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The Cost of Unemployment in Saudi Arabia

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Abstract

After a prosperous youth starting from the early 1900s, Saudi Arabia is finally starting to face some of its first real challenges of the 21st century in the form of high rate of unemployment. This paper seeks to determine the root causes of the persistent rise in unemployment in Saudi Arabia. In addition to more general causes, it also looks at the historical foundations of the problem of unemployment in the nation. The paper explains the high economic and social costs of unemployment and also determines the empirical relationship between unemployment and loss in Gross Domestic Product (GDP), utilizing Okun's law and applying recently developed panel econometrics techniques. Additional details about the social costs of unemployment are also explained. The *primary* goal of the paper is to develop an approach to estimate the cost of unemployment in Saudi Arabia more accurately. This paper utilizes alternative approaches such as the *average product method* as a failsafe to double-check in situations where Okun's law could not be applied. Thus, this paper will detail the potential risks that threaten the nation as an effect of unemployment. Finally, the main findings of this paper is that the loss of the total real GDP is $ 95 billion, while the loss of the non-oil real GDP is $ 95 billion as a result of 1,687,313 Saudis unemployed.

Keywords: Saudi Arabia, labor force, unemployment, economic cost, social cost, Okun's Law

1. Introduction

The most obvious indicator of social and economic problems in a society is unemployment. Theoretically, high unemployment is very costly, both economically and socially, in any society while low unemployment rates can benefit the society as a whole. This paper does not go so far as to explore the idea of full employment as is, and its myriad benefits are beyond the purview of this paper and can be discussed in a later work. Instead, this paper focuses primarily on developing an accurate portrayal of the cost of unemployment. Since the economy and society are in a somewhat symbiotic relationship, any changes to either can lead to different effects rippling out across one another. Unemployment is a phenomenon that has held interest within the economic and scientific community long enough to have been studied by several fields and from different viewpoints. For the sake of identifying the root causes of unemployment, economists have found it necessary to distinguish the unique forms of unemployment. The types of unemployment identified and categorized thus far are Cyclical Unemployment, Frictional Unemployment, Seasonal Unemployment, and Structural Unemployment.

The General Authority for Statistics (GaStat) indicated that the rate of unemployment in Saudi nationals was 12.2% in 2016 (GaStat, 2016). In fact, nearly 34.5% of all Saudi Arabian adult females and 5.9 % of Saudi Arabian adult males are unemployed. However, the highest levels of unemployment are found in youth populations where 40% of all citizens under the age of 35 have no stable form of employment. Moreover, with over 35% of the population being under the age of 19, and with increasing labor force participation of women, the rising number of Saudi citizens entering the workforce will exacerbate the problem of unemployment unless more jobs are created, or expatriates are reduced.

The government has taken some steps to reduce persistent unemployment among the Saudi youth with attempts to place Saudi nationals in jobs that would typically be filled by foreign workers who currently make up 32.7% of the total Saudi population, about 8.1% of total employees in the public sector and a staggering 84.5% of the total employees in the private sector. The government is working to alleviate the associated costs of unemployment as well as trying to solve the problem of unemployment itself. Thus, this paper is devoted to illustrating the social and economic costs of unemployment in the case of Saudi Arabia. More precisely, this paper provides further insight into the use of Okun's law (and backup methods like the average product method in certain cases) to closely

estimate the economic costs of increasing unemployment rate.

2. Literature Review

This section is dedicated to an exploration of previous studies that have both theoretically and empirically approached the issue of unemployment in Saudi Arabia. The section commences with an analysis of prior studies that have covered the topic of unemployment in the Kingdom of Saudi Arabia to illustrate the loss of output as a consequence of the increase in unemployment, and the use of Okun's law.

2.1 Previous Studies on Unemployment

Thorough research into previous studies reveals a general consensus that the unemployment in Saudi Arabia is involuntary and most closely resembles structural unemployment. However, the structural unemployment in Saudi Arabia shows that the younger generation fails to fit into industrial organizations despite technological shifts being relatively insignificant. In the same context, the majority of prior studies tend to attribute unemployment in Saudi Arabia to a disequilibrium between current education outputs, expertise, and laborer attributes in relation to the current labor market demands.

Al-Harthi (2000) concluded that unemployment among eligible Saudi males could be classified as structural unemployment because the education outputs entering the labor force every year are ill-suited to satisfy the current labor force needs. However, he argued that the Saudization program could be an effective solution for this issue if it were to place more emphasis on creating jobs that consider the skills of native-born entrants to the labor market instead of ill-fitting jobs that are currently populated by foreign workers. Moreover, Al-Asmari (2008) studied the current status of the Saudi labor force and the impact of "Saudization" as a solution for the high rate of unemployment. He reached the same conclusion Al-Harthi had, which indicated that the high rate of unemployment is caused by the traditional education system. This system focuses on creating output that appeals to the public sector. Those citizens who have received an education in the country typically feel better prepared for, and thus prefer to work in, the public sector. Additionally, they feel that positions in the public sector offer better job security, higher salaries, and shorter working hours compared with the private sector. Moreover, Al-Asmari highlighted the impact of the large ratio of expatriate workers in the Saudi labor force. He emphasized that the lower pay for foreign workers makes them desirable for private sector companies who often give them preference over Saudi nationals, essentially exacerbating the unemployment issue in the nation.

On the same track, Al Fakeeh (2009) analyzed the phenomenon of unemployment by examining only Saudi male unemployment while excluding female unemployment which she attributed to social and religious restrictions on women's workforce participation. She reached the same conclusion that there is a mismatch between education outputs and the jobs available in the market.

