)				0.280			
				(0.190)			
Trade (% GDP)					0.0180		
					(0.0347)		
LPG						0.634**	
						(0.253)	
CR							4.479*
							(2.355)
ECT	-0.152***	-0.151***	-0.154***	-0.146***	-0.153***	-0.120***	-0.154***
	(0.0247)	(0.0243)	(0.0252)	(0.0249)	(0.0249)	(0.0249)	(0.0246)
ΔGDP	0.0119*	0.0736***	0.0116*	0.00860	0.0126*	-0.0105	0.0113*
	(0.0064)	(0.0270)	(0.0065)	(0.0065)	(0.0066)	(0.0120)	(0.0064)
ΔLMR	-0.131	-0.0782	-0.207	-0.117	-0.125	-0.157*	-0.117
	(0.0977)	(0.0985)	(0.175)	(0.0995)	(0.0997)	(0.0937)	(0.0975)
ΔGDP*LMR		-0.0108**					
		(0.00458)					
ΔLMR*D-skilled			0.111				
			(0.212)				
ΔGove cons(% of GDP)				-			

				0.0486**			
				(0.0233)			
ΔTrade (% of GDP)					0.00143		
					(0.00416)		
ΔLPG						0.0285**	
						(0.0129)	
ΔCR							-0.143
							(0.132)
Constant	0.598	1.129	0.599	-0.759	0.298	0.172	0.628
	(0.709)	(0.724)	(0.712)	(1.034)	(0.912)	(0.695)	(0.705)
Observations	225	225	225	225	225	225	225

Source: Research finding.

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

4. Conclusion

This study investigates the effects of output growth on unemployment rates according to labor market regulations in oil-producing countries. Our findings confirmed an inverse effect of output growth on the unemployment rate. Regarding our interest factor, labor market regulations (LMR), this study proved a positive impact of LMR on the unemployment rate. In other words, a more flexible or less protective labor market in oil-producing countries is associated with higher unemployment rates. The positive sign of the interaction term coefficient between output growth and the LMR index dampens the effect of output growth on the unemployment rate. More specifically, we found that increasing the flexibility of labor regulations leads to a decrease in the unemployment rate only in countries where skilled labor is dominated. Thus, our findings indicate doubt about the hypothesis that higher labor market flexibility results in unemployment reductions. This result is contrary to the neoclassical labor market theory in which the higher flexibility of the labor market leads firms to hire more workers and therefore lowers the hiring costs (Blanchard and Summers, 1986). Even though the findings mentioned above are antithetical to neoclassical labor market theory, this result is supported by the empirical work by Liotti (2022). The findings also support Omojolaibi and Egwaikhide (2014) argument that the rise of oil dependence involves the movement of capital and labor from other sectors to non-tradable ones. Thus, the cost of production in the traditional tradable sector will increase. In this respect, greater labor market flexibility, such as easy hiring and firing regulations, makes it easier for firms to carry out individual and collective dismissals. In all, the effect of labor market regulations on the unemployment rate is controversial. As a result of this analysis, there is a need for more empirical evidence according to the hypothesis that higher labor market flexibility results in a decrease in the unemployment rate.

These findings have important implications for labor market policy implementation in oil-producing countries. These findings conclude that LMR could be costly regarding undesirable distributional consequences and

employment losses. Policymakers in oil-producing countries should ensure fiscal incentives to encourage firms to hire young people with permanent contracts, preventing these workers from sliding into the insecure employment trap. Many oil countries need support to create and enhance better education. Therefore, governments should invest and spend more on education and training policies that allow young workers to access the labor market. In brief, in implementing LMR, whether more flexible or rigid regulations are needed, it is essential to consider the relevant economy's specific characteristics. For instance, the demographic groups, unemployment level, and the labor force's skill levels.

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