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**Article**

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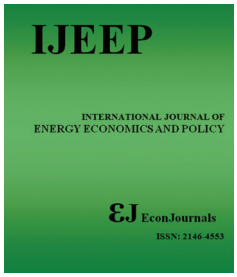


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# Determinants of Diversification from Oil Sector in Saudi Arabia

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**ABSTRACT**

Saudi Arabia targets diversification policy in the Vision 2030. This study estimates the production, exports, government revenue, investment and employment diversification indices and also finds its determinants. Increasing inflation promotes the production and export diversification and depresses the investment, government revenue and employment diversification. The depreciation policy encourages the government revenue diversification and reduces investment and employment diversification. Foreign Direct Investment (FDI) improved the government revenue diversification and weakens the export diversification. Economic growth stimulates the government revenue, employment and export diversification and slow down the production and investment diversification. Government spending improves the production and investment diversification and dampens the government revenue and exports diversification. Capital formation promotes the export diversification and reduces the government revenue and employment diversification. Money supply diminishes the investment, government revenue, exports and employment diversification. Subsidies expand production diversification and contract the government revenue diversification. Trade openness lifts up the investment and employment diversification and reduces the government revenue diversification.

**Keywords:** Diversification, Exports, Government Revenue and Spending, Money Supply
**JEL Classifications:** L25, B17, E62, E52

## 1. INTRODUCTION

In light of the Kingdom's commitment to Oil Producing Economic Cooperation (OPEC), it is expected that the value of oil exports would decrease and thus affect the state's general budget. To protect the Saudi economy from economic risks, it is necessary to diversify the economy, to expand the production base and to increase the revenues obtained from the non-oil productive sectors. Thus, this process may increase the relative proportion of non-oil sector in the income. Petroleum exports play an important and influential role in local economic condition. But, non-oil sector should be enhanced to reduce the dependence of Saudi economy on the oil sector. The economic diversification aims to make the country's economic dependence on its income and growth on various sectors, which could contribute a significant proportion in the Gross Domestic Product (GDP).

Economic diversification depends on the flexibility of the productive elements, the most important of which are labor, capital and technology. Economic diversification in oil-rich countries aims to reduce the dependence on oil and thus to develop non-oil productive sectors. Economic diversification, according to its objectives, is divided into diversification in products and diversification in the exports and its markets. Economic diversification may also be divided into horizontal diversification, which is intended to create opportunities for the production of new commodities in the same sector. Secondly, vertical diversification means shifting from one industry or sector to another. This type of diversification promotes and strengthens

the forward and backward linkages between different sectors. Economic diversification is further divided into diversification at the macro level at the level of all sectors or diversification at the micro level. Al-Qur'an (2013) argued that the diversification process must take into account competitiveness, innovation and overall development. The oil sector plays a prominent role in the economies of the Gulf Cooperation Council (GCC) states, as the oil sector contributed about 45.6% to the gross domestic product and about 83.9% to the total value of exports and about 84.2% to government revenues during the period 2005-2016 (SAMA, 2019).

The rentier state theory explains that oil-rich countries' governments depend on the oil rents for spending purpose instead of taxes. Therefore, government may face a hard situation in times of oil price crisis like now-a-day Saudi government is facing problems due to non-tax base and due to heavy dependence of income, government revenue and export on the oil sector. In recent years, the nominal prices for light Arab crude oil have decreased from $ 110.2/barrel in 2012 to $40.96/barrel in 2016, and then increased to $70.59/barrel in 2018 (SAMA, 2019). These oil price fluctuations may accelerate the uncertainty in the income, government revenues and exports which are heavily influenced by these fluctuations of oil prices. Oil price has significantly affected the consumption, investment, economic activities, employment and pollution in Saudi Arabia (Mahmood and Zamil, 2019; Alkhateeb et al., 2017; Mahmood and Alkhateeb, 2018; Mahmood et al., 2020). Therefore, overdependence on oil sector in the low oil price period is very risky and may be harmful for the country's all macroeconomic performance indicators.

During each development plan since 1970, the Saudi economy has targeted the diversification policy but it could not be achieved the expected level in any of development plan which need attention to be investigated thoroughly. The macroeconomic factors and policies may become the hurdles in the way of diversification policy if the current macroeconomic policies and macroeconomic position of the country are not supportive enough, ready and suitable for the diversification policy. Therefore, there is dire need to investigate this issue in a comprehensive way by investigating the macroeconomic policies and macroeconomic indicators as determinants of various diversification domains. Therefore, this present research aims to split the concept of economic diversification into production, government revenue, exports, investment and employment diversifications in the Saudi Arabia at first. Then, we test the influences of macroeconomic indicators and macroeconomic policies on each diversification category to test the effectiveness and magnitude of each effect as well. For this purpose, we utilize a maximum available period 1970-2018.