Al-Dosary and Rahman (2005) explained that the efforts (Saudization) carried out by the government to reduce unemployment in Saudi Arabia have proven unsatisfactory because those efforts have not significantly reduced the rate of unemployment. The same conclusion is reached by Eldemerdash (2014) when she utilized domestic news reports as a means to illustrate the impact of nationalized employment in Saudi Arabia. In fact, she examined government attempts to solve unemployment from the first attempts at "Saudization" all the way through an analysis of the effect of other methods such as employment quotas and penalties levied against businesses who failed to employ Saudi workers. She concluded that these kinds of policies and practices are insufficient to effectively reduce unemployment among Saudi workers. Similarly, Kabli (2014) studied the effect of both the Saudization and Nitaqat programs. He found that the Saudization program had little effect on the unemployment rate of youth, which remained virtually stagnant throughout the periods in which the Saudization programs were enforced. However, he claimed that the market suffers from lack of training and technical and vocational skills. Moreover, Al Munajjed (2010) studied women's employment and the major challenges facing it in Saudi Arabia. She described the Saudi policies and programs promising to increase women's participation in the labor force. However, she blamed various social, educational, and occupational limitations for the relatively low rate of female participation in the work force.

Peck (2014) analyzed the efforts made by the Saudi government to significantly improve active labor market policies to address the serious problem of the ballooning unemployment among the youth and relatively low rates of native Saudi worker participation in the private sector. Peck's results revealed that the policies (Nitaqat program in 2011) were relatively successful, in the short run, in increasing native-born worker participation in certain companies (Note 1). However, in the long -run, the negative impact of the program was substantial in that 11,000 different companies or firms went out of business as a result of the burdens imposed on them through these new policies.

Finally, the IMF staff (2013) examined the Saudi labor force and concluded that Saudi policy-makers should seize the opportunity of a young and increasingly well-educated Saudi labor force to boost economic growth and living standards. Despite significant economic growth around that time, unemployment has remained very high, particularly among youth and women. In their report, the team pointed out a factor that often differentiates native workers from expatriate workers, which is that native workers are, on average, more highly educated. Additionally, they found that native-born workers represent only 17% of the total employment in the private sector, with foreign workers dominating the remaining 83%. Moreover, the team strongly emphasized the danger of such low rates of female participation in the labor force. Finally, they concluded that the cause for such high unemployment rates is the wage differential between foreign workers and nationals, while cultural gender roles and societal expectations negatively affect female participation.

In summary, most of the previous studies placed much of the blame for high rate of unemployment on the education system for not equipping the native citizens with the required skills to meet the labor needs of employers. According to previous studies, the skills that most Saudis are taught in the public school systems do not align with those required by the current labor market. Lastly, they claimed that the market suffers from the lack of training in technical and vocational skills.

2.2 Previous Empirical Studies in Okun's Law

There are very few studies that have utilized Okun's law to study the relationship between decreases in economic output and increases in unemployment rates in Saudi Arabia. Thus, this paper investigated some of the few papers that have employed Okun's law to evaluate a similar phenomenon, even if some were carried out in other nations. "Okun's law" is described as the negative relationship between the growth rate of a country's output and unemployment rate as documented in the early 1960s by Arthur Okun. This law has been tested and applied to different situations, creating new versions such as the Difference version, the Gap version, the Dynamic version, and the Production version (Knotek II, 2007). However, for the sake of avoiding restrictions based on assumptions required in other versions, when calculating the potential output and rate of unemployment, this paper employs the use of the Difference version.

In the original estimation of Okun's law, a 3% increase in output coincided with a 1% fall in the rate of unemployment, on average (Okun, 1965; Prachowny, 1993; Levine, 2013). Nevertheless, Okun's law has been retested recently via regressing the growth of the GDP against the change in the rate of unemployment. It was found that a 1% increase in the rate of unemployment coincides with a 2% decline in growth of output (Abel & Bernanke, 2005). Thus, the relationship between unemployment and growth in real GDP varies and can differ based on the time period and the country under investigation (Kabanova & Tregub, 2012). Recently, using annual data for the period from 2000 to 2012, Okun's law was tested in Malta. In this case, there was statistical evidence that Okun's law holds in Malta in that a 1% increase in growth of GDP decreases the rate of unemployment by 0.16% (Apap & Gravino, 2014). Also, professional forecasters believe in the validity of Okun's law and provide evidence by testing the relationship between estimated changes in the rate of unemployment and changes in real growth of output (Ball, Furceri, Leigh, & Loungani, 2013; Ball, Jalles, & Loungani, 2015).

Knotek (2007) examined how Okun's law explains short-run unemployment fluctuations within the United States since 1948, and 20 other advanced countries since 1980. He concluded that Okun's law held true and was stable in most countries. Mattoscio, Bucciarelli, Odoardi, and Persico (2012) further confirmed that a long-term relationship existed between unemployment and output. Their paper showed that there was an inverse relationship between unemployment and GDP growth for six EU countries. Cháfer (2015) found Okun's law holds in the Spanish provinces. However, there was at least one instance where Okun's law was not supported; Fatai and Bankole (2013) found that Okun's law did not apply in Nigeria, as their results showed that output and unemployment were unrelated. Additionally, there are several other papers that have statistical evidence implying that Okun's Law does not hold in certain countries, such as Pakistan (Akram, Hussain, Raza, & Masood, 2014).

In addition, certain studies were conducted testing Okun's law in Saudi Arabia. For example, Al-Qudsi (2005) utilized a combination of time series and cross sectional data to explore the effect of unemployment on the output in GCC economies. He used one of the standard model specifications of Okun's law known as gap model or gap version of Okun's law to estimate the long-run unemployment as a result of the falling of the actual output below the potential output in the GCC economies. More specifically, he used the Hodrick-Prescott filter to estimate the potential and the output gaps for each GCC country then ran the rate of unemployment on the output gap (difference between actual output and potential output) to estimate the long-run differenced rate of unemployment in the GCC countries. In short, Al-Qudsi's results revealed that the long-time differenced rate of unemployment is: 2.65+ 0.65*g, where g stands for the output gap. This implies that if output were to fall by 5%,

unemployment rates in GCC countries would rise by an average of 8.25%. Finally, on a national level, he contended that the long-run unemployment rate in Saudi Arabia is 3.3%. However, according to his estimations, if the actual output were to decline to 2.5% below its potential output, then unemployment would rise by 5.7% in the long run.

Also, he estimated the relationship between unemployment, the lagged unemployment, and output gap. Based on his results, the differenced rates of unemployment are affected by higher-order differences of unemployment rates that occurred in earlier periods of time than are shown in Table 1.

Table 1. The relationship between unemployment, lagged unemployment, and output gaps. GCC Economies 1974-2000

Variable	Coefficient	T-value
Δt-2 log unemployment	0.931*	8.26
Δt-3 log unemployment	-0.316*	5.10
$\Delta_{t-1}\ output\ gap$	0.551**	1.72
Intercept	0.0427	2.59

Source: Al-Qudsi (2005).

In their paper, Al-Habees and Abu Rumman (2012) studied the relationship between unemployment and economic growth in several Arab countries, with major emphasis on the country of Jordan. They confirmed that a negative relationship exists between economic growth and rates of unemployment in most Arab countries. Although many of the countries could obtain high levels of growth, very little effect on the significantly high unemployment rates could be seen. Al-Habees and Abu Rumman (2012) attributed this insignificant reduction in unemployment to the nature of the growth achieved in these countries. For instance, growth within the Saudi Arabian economy depends on the oil sector, which is heavily capital intensive.

Ramady (2010) studied the Saudi government's urgent priority of tackling the unemployment rate in Saudi Arabia. He illustrated the consequences of unemployment in terms of reduced output, lower standards of living, and high rates of dependency. He used Okun's law to estimate Saudi Arabia's potential output losses due to the already high and continually increasing unemployment, which he found to be close SR 968 billion for the period from 1993 to 2008. Furthermore, he saw that the Saudization Program was one method of combating these significant hits to output and rising unemployment rates.

3. Methodology and Data

The quantitative methodology in this paper focused on panel data to estimate Okun's law for all of the Gulf Cooperation Council (GCC) countries. In fact, the ultimate goal here is not to estimate Okun's coefficient for six individual countries *per se*, but instead to help create a more accurate estimate of Okun's coefficient for Saudi Arabia in particular. Involving the other Gulf countries can help fill in the gaps left by insufficient data for Saudi Arabia. Accordingly, the goal here is to estimate Okun's law by applying panel estimation to all of the six GCC countries to interpret the Okun's coefficient for the Saudi Arabian economy. By using an annual time series, I investigated the relationship between unemployment and output (growth rate of GDP) over the period from 1994 to 2016. Alternatively, this paper uses the average product method as alternative method to calculate the loss of output as a result of increase in unemployment if Okun's law does not hold true in the case of Saudi Arabia. Also, this paper utilizes a qualitative methodology to illustrate social cost that is associated with the rise in unemployment.

4. The Social Cost of Unemployment

It is hardly possible to deny the inextricable links between the costs that unemployment has to both the economy and the society. As people become unemployed, they may become susceptible to financial hardships if they are not supported by sufficient safety nets, such as unemployment insurance or family assistance. Often such support, moreover, has time limits, does not fully offset the lost income due to job loss, and has eligibility criteria such that not all unemployed qualify. For instance, the primary income support program in Saudi Arabia, *Hafiz*, is unavailable for anyone over 35 years of age (Nitaqat, n.d.). Research has documented the numerous direct and indirect social costs due to unemployment.

Empirically, there is a direct link between unemployment and family disruption. A common reason for marital unrest is financial difficulties. Financial struggles can lead to a rise in dependency rates, as when adult children or even grandparents move back in with their parents or children (Forstater, 2015b). If jobless individuals must

rely on family, friends, or public assistance for their livelihood, it may simply become a case of more and more people consuming resources without contributing to economic growth or societal development (Forstater, 2002b, 2002c).

Another social cost of unemployment is the impact on psychological health, including depression, anxiety, and even suicide. Several studies have indicated that unemployment is associated with higher rates of suicide, particularly for men ages 18-24 (Blakely, Collings, & Atkinson, 2003; Nordt, Warnkey, Seifritz, & Kawohl, 2015). Along similar lines, unemployment has been linked to drug abuse. In addition to mental illness, unemployment can also cause other physical or cognitive problems in the event that financial hardship makes it impossible to properly feed oneself, get an education, or pay for medical services or insurance (Berger & Forstater, 2007).

Another serious social cost of unemployment and subsequent financial insecurity is an increase in the problem of homelessness within society. If one is unable to generate income, it could eventually be impossible to afford rent or payments on a house, which can result in eviction or repossession, and the consequential issues that are associated with homelessness (Feather, 1990; Forstater, 2014, 2015b; Jahoda, 1982).

In short, unemployment could have profound social consequences for Saudi Arabia. Unfortunately, because of the dearth of measurements and records for the nation, the extent of these costs is impossible to accurately quantify at this time. Nevertheless, even from the first glance, costs is enough for Saudis to understand the imperative need to examine the scarcity of job creation, since these social impacts could negatively affect the economy and thus exacerbate the issue of unemployment even further. While a lack of sufficient data makes quantifying these social costs impossible for Saudi Arabia at this time, strong evidence for other countries over many years means it is likely to characterize Saudi unemployment as well. It is hoped that this study and research that develops out of it will provide support for proposals for increased data collection.