## 2. LITERATURE REVIEW

The rentier state theory argued that oil-rich countries' governments depend on oil rents in their spending instead of taxes and may face problems during resource-crisis period. On the other hand, diversification policy may help to improve or stabilize the macroeconomic indicators. For example, Nisar et al. (2018) found positive effect of income-diversification on technical, scale and pure technical efficiencies of commercial banks of South Asia. Economic diversification helped the economies to reduce cyclical effects during the crises' periods and to recover from oil price and exchange rate crises as well (Alley, 2018). On the other hand, Maalel and Mahmood (2018) found that oil-exports' dependency was having negative effects on economic growth of Saudi Arabia. On determinants' side, Grillitsch (2018) argued that innovative entrepreneurs played an effective role in the structural changes with unique innovations. Entrepreneurship could play an effective role on regional innovations and would accelerate the economic and industrial diversification (Grillitsch and Asheim, 2018; Xiao et al., 2018), would help the structural changes and diversification process in a country (Neffke et al., 2018) and could accelerate the knowledge spillovers and exports diversification (Chatmi and Elasri, 2018).

Agustiar (2020) argued that export diversification may be harmful for monetary integration. He investigated this issue for the 7-oil producing countries and found that export concentration in these countries was not harmful for their monetary integration due to their strong economic structures. Alomari and Bashayreh (2020) investigated the relationship of exports concentration and growth in the GCC countries from 1992-2017. They found that labor, capital, energy and trade openness growth had positive effects on the economic growth rates. However, export diversification has negative effects on the economic growth of GCC countries. Kirichenko et al. (2020) argued that oil price fluctuations were hurdle in the way of strategic planning of oil companies. Therefore, the diversification policy could support the industry in times of oil price crisis to reduce the risk of uncertainty.

Said (2019) studied the relationship between economic diversification and private sector development in the United Arab Emirates (UAE). The ARDL method was used to verify the long and short run relationship among financial development, degree of corruption control, infrastructure, trade openness, GDP growth, and economic diversification. Using data from 1990-2018, he found that investment was found essential for long-term growth to achieve sustainable development. Financial development might strengthen the economic diversification in the short and long run. Infrastructure had promoted the economic diversification. Trade openness had a negative impact on diversification. He recommended the need to stimulate the role of the private sector to enhance the its contribution in the UAE economy and to enhance economic diversification as well. Ayasrah (2014) calculated the coefficient of the industrial diversification in Jordan. This study showed that a degree of industrial diversification was different in different governorates of Jordan. The study recommended to encourage investments in the growth-stimulating sectors, in addition to adopting the principle of industrial diversification while designing and planning the industrial policy in the short and long run.

While gaging the economic diversification policy, we cannot ignore the role of rule of law and education. Hendrix (2019) explored the issues of economic diversification for the forty oil and gas producing countries. He found that most of the economies had the diversified share of different sectors in the income but most of the economies were extensively depending on export concentration. Further, he found that

rule of law had a strong relationship with low income dependence. The proportion of education among the population played a significant role in the income diversification but education had promoted the exports' concentration in contrast. Education, experience and training might bring the innovative entrepreneurs in the economies to support the idea of economic, exports or industrial diversification. They concluded that rule of law and education level helped at a great extent in achieving the diversification policy. Moreover, education, experience and training might bring innovative entrepreneurs in economies to support idea of diversification. Grillitsch and Asheim (2018) investigated the role of innovation and entrepreneurship on the diversification. They found that differentiations in the regional innovations and in the capabilities of the entrepreneurs had helped in boosting the industrial diversification.

Neffke et al. (2018) appreciated the role of firms and entrepreneurs in the structural change and diversification process. They observed that diversification with the structural change was mostly originated from newly establish foreign firms. Therefore, international experienced entrepreneurs were contributed a lot in the process of diversification. Chatmi and Elasri (2018) investigated the role of goods and services exports and foreign investments on the entrepreneurial activities through knowledge spillovers in a panel of 75 countries. They found that entrepreneurial activities had been benefited from the exports diversification in the efficiency-driven and factor-driven economies respectively. However, concentration helped to accelerate the knowledge spillovers in the innovation-driven stage. Xiao et al. (2018) investigated the effect of innovative capacity on the economic and industrial diversification. They found that probability of new industry specialization was enhanced in a region with existing specialization. Further, new industry's relatedness depended on the innovative capacity of the region. Therefore, they concluded that relatedness was a good determinant of diversification. Ling et al. (2005) conducted a study measuring the degree of industrial diversification and its impact on the productivity growth of the electronics industry in Taiwan. It was found that the degree of diversity in the electronics industry was much higher than that of its manufacturing counterparts.

Euchi et al. (2018) investigated the diversification in Saudi Arabia. More specifically, the study intended to verify whether government has succeeded in achieving the diversification goal. Using cointegration and data of a period of 1970-2014, they found that capital, labor force, education, tourism and entrepreneurship were found major determinants of economic diversification. The results of the study showed that Saudi goal behind her goals. Oil was still being significantly contributed in study's period and they recommended the Saudi policy makers to adopt an appropriate development plans which might support the private sector to enhance knowledge economy and to increase the contributions of non-oil sectors to economic growth. The private sector, Small and Medium Enterprises (SME) and a transition to a knowledge-based economy might lead to increased workforce productivity and productivity of other factors of production as well. These would reduce production costs, increase income and thus raise the consumption level. They also argued that diversified development plan should be economically measurable as per targeted diversification indicators.