5. The Economic Cost of Unemployment

Theoretically and empirically, it has been demonstrated that a negative relationship exists between the rate of unemployment and potential output. The empirical works discussed in the literature review showed that high rates of unemployment cause an overall loss of potential output of goods and services. Thus, a portion of this section is dedicated to estimating the extent of output loss resulting in increased unemployment rates by applying Okun's law. Before estimating the economic cost in terms of output loss, it is worth mentioning certain other costs that directly or indirectly result from unemployment. For example, high rates of unemployment can result in a significant reduction in spending, lower sales, consequently, and ultimately a reduction in overall business profits. Extreme unemployment rates greatly reduce income, which causes a sharp drop or even elimination of potential purchasing power. As a result, local entrepreneurs and businesses see a halt in sales that they need to continue investment and maintain their business. In fact, certain businesses are forced to make cutbacks and lay off employees as a result of the decline in sales. This only further exacerbates the issue by reducing total purchasing power even more and spreading the impact to more businesses. This eventually affects the economy as a whole because without consumption, there will be no production and vice versa (Forstater, 2002d; Kaboub, 2015; Marx & Engels, 1990).

The most significant factor affecting the economy is how productivity is impacted by high rates of unemployment. When individuals are not working, it is possible that their skills will deteriorate or become obsolete, which will negatively impact productivity. Additionally, unemployment will have other effects on the health and cognition of potential laborers, which will further reduce productivity. Moreover, when a large portion of the population is unemployed and thus has low purchasing power, the decrease in demand will mean that there are no incentives for businesses to innovate new goods and services without a population who would be willing or able to buy (Note 2) (Darity, 1999; Forstater, 2007). This halt in innovation creates even slower productivity growth, which leads to high prices—lowering sales rates and eventually reducing profits. Briefly, high rates of unemployment will lead the economy to suffer from a declining growth of demand, very low rates of capacity utilization, and decreasing productivity (Kaboub, 2015).

Realistically, stakeholder expectations play a crucial role in all economic activities. If stakeholders are uncertain about the future of their investments, then they will be less likely to put forth the capital or means to produce new goods and services. Fear of the risk of losing capital often outweighs their outlook for possible profits without strong indicators that they will succeed. One of the factors that would be detrimental to business prospects is unemployment, since it reduces demands and purchasing potential, meaning that stakeholders are hesitant to invest new money in a market that they feel will not reciprocate (Forstater, 2002a, 2007, 2013b; Pasinetti, 1981). In other words, unemployment has an indirect impact on the uncertainty of organizations, which

plays a role in investment decisions. If instability and uncertainty are too high, then marginal efficiency of capital (MEK) will decrease, which will lower rates of employment and consequently reduce purchasing power. All of this will reduce demand, which lowers profits and essentially causes the entire economy to suffer (Davidson, 1984; Keynes, 1936/1978, 1937; Kregel, 1988).

5.1 The Economic Cost in Terms of Output Loss (Okun's Law)

When a country is at risk of or suffering from high rates of unemployment, it indicates that the nation is not making efficient use of its labor resources. Theoretically, unemployment has a direct impact on economic growth; therefore, economic policies endeavoring to reduce unemployment rates are consequently also attempting to increase economic growth (Fatai & Bankole, 2013). Recently, Saudi Arabia has struggled with high rates of unemployment which could be exacerbated as larger number of students finish school and enter the work force each year but are unable to find jobs despite having obtained degrees. Thus, one of most important challenges facing the Saudi policy-maker is to furnish jobs for these newly graduated citizens to avoid the risk of loss of output and other issues related to unemployment. Therefore, the new reforms (2030 Vision) is urgent to tackle such problem (Forstater, 2015a). Currently, a majority of those unemployed in Saudi Arabia are individuals with high levels of education and prestigious degrees i.e. roughly 50 percent of unemployed have high education certificate (hold bachelor degree and above) (GaStat, 2016). Okun (1965) stipulated the relationship between economic growth and unemployment rate. This section is dedicated to estimating the output losses in Saudi Arabia that result from high unemployment.

The motivation for using Okun's law. Okun's law is the most suitable for this analysis for a myriad of theoretical and empirically supported reasons. Okun's law is theoretically important because it derives from both new Keynesianism and old Keynesianism, while including Phillip's Curve to install itself as a central element driving the aggregate supply curve (Al-Habees & Abu Rumman, 2012). Furthermore, Okun's law is empirically valuable because it has been proven to be worthwhile for both forecasting and policy-making (Harris & Silverstone, 2001). Thus, Okun's law is unique in its combination of other theories, laws, and economic principles, and it has also proven its practical usefulness in direct application to measure the cost of unemployment. This part will highlight how unemployment can affect Saudi Arabian real growth of GDP and will draw Saudi policy-makers' attention to the unemployment.

5.2 Theoretical Foundation of the Output Loss

Theoretical foundation of the loss of output as a result of an increase in unemployment rate. This section highlights the importance of defining the relationship between GCC's real economic growth and unemployment, with specific attention paid to the case of Saudi Arabia. This section is essential because of how economic growth has shone forth from successive economic schools focusing on development and progress. Increases in economic growth are brought about through the use of specialization and the employment of the principle of division of labor as Adam Smith postulated (1817). Moreover, Marx (1990) claimed that the main source for the creation of absolute surplus values is the exploitation of laborer power. He showed how the labor process interplays with the means of production (owned by capitalists) that were built and created from prior labor and natural sources to create valuable commodities, whereas without the labor power, there could be no increase in general value or creation of said means (Howard & King, 1985; Marx & Engels, 1990).

Additionally, Keynes (1936) highlighted the crucial role of employment, interest rates, and money within a national economy. He emphasized how the aggregate demand is affected by employment and therefore there will not be growth without more employment. Moreover, Arthur Lewis's vision for economic growth involved transitioning workers from the agricultural sector to the industrial sector in order to achieve certain economic growth (Fatai & Bankole, 2013). A key factor in understanding the nature of the relationship between economic variables, as growth, investment, inflation rates, and wage rates, appears in the understanding of unemployment issues. Therefore, one can logically conclude that any economic policies intended to spur economic growth must enact measures aimed at tackling unemployment. Previous studies revealed a significant association between keeping unemployment rates low and maintaining an increased rate of economic growth. The following illustration helps simplify and clearly represent the correlation between low rates of unemployment and increased economic growth.

Low Unemployment Rate $\Rightarrow$ High Rate of Operation $\Rightarrow$ High Rate of Economic Growth. Capitalists purchase labor power in order to produce commodities that will return a profit and earn them money (Monetary Production Function) (Rochon & Seccareccia, 2013). As a result, labor transforms from a potential to a real commodity within this process. In order for labor to become a commodity, its owner must expend something that has value to the laborer. In this way, it has use value. Man's interaction with nature will manipulate and change

the world. Man can act to adapt nature's product to fulfill his own desires. This is more or less a simple explanation for how the labor process creates value while maintaining a high operation rate, which increases economic growth. The labor process generates a new use-value in the form of the product, and the other use-value products of the previous laborer enter into the process as means of production. Products can have multiple uses and can act as either an instrument of labor, or raw materials in the production process. Consumption of labor ensures that there is no production without consumption and no consumption without production. In this sense, a very high rate of unemployment is inevitably associated with deterioration in aggregate demand (Keynes, 1936/1978; Marx & Engels, 1990). The concepts here thoroughly and empirically support the theoretical proposition that unemployment will lead to a loss of national output; the next section using Okun's Law will attempt to estimate the actual economic costs.

5.3 Okun's Law

This study utilized panel data to estimate the Okun's coefficient of the Gulf Cooperation Countries (GCC) comprising Saudi Arabia, the United Arab Emirates, Kuwait, Oman, Bahrain, and Qatar. In the last two decades, the GCC have suffered from high in average unemployment rates. In fact, the ultimate goal here is not to estimate Okun's coefficient for six individual countries *per se* but instead to help create a more accurate estimate of Okun's coefficient for Saudi Arabia in particular. Involving the other Gulf countries can help fill in the gaps left by insufficient data for Saudi Arabia. The goal here is to estimate Okun's law by applying panel estimation to all of the six GCC countries to interpret the Okun's coefficient for the Saudi Arabian economy. While there are three distinct versions of Okun's law, this paper employs the difference version.

The difference version captures the change in the unemployment rate from one year to the next year with the yearly growth in real GDP. As mentioned above, it would be of little use to try to estimate Okun's law for Saudi Arabia alone because of the presence of such short time series data, which is detrimental to the purpose of the test. Therefore, to overcome this issue, the study used recently developed panel econometrics techniques and panel data. In turn, this version of Okun's law was applied to all of the six countries of the GCC.

Model specification and data. The following are data obtained from the World Bank: (1) percent change in the unemployment rate for each country, (2) percentage change in the growth of real output for each country, and (3) the change in oil price, because all these six countries are oil-based economies. Therefore, regression model will be formulated as follows:

$$\Delta y_{it} = \alpha + \beta^{*} X_{1it} + \beta^{*} X_{2it} + u_{it}$$

$$u \sim i.i.d.N(0, \sigma^{2})$$

where Δy_{it} stands for the real growth of all six countries. X_{1it} represents the rate of unemployment for all six countries, and X_{2it} denotes the change in oil price, where i is individual dimension $(i = 1,2,3,4,5,6)$ (Note 3) and t is the time dimension $(t = 1,2, \ldots ,21)$ (Note 4).

Estimation procedure. Before running the regression for Okun's law, it is necessary to test the panel data properties. In order to avoid spurious model (unreliable model), it is essential to test the existence of the unit root for the three variables (real growth of the GDP, unemployment rate, and oil price) by using the following tests: Levin and Lin (Levin, Lin, & Chu, 2002) known as Levin-Lin (LL) test, Breitung (Enders, 1995), Im et al. (Enders, 1995) known as Im-Pesaran-Shin (Enders, 1995) (IPS) test, and Augmented Dickey-Fuller (ADF) test in which the null hypothesis is that panel data has a unit root (assume individual unit root process) (Non-stationary). The alternative hypothesis suggests that panel data does not have a unit root. Technically, after testing for the stationary property, the second step of the analysis is to apply pooled OLS regression model and to test for the properties of the model such as homoscedasticity and others. If some of assumptions do not hold, it will become useful to employ Feasible Generalized Square (FGS) Estimator to address common issues in panel data, such as heteroscedasticity, cross-sectional, and temporal dependence (Hoechle, 2007; Reed & Ye, 2011).

Empirical analyses. ***Unit root tests.*** The following tests will detect whether the Growth of GDP (GDP), unemployment rate (UN), and oil price (OP) have unit root or not

Table 2. Unit root tests results

Variables	LLC	IPS	ADF	PP	HZ	Order of Integration
GGDP	-3.741	-3.075	29.375	44.947	0.0127	I(0)
	(0.000)	(0.001)	(0.003)	(0.000)	(0.494)	
UN	-3.0588	-2.131	24.800	25.049	4.771	I(0)
	(0.001)	(0.016)	(0.015)	(0.0146)	(0.000)	
OP	-7.122	-6.624	62.431	129.757	2.460	I(1)
	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	

Source: Author's Computation. *Note.* P-Values are in brackets under T-statistics.

The results in Table 1 reveal that the growth of the real GDP and unemployment rate are stationary at their levels. On the other hand, results show that the oil price is stationary after taking the first difference. Therefore, I will be avoiding spurious model by regressing the growth of real GDP on unemployment and oil price at the first difference.

Table 3. Pooled OLS model result

	Coefficient	Std. Error	t-ratio	p-value
Constant	7.632	0.834	9.140	0.000
UN	-0.706	0.184	-3.829	0.000
OP	0.023	0.0142	1.635	0.001

Source: Author's computation.