Some Saudi literature utilized descriptive analyses to comprehend the economic diversification. For example, Albassam (2015) and Al Bakr (2015) discussed different indicators of diversification and argue that diversification has still been lower than targeted in Saudi 8-years plans. They suggested that SMEs with government support might play very significant role in diversification process. They revealed the challenges of production base diversification in the Kingdom of Saudi Arabia. Therefore, they analyzed the indicators such as the contribution of non-oil exports to the GDP, the contribution of SMEs in the local production and employment, and portfolio loans to SMEs according to economic activity. These studies indicated that the challenges of production-base diversification in two main directions are demand-sided and supply-sided. The general framework for macroeconomic management were demand-side challenges and human capital development, public sector reform, and distortions of work, and building an industrial base which could support exports were supply-sided challenges. They stressed that the achieved diversification of the economy was due to the support to the SMEs. Therefore, the Kingdom recently paid attention to establishing a body for SMEs to support the exports diversification through reviewing and directing the financing systems for their support. To medium and high tech industries, the financing activities with high added value were also found helpful in diversifying the production-based diversification along with FDI in the high value-added activities to diversify Saudi exports.

Reviewed literature is highlighted the importance of both determinants and consequences of economic diversification. But, most kinds of diversification like investment, employment and government revenue diversification have not been caught the attention of literature particularly in case of an oil-rich Saudi economy. So, this present study is highly motivated to capture the macroeconomic and policy effects on the production, export, investment, employment and government revenue diversification of Saudi Arabia using a maximum available data from 1970-2018.

## 3. METHODOLOGY

This research aims at finding the macroeconomic and policy determinants of different non-oil diversification indicators. So, we calculate the diversification indices of exports, income, government spending, investment and employment using following formula of Hirschman (1964):

$$H = \left[\sum_{1}^{N}\left(\frac{y_i}{Y}\right)^2 - \frac{1}{N}\right] \Big/ \left[1 - \frac{1}{N}\right] \quad (1)$$

Where, $y_i$ is value of one sector contribution in exports and $Y$ is total value of the exports. This formula may be utilized to estimate the income, government spending, investment and employment diversification as well. The increasing value of calculated $H$ index will be sign of concentration on the single sector like oil sector in our case and decreasing the value would be considered as non-oil sector diversification from the oil sector.

After estimation of diversification indices, we need to check the unit root in the diversification series and in the series of their determinants. For this purpose, we utilize the Dickey and Fuller (1981) methodology:

$$\Delta y_t = \beta y_{t-1} + \sum_{i=1}^{k} \vartheta_i \Delta y_{t-i} + \xi_t \quad (2)$$

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{i=1}^{k} \vartheta_i \Delta y_{t-i} + \xi_t \quad (3)$$

$$\Delta y_t = \alpha + \lambda t + \beta y_{t-1} + \sum_{i=1}^{k} \vartheta_i \Delta y_{t-i} + \xi_t \quad (4)$$

Equations 2-4 are test-equations to find the unit root in the series $y_t$ with null hypothesis of non-stationary series and rejection of it would identify the stationary series. After this exercise, we moved to the Autoregressive Distributive Lag (ARDL) testing of Pesaran et al. (2001). It is utilized to estimate the long and short run effects of the macroeconomic and policy variables on the performance of diversification from oil sector. ARDL is as follows for the system of equations to test our hypotheses:

$$\begin{aligned}\Delta H_t &= \alpha_0 + \alpha_1 H_{t-1} + \alpha_2 CPI_{t-1} + \alpha_3 ER_{t-1} + \alpha_4 FDI_{t-1} \\ &+ \alpha_5 GR_{t-1} + \alpha_6 GS_{t-1} + \alpha_7 K_{t-1} + \alpha_8 MS_{t-1} + \alpha_9 SUB_{t-1} \\ &+ \alpha_{10} TO_{t-1} + \sum_{i=1}^{k} \beta_{0i} \Delta H_{t-i} + \sum_{i=0}^{k} \beta_{1i} \Delta CPI_{t-i} + \sum_{i=0}^{k} \beta_{2i} \Delta ER_{t-i} \\ &+ \sum_{i=0}^{k} \beta_{3i} \Delta FDI_{t-i} + \sum_{i=0}^{k} \beta_{4i} \Delta GR_{t-i} + \sum_{i=0}^{k} \beta_{5i} \Delta GS_{t-i} \\ &+ \sum_{i=0}^{k} \beta_{6i} \Delta K_{t-i} + \sum_{i=0}^{k} \beta_{7i} \Delta MS_{t-i} \\ &+ \sum_{i=0}^{k} \beta_{8i} \Delta SUB_{t-i} + \sum_{i=0}^{k} \beta_{9i} \Delta TO_{t-i} + \psi_t \end{aligned} \quad (5)$$