Testing the model properties. The first test was for the presence of heteroscedasticity by using White's test. Heteroscedasticity occurs when there is violation of the OLS assumption that says the variance of the error terms is constant. The error terms are said to be heteroscedastic when their variance is not constant and thus erratic. For example, one instance in which heteroscedasticity issues may arise is when error terms increase as the values of an independent variable become more extreme in either direction. Additionally, heteroscedasticity may sometimes occur because of small misspecifications in the model. The consequences of the violation of homoscedasticity assumption do not necessary involve biased parameter estimates, but OLS estimates are no longer BLUE because the OLS would not provide the estimate with the smallest variance. Moreover, there is bias in the test statistics and confidence intervals as a result of the presence of heteroscedasticity. Therefore, it is important to test and ensure the absence of heteroscedasticity issue in this model to be sure that it is acceptable to rely on the above results.

White's test for heteroscedasticity. Null hypothesis: heteroscedasticity not present. *Test statistic: LM = 16.852 with p-value = P(Chi-square(5) > 16.852) = 0.004*. This decision is based on the p-value. Thus , since the p-value is less than 5%, the null hypothesis will be rejected, and it can be concluded that this model suffers from issues of heteroscedasticity.

The take away. The take away from the above test is that some of the underlying regression model's assumptions did not hold. This indicates that the researcher cannot rely on the statistical inferences of the current model. Consequently, there is a need for some method or transformation to produce a robust standard error to guarantee valid statistical inference (Hoechle, 2007; Reed & Ye, 2011). More precisely, I shall use the Feasible Generalized Least Squares (FGLS) estimator to ensure robust standard error. The FGLS estimator can be used if and only if the time period (T) is greater than the unit (N). The case at hand fulfills the FGLS' condition since the unit here is six counties and the time period (T) is 21 years.

Table 4. The Feasible Generalized Least Squares (FGLS) estimator

	Coefficient	Std. Error	t-ratio	p-value
Constant	5.766	1.010	5.707	0.000
UN	-0.522	0.148	-3.526	0.000
OP	0.026	0.010	2.430	0.016

Source: Author's computation. R^2 is equal to 0.60 and Adjusted R-squared is equal to 0.60. P-Value(F) is equal to $1.66e^{-24}$.

5.4 Testing the Model Properties after the FGLS was Implemented

Test statistic: LM = 9.093 with p-value = P (Chi-square (9) > 9.093) = 0.428.

I am basing my decision on the p-value; therefore, I fail to reject the null hypothesis. There is evidence in support of homoscedasticity.

The take away. Since there is no violation of the underlying regression model's assumptions, one can interpret these results as the FGLS provided a robust standard error leading them to be valid statistical inference. Therefore, one can now interpret the regression coefficients and estimate the loss of the output as a result of increase of unemployment rate. Table 3 reveals that the real growth of the GDP will be equal to 5.766 when all other explanatory variables are held to be zero. However, the cost of unemployment in terms of output loss is equal to -0.522, which means that if unemployment rate increases by one percent, the real growth of the GDP will decrease by 0.522 on average. Also, I included oil price because the Saudi economy is an oil-based economy, meaning that oil price has an effect on the growth of the real GDP (Note 5). Thus, when the oil price increases by one unit (dollar,) the growth of the real GDP will increase by 0.026 on average.

The second step of this analysis, however, is to determine the appropriate model from a pooled OLS regression model, the Fixed Effect Model, or the Random Effect Model. This is necessary because when running the pooled Model, we ignored the cross sectional and time series nature of data. In plain terms, all six countries were assumed to be homogeneous. In short, the problem with this model is that this model does not distinguish between the countries (GCC countries in the model). In other words, by using the pooled model, we deny the existence of heterogeneity between the countries where significant differences may in fact exist. Thus, it is vital that we determine the best model to use among these three by using joint significance of differing group means and the Hausman Test.

According to the panel diagnostic test, the pooled model is not ideal for use in these purposes. I used the joint significance of differing group means to pinpoint which model is the best fit between pooled and fixed.

H0: pooled model is the appropriate model.

H1: hypothesis saying that the fixed effect is the appropriate model.

$F(5, 112) = 4.845$ with p-value 0.000

Based on the p-value, I rejected the null hypothesis and concluded that the fixed effect is the appropriate model to use.

Fixed effect model. Using a fixed effect model allows for heterogeneity or individuality between these six countries by allowing them to have individual intercept values. In other words, the term fixed effect indicates that the intercept may vary across countries while remaining fixed over time, i.e., it is time invariant. In short, the six countries should be individual and thus have their own intercept value.

Table 5. Fixed effect model result

	Coefficient	Std. Error	t-ratio	p-value
Constant	4.822	2.657	1.814	0.072
UN	0.037	0.694	0.053	0.956
OP	0.111	0.032	3.468	0.000

The results in Table 5 reveal that both constant and oil price are significant but unemployment is not. However, I have doubts about the accuracy of the fixed effects model because the unemployment coefficient has a positive sign, which goes against the economic theory that says there is a negative relationship between unemployment and economic growth. Therefore, I must conduct further tests to determine whether the random effect model will be more accurate than the pooled or fixed effect models. This will be accomplished using the Hausmam Test. Analyzing the results of the Hausman test will indicate the appropriate model.

Hausman test statistic:

H0: Random-effect is appropriate.

H1: Fixed-Effects is appropriate.

$H = 0.981$ with p-value = Prob (chi-square (2) > 0.981) = 0.612

Based on the Hausman test results, I failed to reject the null hypothesis, which means I must use the random model because the random effect model is the most consistent.

Random effect model. The random effect model indicates that the six countries have a common mean value for the intercept.