$H_t$ presents the diversification indices $ProdD_t$, $RevD_t$, $ExpD_t$, $InvD_t$ and $EmpD_t$ estimated through equation 1 and represents production, government revenue, exports, investments and employment diversification indices, respectively. These indices will be used one by one in the equation 5 to estimate the long run effects. $CPI_t$ is consumer price index to estimate the effect of inflation on each diversification index. $ER_t$ is exchange rate to estimate the effect of international policy on each diversification index. $FDI_t$ is net Foreign Direct Investment (FDI) to see whether FDI is helping in diversifying the Saudi economy or not. $GR_t$ is growth rate of GDP to estimate the effects of economic growth on each diversification index. $GS_t$ is government spending to estimate the effect of fiscal policy on each diversification index. $K_t$ is capital formation to see whether domestic investments are helping in diversifying the Saudi economy or not. $MS_t$ is money supply to estimate the effect of monetary policy on each diversification index. $SUB_t$ is subsidies to estimate the effect of fiscal policy that economic assistance by government is helpful for diversification policy or not. $TO_t$ is trade openness to estimate the effect of freer trade policy on the promotion of the diversification. All the data to developed the variables in equation 5 are sourced from SAMA (2019). All the variables are in form of natural log except the FDI and growth rate variables containing a mix of positive and negative values.

The long run results from equation 5 will be estimated after selection of optimum lag and after corroboration of cointegration through bound test on the null hypothesis of $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = \alpha_9 = \alpha_{10} = 0$. Afterwards, the short run estimates may be estimated from following model replacing the Error Correction Term ($ECT_{t-1}$) with lagged-level variables in equation 5 in following way:

$$\begin{aligned}\Delta H_t &= \gamma_0 + \gamma_1 ECT_{t-1} + \sum_{i=1}^{k} \beta_{0i} \Delta H_{t-i} + \sum_{i=0}^{k} \beta_{1i} \Delta CPI_{t-i} \\ &+ \sum_{i=0}^{k} \beta_{2i} \Delta ER_{t-i} + \sum_{i=0}^{k} \beta_{3i} \Delta FDI_{t-i} + \sum_{i=0}^{k} \beta_{4i} \Delta GR_{t-i} \\ &+ \sum_{i=0}^{k} \beta_{5i} \Delta GS_{t-i} + \sum_{i=0}^{k} \beta_{6i} \Delta K_{t-i} + \sum_{i=0}^{k} \beta_{7i} \Delta MS_{t-i} \\ &+ \sum_{i=0}^{k} \beta_{8i} \Delta SUB_{t-i} + \sum_{i=0}^{k} \beta_{9i} \Delta TO_{t-i} + \psi_t \end{aligned} \quad (6)$$

The evidence of a short run relationship in the equation 6 would be corroborated by the negative and significant parameter of $\gamma_1$. Then, estimated coefficients of lagged differenced variables would convey the short run effects.

## 4. DATA ANALYSES

Table 1 showed the ADF results. $RevD_t$, $ExpD_t$, $CPI_t$, $ER_t$, $GD_t$ and $K_t$ variables are showing stationary behavior at their level with some evidences and FDIt and GRt are totally level-stationary. In their first differences, all the variables are stationary at 1% level of significance. The ADF results showed a mix order of integration in the models but it is sufficient to proceed for ARDL as all variables are at least first difference stationary. ARDL may

**Table 1: Unit root**

| Variable | C | T | C and T |
|---|---|---|---|
| $ProdD_t$ | −1.9240 | −2.5169 | −0.3583 |
| $RevD_t$ | −3.3278** | −3.3009* | −1.0587 |
| $ExpD_t$ | −0.9752 | −3.3732* | 0.2007 |
| $InvD_t$ | −2.2790 | −2.1949 | −1.3588 |
| $EmpD_t$ | 1.5878 | −2.3440 | −1.6985 |
| $CPI_t$ | −3.0160** | −2.6918 | 2.0189 |
| $ER_t$ | −13.07144*** | −10.6093*** | 0.8647 |
| $FDI_t$ | −3.6515*** | −3.8739** | −3.3653*** |
| $GR_t$ | −5.6679*** | −6.0556*** | −4.9847*** |
| $GS_t$ | −3.1050** | −3.3512* | −0.0097 |
| $K_t$ | −2.7059* | −2.7966 | −0.1966 |
| $MS_t$ | −1.5745 | −2.2984 | −1.2267 |
| $SUB_t$ | −1.9250 | −1.9256 | −1.8780 |
| $TO_t$ | −2.2927 | −2.3344 | −0.1677 |
| $\Delta ProdD_t$ | −6.9006*** | −6.8160*** | −6.9747*** |
| $\Delta RevD_t$ | −9.9300*** | −9.8205*** | −10.0159*** |
| $\Delta ExpD_t$ | −5.7079*** | −5.6389*** | −5.6476*** |
| $\Delta InvD_t$ | −6.6212*** | −6.6154*** | −6.6658*** |
| $\Delta EmpD_t$ | −4.6734*** | −4.6324*** | −4.5767*** |
| $\Delta CPI_t$ | −5.721*** | −6.0362*** | −5.1583*** |
| $\Delta ER_t$ | −6.8420*** | −6.3028*** | −7.2167*** |
| $\Delta FDI_t$ | −8.7517*** | −8.6734*** | −8.8471*** |
| $\Delta GR_t$ | −11.6907*** | −11.5633*** | −11.8178*** |
| $\Delta GS_t$ | −6.1750*** | −6.1996*** | −6.2306*** |
| $\Delta K_t$ | −5.7990*** | −5.6612*** | −5.8029*** |
| $\Delta MS_t$ | −8.0006*** | −8.1481*** | −7.9910*** |
| $\Delta SUB_t$ | −5.7733*** | −5.7039*** | −5.8267*** |
| $\Delta TO_t$ | −5.4794*** | −5.4007*** | −5.5326*** |

provide the efficient results in this case due to bound testing (Pesaran et al., 2001).

Table 2 showed the bound testing results based on equation 5 for each kind of diversification. Cointegration is proved at 1% level in the equations with $InvD_t$ and $RevD_t$ as dependent variables and at 5% level in the equation with $ExpD_t$ as dependent variable. For the rest models, cointegration is not proved with Bound testing procedure but it is validated alternatively from negative and significant coefficients of $ECT_{t-1}$ in the equations with $ProdD_t$ and $EmpD_t$ as dependent variables shown in Table 3. Moreover, the magnitudes of diagnostic test are also fine and showed reliability of estimates. Hence, we can move forward in case of all the estimated models.

Table 3 shows the long run estimates. The impact of $CPI_t$ on the $ProdD_t$ is found negative. It means that increasing inflation is decreasing the production concentration and increasing the production diversification. Moreover, 1% increase in $CPI_t$ increases the 0.0126% of production diversification. The impact of $GR_t$ on the $ProdD_t$ is found positive. It means that increasing economic growth is increasing the production concentration and decreasing the production diversification. Moreover, 1% increase in economic growth decreases the 0.005% of production diversification. The impact of $GS_t$ on the $ProdD_t$ is found negative. It means that increasing government spending is decreasing the production concentration and increasing the production diversification. Moreover, 1% increase in government spending increases the 0.2642% of production diversification. In the production diversification model, government spending is found most helpful in promoting the production diversification in the Saudi Arabia.

The impact of $CPI_t$ on the $InvD_t$ is found positive. It means that increasing inflation is increasing the investment concentration and decreasing the investment diversification. Moreover, 1% increase in $CPI_t$ decreases the 1.2660% of investment diversification. The impact of $ER_t$ on the $InvD_t$ is found negative. It means that depreciation of Saudi Riyal is increasing the investment concentration and decreasing the investment diversification. Moreover, 1% depreciation of Saudi Riyal decreases the 3.4207% of investment diversification. The impact of $GR_t$ on the $InvD_t$ is found positive. It means that increasing economic growth is increasing the investment concentration and decreasing the investment diversification. Moreover, 1% increase in economic growth decreases the 0.0537% of investment diversification. The impact of $GS_t$ on the $InvD_t$ is found negative. It means that increasing government spending is decreasing the investment concentration and increasing the investment diversification. Moreover, 1% increase in government spending increases the 1.1942% of investment diversification. The impact of MSt on the $InvD_t$ is found positive. It means that increasing money supply is increasing the investment concentration and decreasing the investment diversification. Moreover, 1% increase in money supply decreases the 0.1861% of investment diversification. The impact of $TO_t$ on the $InvD_t$ is found negative. It means that increasing trade openness is decreasing the investment concentration and increasing the investment diversification. Moreover, 1% increase in trade openness increases the 0.7614% of investment diversification. In the investment diversification model, depreciation of local currency is found most helpful in promoting the investment diversification in Saudi Arabia and inflation in the country is responsible for depressing the process of investment diversification.

The impact of $CPI_t$ on the $RevD_t$ is found positive. It means that increasing inflation is increasing the government revenue concentration and decreasing the government revenue diversification. Moreover, 1% increase in CPI decreases the 0.4439% of government revenue diversification. The impact of $ER_t$