Table 6. Random effect model result

	Coefficient	Std. Error	t-ratio	p-value
Constant	7.004	1.683	4.161	0.000
UN	-0.540	0.361	-1.495	0.137
OP	0.113	0.032	3.531	0.000

Results at Table 6 reveal that both constant and oil price are significant but unemployment is not. Arguably, the random effect model results are compatible with the economic theory. Finally, by completing all these above steps and after estimating these models, I cannot rely on any of these models to estimate the losses of output, that result from increasing unemployment rates because no model is free from errors. For instance, the pooled model is rejected when using the joint significance of differing group means. The next alternative used was the fixed effects model which was incompatible with trusted economic theories because the unemployment coefficient had the wrong sign. Furthermore, the Hausman Test pointed towards using a random effects model; however, even when aligning with economic theories (Okun's Law), the coefficient of unemployment is no longer significant. Consequently, it is necessary to use an alternative approach to estimate the economic costs of unemployment in Saudi Arabia.

5.5 Average Product Method

The average product method is used to estimate loss of output, that is caused by unemployment through estimating the average GDP per worker and then multiply that by the total number of unemployed. According to General Authority for Statistics, the total real GDP is $ 690,549,935,500; Saudi laborers total 13,944,732 million individuals at the year of 2016(GaStat, 2016). To proceed with the "average product" method, I must know the total number of Saudis unemployed, which reached 12.1 percent of the total labor force (1,687,313), and the average real GDP per worker, which reached 56.337 in 2015 (SAMA, 2016).

Table 7. Economic cost of unemployment using "Average Product" method on the real GDP in US $

Total Real GDP	690,549,935,500
Total Labor Force	13,944,732
Total Employment	12,257,419
Real GDP Per Workers	56,337
Total of Unemployed	1,687,313
Total Loss in GDP	95,058,152,000

Source: Author's computation (Note 6).

Results in Table 7 reveal that the total loss of Saudi output is $ 95 billion (13.7) percent of the total real GDP) per year as a result of 1,687.313 Saudis unemployed. These estimates were based on the total real GDP of which the oil sector contributes 44.4 percent. As a matter of fact, the oil sector is primarily capital-intensive, meaning that this sector does not have a significant direct effect on reducing unemployment rates. Theoretically speaking, unemployment would have little effect on the output within the oil sector. Therefore, it is worthwhile to use a second alternative estimating the real GDP within the non-oil sector. The non-oil sector registered at 55.6 percent of the total real GDP (total GDP of the non-oil sector is $ 380, 9 billion) (SAMA, 2016).

Table 8. Economic Cost of Unemployment Using "Average Product" Method on the Real GDP of Non-Oil Sector in US $

Total Real GDP	380,995,090,000
Total Labor Force	13,944,732
Total Employment	10,844,585
Real GDP Per Workers	35,132
Total of Unemployed	1,687,313
Total Loss in GDP	59,2791,672

Source: Author's computation (Note 7).

Results in Table 8 reveal an estimation of economic cost (losses in the real GDP of the non-oil sector) from the number of unemployed people in 2016. The loss of real GDP of the non-oil sector is 59.2 billion per year (15.5 percent of the total real GDP of non-oil sector). Based upon the above method, Saudi economy has been

suffering greatly from high rates of persistent unemployment. To conclude, Saudi policy-makers must tackle the problem of unemployment to avoid these economic costs and other non-quantified social costs.

6. Conclusion

This study showed that the negative impact of unemployment hits more than just the individual left without a job; in fact, the detriment of unemployment ripples out throughout the entire economy and society as more and more individuals fall into its grasp. Therefore, given the unemployment, economic, or social costs, it is important that the Saudi policy makers focus their efforts on solving the root causes of unemployment.

Moreover, extreme rates of unemployment tend to reduce overall production and operation, which slows economic growth. As the results of "average product" method in this study show, the loss of Saudi output is $ 95 billion for year of 2016 as a result of 1,687313 Saudis unemployed (based on total real GDP) and the loss of real GDP of the non-oil sector is 59 billion for the same year as a result of 1,687,313 Saudis unemployed. Thus, the estimated output loss should be significant enough to draw policy-makers' attention to the unemployment problem.

In conclusion, unemployment is a challenge that brings to the fore many social and economic costs. In fact, Saudi Arabia has vast amounts of capital and a high number of skilled labor. This secures its position as a developed country in the modern world. Under those circumstances, policy-makers must adapt an effective approach to reduce unemployment. Currently, one way of tackling unemployment problem is to fast the process of Saudi Arabia Vision 2030 that is able to attain and maintain full employment and environmental sustainability transferring the Saudi economy from oil-based economy to Knowledge-based economy.

References

Abel, A. B., & Bernanke, B. S. (2005). *Macroeconomics.* Boston, MA: Pearson Addison Wesley.

Akram, M., Hussain, S., Raza, S. H., & Masood, S. (2014). An empirical estimation of Okun's law in context of Pakistan. *Journal of Finance and Economics, 2*(5), 173-177. https://doi.org/10.12691/jfe-2-5-7

Al-Asmari, M. G. H. (2008). Saudi labor force: Challenges and ambitions. *JKAU: Arts & Humanities, 16*(2), 19-59. https://doi.org/10.4197/art.16-2.2

Al-Dosary, A. S., & Rahman, S. M. (2005). Saudization (Localization): A critical review. *Human Resource Development International, 8*(4), 495-502. https://doi.org/10.1080/13678860500289534

Al-Habees, M. A., & Abu Rumman, M. (2012). The relationship between unemployment and economic growth in Jordan and some Arab countries. *World Applied Sciences Journal, 18*(5), 673-680. Retrieved from https://pdfs.semanticscholar.org/95c3/7e58c6b350dd0eb30e7bfdeb53d6c524564a.pdf