**Table 2: Bound testing**

| Model | Bound test F-value | Heter | Serial correl | Normality |
|---|---|---|---|---|
| F(ProdD/CPI, ER, FDI, GR, GS, K, MS, SUB, TO) | 2.7460 | 1.1922 (0.3282) | 0.8049 (0.4555) | 0.1918 (0.9085) |
| F(InvD/CPI, ER, FDI, GR, GS, K, MS, SUB, TO) | 6.7588 | 0.5368 (0.9203) | 0.1075 (0.8985) | 2.4025 (0.3008) |
| F(RevD/CPI, ER, FDI, GR, GS, K, MS, SUB, TO) | 10.9263 | 1.6319 (0.1218) | 1.9006 (0.1431) | 1.6721 (0.4334) |
| F(ExpD/CPI, ER, FDI, GR, GS, K, MS, SUB, TO) | 3.9242 | 1.5556 (0.1469) | 0.4338 (0.6506) | 0.9106 (0.6343) |
| F(EmpD/CPI, ER, FDI, GR, GS, K, MS, SUB, TO) | 0.5493 | 1.0223 (0.4726) | 0.0267 (0.9737) | 1.7484 (0.1210) |
| Critical Values | | | | |
| 10% 1.88-2.99 | | | | |
| 5% 2.14-3.3 | | | | |
| 1% 2.65-3.97 | | | | |

**Table 3: Long run results**

| Variable | $ProdD_t$ | $InvD_t$ | $RevD_t$ | $ExpD_t$ | $EmpD_t$ |
|---|---|---|---|---|---|
| $CPI_t$ | −0.0126 (0.0189) | 1.2660 (0.0000) | 0.4439 (0.0334) | −0.3122 (0.0000) | 1.9380 (0.0084) |
| $ER_t$ | −0.0434 (0.9567) | −3.4207 (0.0000) | 1.5162 (0.0014) | 0.9080 (0.3671) | −1.4522 (0.0986) |
| $FDI_t$ | −0.0134 (0.4100) | 0.0556 (0.1550) | −0.1246 (0.0064) | 0.0541 (0.0000) | −0.0387 (0.7718) |
| $GR_t$ | 0.0050 (0.0263) | 0.0537 (0.0018) | −0.0432 (0.0064) | −0.0152 (0.0002) | −0.0269 (0.0891) |
| $GS_t$ | −0.2642 (0.0715) | −1.1942 (0.0062) | 1.1546 (0.0359) | 0.5058 (0.0003) | −0.3820 (0.7586) |
| $K_t$ | 0.0473 (0.7328) | 0.5918 (0.3301) | 1.7854 (0.0038) | −0.4203 (0.0005) | 0.5138 (0.0778) |
| $MS_t$ | −0.04461 (0.2368) | 0.1861 (0.0547) | 0.7343 (0.0009) | 0.0892 (0.0007) | 0.9183 (0.0762) |
| $SUB_t$ | −0.3356 (0.0037) | 0.6292 (0.1114) | 1.0990 (0.0250) | −0.1112 (0.2016) | −0.2373 (0.8342) |
| $TO_t$ | 0.4274 (0.1642) | −0.7614 (0.0000) | 3.3697 (0.0024) | −0.0581 (0.7451) | −0.9346 (0.0821) |
| Intercept | −1.8596 (0.3167) | 67.9091 (0.0000) | −47.8512 (0.0000) | −0.9650 (0.6050) | 32.4860 (0.1377) |

on the $RevD_t$ is found positive. It means that depreciation of Saudi Riyal is decreasing the government revenue concentration and increasing the government revenue diversification. Moreover, 1% depreciation of Saudi Riyal increases the 1.5162% of government revenue diversification. The impact of $FDI_t$ on the $RevD_t$ is found negative. It means that increasing FDI is decreasing the government revenue concentration and increasing the government revenue diversification. Moreover, 1% increase in FDI increases the 0.1246% of government revenue diversification. The impact of $GR_t$ on the $RevD_t$ is found negative. It means that increasing economic growth is decreasing the government revenue concentration and increasing the government revenue diversification. Moreover, 1% increase in economic growth increases the 0.0432% of government revenue diversification. The impact of $GS_t$ on the $RevD_t$ is found positive. It means that increasing government spending is increasing the government revenue concentration and decreasing the government revenue diversification. Moreover, 1% increase in government spending decreases the 1.1546% of government revenue diversification. The impact of $K_t$ on the $RevD_t$ is found positive. It means that increasing capital is increasing the government revenue concentration and decreasing the government revenue diversification. Moreover, 1% increase in capital formation decreases the 1.7854% of government revenue diversification. The impact of $MS_t$ on the $RevD_t$ is found positive. It means that increasing money supply is increasing the government revenue concentration and decreasing the government revenue diversification. Moreover, 1% increase in money supply decreases the 0.7343% of government revenue diversification. The impact of $SUB_t$ on the $RevD_t$ is found positive. It means that increasing subsidies are increasing the government revenue concentration and decreasing the government revenue diversification. Moreover, 1% increase in subsidies decreases the 1.0990% of government revenue diversification. The impact of $TO_t$ on the $RevD_t$ is found positive. It means that increasing trade openness is increasing the government revenue concentration and decreasing the government revenue diversification. Moreover, 1% increase in trade openness decreases the 3.3697% of government revenue diversification. In the government revenue diversification model, FDI is found most helpful in promoting government revenue diversification in Saudi Arabia and trade openness in the country is responsible for depressing the process of government revenue diversification.

The impact of $CPI_t$ on the $ExpD_t$ is found negative. It means that increasing inflation is decreasing the export concentration and increasing the export diversification. Moreover, 1% increase in CPI increases the 0.3122% of export diversification. The impact of $FDI_t$ on the $ExpD_t$ is found positive. It means that increase in FDI is increasing the export concentration and decreasing the export diversification. Moreover, 1% increase in FDI decreases the 0.0541% of export diversification. The impact of $GR_t$ on the $ExpD_t$ is found negative. It means that increasing economic growth is decreasing the export concentration and increasing the export diversification. Moreover, 1% increase in economic growth increases the 0.0152% of export diversification. The impact of GSt on the $ExpD_t$ is found positive. It means that increasing government spending is increasing the export concentration and decreasing the export diversification. Moreover, 1% increase in government spending decreases the 0.5058% of export diversification. The impact of $K_t$ on the $ExpD_t$ is found negative. It means that increasing capital formation is decreasing the export concentration and increasing the export diversification. Moreover, 1% increase in capital increases the 0.4203% of export diversification. The impact of $MS_t$ on the $ExpD_t$ is found positive. It means that increasing money supply is increasing the export concentration and decreasing the export diversification. Moreover, 1% increase in money supply decreases the 0.0892% of export diversification. In the export diversification model, capital formation is found most helpful in promoting export diversification in Saudi Arabia and government spending in the country is responsible for depressing the export diversification.

The impact of $CPI_t$ on the $EmpD_t$ is found positive. It means that increasing inflation is increasing the employment concentration and decreasing the employment diversification. Moreover, 1% increase in CPI decreases the 1.9380% of employment diversification. The impact of $ER_t$ on the $EmpD_t$ is found negative. It means that depreciation of Saudi Riyal is increasing the employment concentration and decreasing the employment diversification. Moreover, 1% depreciation of Saudi Riyal decreases the 1.4522% of employment diversification. The impact of $GR_t$ on the $EmpD_t$ is found negative. It means that increasing economic growth is decreasing the employment concentration and increasing the employment diversification. Moreover, 1% increase in economic growth increases the 0.0269% of employment diversification. The impact of $K_t$ on the $EmpD_t$ is found positive. It means that increasing capital formation is increasing the employment concentration and decreasing the employment diversification. Moreover, 1% increase in capital formation decreases the 0.5138% of employment diversification. The impact of $MS_t$ on the $EmpD_t$ is found positive. It means that increasing money supply is increasing the employment concentration and decreasing the employment diversification. Moreover, 1% increase in money supply decreases the 0.9183% of employment diversification. The impact of $TO_t$ on the $EmpD_t$ is found negative. It means that increasing trade openness is decreasing the employment concentration and increasing the employment diversification. Moreover, 1% increase in trade openness increases the 0.9346% of employment diversification. In the employment diversification model, appreciation of exchange rate policy is found most helpful in promoting employment diversification in Saudi Arabia and depreciation may increase employment concentration.

Table 4 displays the short run results. In the short run, the coefficients of $ECT_{t-1}$ of all diversification models are negative and significant. Hence, short run relationships are corroborated in the all estimated models. The lag of exports diversification is increasing the export diversification in the present period. Increasing inflation is found helpful in increasing the production diversification and depressing the government revenue, export and employment diversification. However, the lag of increasing inflation is improving investment diversification and depressing the exports diversification. Exchange rate depreciation policy would be helping in promoting the government revenue diversification and depressing the investment and employment diversification, and vice versa for appreciation policy. Increasing FDI is found helpful in improving the government revenue diversification. The

**Table 4: Short run results**

| Variable | $\Delta ProdD_t$ | $\Delta InvD_t$ | $\Delta RevD_t$ | $\Delta ExpD_t$ | $\Delta EmpD_t$ |
|---|---|---|---|---|---|
| $\Delta H_{t-1}$ | | | −0.1172 (0.2733) | 0.2535 (0.0823) | |
| $\Delta CPI_t$ | −0.0559 (0.0480) | −1.0680 (0.1218) | 0.6859 (0.0000) | 1.4041 (0.0000) | 0.4724 (0.0188) |
| $\Delta CPI_{t-1}$ | | −1.5452 (0.0173) | | 0.6522 (0.0118) | |
| $\Delta ER_t$ | −0.0193 (0.9568) | −1.6929 (0.0000) | 1.1223 (0.0000) | 0.5969 (0.3426) | −1.1324 (0.0405) |
| $\Delta FDI_t$ | −0.0059 (0.3807) | 0.0299 (0.1690) | −0.0923 (0.0048) | 0.0109 (0.1110) | 0.0179 (0.5842) |
| $\Delta FDI_{t-1}$ | | | | −0.0315 (0.0003) | 0.0532 (0.0308) |
| $\Delta GR_t$ | 0.0022 (0.0032) | 0.0135 (0.0024) | −0.0385 (0.0000) | −0.0078 (0.0000) | −0.0066 (0.1409) |
| $\Delta GR_{t-1}$ | | −0.0089 (0.0000) | −0.0066 (0.0161) | −0.0023 (0.0028) | |
| $\Delta GS_t$ | −0.1171 (0.0339) | −0.3834 (0.0409) | 0.8547 (0.0062) | 0.0375 (0.5781) | −0.5358 (0.0817) |
| $\Delta GS_{t-1}$ | | 0.2756 (0.1606) | | −0.1516 (0.0323) | 0.3590 (0.2139) |
| $\Delta K_t$ | 0.0210 (0.7330) | −0.0446 (0.8522) | −0.1031 (0.8149) | −0.2763 (0.0002) | 0.6994 (0.0333) |
| $\Delta K_{t-1}$ | | 0.9056 (0.0006) | | | 0.4790 (0.0641) |
| $\Delta MS_t$ | −0.0204 (0.2274) | 0.1003 (0.0546) | 0.2901 (0.0032) | 0.0586 (0.0037) | 0.2238 (0.0051) |
| $\Delta SUB_t$ | −0.1487 (0.0296) | 0.3390 (0.0991) | −1.4059 (0.0032) | −0.2698 (0.0019) | −0.7891 (0.0516) |
| $\Delta TO_t$ | 0.1893 (0.1579) | −1.2898 (0.0246) | 2.4944 (0.0036) | −0.0382 (0.7479) | 0.3080 (0.6812) |
| $\Delta TO_{t-1}$ | | 3.9524 (0.0000) | | | 1.6079 (0.0637) |
| $ECT_{t-1}$ | −0.4430 (0.0001) | −0.5388 (0.0000) | −0.7403 (0.0000) | −0.6574 (0.0000) | −0.2437 (0.0310) |

increasing value of lag of FDI is found helpful in improving the exports diversification and depressing employment diversification. Increasing economic growth is found helpful in improving the government revenue and export diversification and is depressing production and investment diversification. The increasing value of lag of economic growth is found helpful in improving the investment, government revenue and export diversification. Increasing government spending is found helpful in improving the production, investment and employment diversification and depressing government revenue diversification. The increasing value of lag of government spending is found helpful in improving the exports diversification. Increasing capital formation is found helpful in improving the export diversification and depressing employment diversification. The increasing value of lag of capital formation is found responsible for depressing the investment and employment diversification. Increasing money supply is found responsible for depressing investment, government revenue, exports and employment diversification. Increasing subsidies are found helpful in improving the production, government revenue, export and employment diversification and depressing the investment diversification. Increasing trade openness is found helpful in improving the investment diversification and depressing government revenue diversification. The increasing value of lag of trade openness is responsible for depressing the investment and employment diversification.

## 5. CONCLUSIONS AND POLICY IMPLICATIONS

Economic diversification is a desirable policy for every resource-rich country. Saudi Arabia has targeted the diversification from oil to non-oil sector in every development plan but still the level of diversification may be claimed lower than the targeted level. This research investigates the macroeconomic and policy determinants of production, exports, government revenue, investment and employment diversification indices. These indices are calculated using Herfindahl Hirschman index. The long run analyses based on ARDL models disclose many insights. Increasing inflation is found helpful in increasing the production and export diversification and is depressing the investment, government revenue and employment diversification. Exchange rate depreciation policy would be helping in promoting government revenue diversification and is depressing the investment and employment diversification and vice versa for appreciation policy. Increasing FDI is found helpful in improving the government revenue diversification and is depressing the export diversification. Increasing economic growth is found helpful in improving the government revenue, employment and export diversification and is depressing production and investment diversification. Increasing government spending policy is found helpful in improving the production and investment diversification and is depressing the government revenue and exports diversification. Increasing capital formation is found helpful in improving the export diversification and is depressing government revenue and employment diversification. The expansionary monetary or increasing money supply is found responsible for depressing investment, government revenue, exports and employment diversification. Increasing subsidies policy is found helpful in improving the production diversification and depressing the government revenue diversification. The trade openness policy is found helpful in improving the investment and employment diversification and is depressing the government revenue diversification.

Based on results, inflation should be controlled to promote investment, government revenue and employment diversification. Exchange rate should be stabilized to promote government revenue, investment and employment diversification. FDI should be encouraged with relax investment policies to promote government revenue diversification. Economic growth should be supported by expansionary policies to promote the government revenue, employment and export diversification. Production and investment should be encouraged in the non-oil sector to support the non-oil sector economic growth. The expansionary government spending policy should be implement to support the production and investment diversification. Non-oil exports substitutes should be promoted to support the growth. The government should rely on the taxes and other non-oil revenues should be promoted to ensure the fiscal sustainability. Loans' conditions should be relaxed to support the funding for non-

oil export sector and non-oil sector employment should also be promoted. The contractionary monetary policy should be utilized to promote investment, government revenue, exports and employment diversification. Subsidies should be expanded to support the production diversification and to ensure the return from this sector as well. Trade openness should be promoted by relaxing taxes to support the investment environment for non-oil sector in the country.

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