Al-Harthi, M. A. (2000). *The political economy of labor in Saudi Arabia: The causes of labor shortage* (Unpublished doctoral dissertation). State University of New York at Binghamton, Political Science Department, Binghamton, New York. Retrieved from https://elibrary.ru/item.asp?id=5326032

Al Munajjed, M. (2010). *Women's employment in Saudi Arabia: A major challenge.* Booz & Company. Retrieved from https://ncys.ksu.edu.sa/sites/ncys.ksu.edu.sa/files/Women002_5.pdf

Al-Qudsi, S. S. (2005). *Unemployment evolution in the GCC economies: Its nature and relationship to output gaps.* Retrieved from http://squdsi.com/downloads/Unemployment%20in%20the%20GCC.pdf

Apap, W., & Gravino, D. (2014). *Okun's law in Malta: Lessons learnt from a sectoral perspective*. Economic Policy Department Working Paper. Ministry for Finance: Malta. Retrieved from http://redfame.com/journal/index.php/aef/article/view/1930

Ball, L., Furceri, D., Leigh, D., & Loungani, P. (2013, September 10). *Does one law fit all? Cross-country evidence on Okun's law.* Retrieved from https://www.slideshare.net/ploungani/okun-talk-at-new-school-by-prakash-loungani

Ball, L., Jalles, J. T., & Loungani, P. (2015). Do forecasters believe in Okun's law? An assessment of unemployment and output forecasts. *International Journal of Forecasting, 31*(1), 176-184. https://doi.org/10.1016/j.ijforecast.2014.03.009

Berger, S., & Forstater, M. (2007). Toward a political institutionalist economics: Kapp's social costs, Lowe's instrumental analysis, and the European institutionalist approach to environmental policy. *Journal of Economic Issues, 41*(2), 539-546. https://doi.org/10.1080/00213624.2007.11507043

Blakely, T. A., Collings, S. C., & Atkinson, J. (2003). Unemployment and suicide. Evidence for a causal

association? *Journal of Epidemiology and Community Health, 57*(8), 594-600. https://doi.org/10.1136/jech.57.8.594

Cháfer, C. M. (2015). *An analysis of the Okun's law for the Spanish provinces.* (No. 201501). University of Barcelona, Research Institute of Applied Economics. Retrieved from http://diposit.ub.edu/dspace/handle/2445/61326

Darity, W. (1999). Who loses from unemployment. *Journal of Economic Issues,* 491-496. https://doi.org/10.1080/00213624.1999.11506182

Davidson, P. (1984). Reviving Keynes's revolution. *Journal of Post Keynesian Economics*, *6*(4), 561-575. https://doi.org/10.1080/01603477.1984.11489467

Eldemerdash, N. (2014). *Securitizing unemployment and migration in Saudi Arabia* (MA Candidate). Political Science, University of Toronto.

Fatai, B. O., & Bankole, A. (2013). Empirical test of Okun's law in Nigeria. *International Journal of Economic Practices and Theories*, *3*(3), 227-231.

Feather, N. T. (1990). The effects of unemployment on work values and motivation. In U. Kleinbeck, H-H. Quast, H. Thierry, & H. Hacker (Eds.), *Work motivation* (pp. 201-229). Hillsdale, NJ: Lawrence Erlbaum.

Forstater, M. (2002a). Full employment and environmental sustainability. In E. Carlson & W. Mitchell (Eds.), *The urgency of full employment*. Sydney, Australia: The Centre for Applied Economic Research, University of South Wales Press.

Forstater, M. (2002b). Full employment policies must consider effective demand and structural and technological change. In P. Davidson (Ed.), *A post Keynesian perspective on twenty-first century economic problems* (p. 195). Cheltenham, UK: Edward Elgar.

Forstater, M. (2002d, February). *Unemployment.* Working Paper 20. Center for Full Employment and Price Stability, University of Missouri-Kansas City.

Forstater, M. (2013b). Unemployment and underemployment. In P. Mason (Ed.), *Encyclopedia of race and racism* (2nd ed., Vol. 4, pp. 213-220). Detroit, MI: Macmillan Reference.

Forstater, M. (2015a). Complementary currencies, communities, cooperation: The local job guarantee in the Eurozone. In A. Bitzenis, N., Karagiannis, & J. Marangos (Eds.), *Europe in crisis: Problems, challenges, and alternative perspectives* (pp. 195-204). New York, NY: Palgrave Macmillan.

Forstater, M. (2015b). Working for a better world: Cataloging arguments for the right to employment. *Philosophy & Social Criticism*, *41*(1), 61-67. https://doi.org/10.1177/0191453714553500

Howard, M. C., & King, J. E. (1985). *The political economy of Marx.* New York, NY: NYU Press.

International Monetary Fund. (2013, July). *Saudi Arabia: 2013 Article IV consultation.* Washington DC: Author. https://doi.org/10.5089/9781484361375.002

Jahoda, M. (1982). *Employment and unemployment: A social-psychological analysis* (Vol. 1). Cambridge, UK: Cambridge University Press Archive. Retrieved from http://dar.aucegypt.edu/handle/10526/4273

Kabanova, E., & Tregub, I. V. (2012). *Okun's law testing using modern statistical data.* Retrieved from http://www.freit.org/WorkingPapers/Papers/Development/FREIT488.pdf

Kabli, S. A. (2014). *Unemployment in Saudi Arabia: Assessment of the Saudization program and the imperatives leading to youth unemployment* (Unpublished Master's thesis).The American University in Cairo. Retrieved from http://dar.aucegypt.edu/handle/10526/4273

Kaboub, F. (2015). *The cost of unemployment and the job guarantee alternative in Saudi Arabia* (Doctoral dissertation). University of Missouri-Kansas City.

Keynes, J. M. (1936/1978). The general theory of employment, money and interest. In E. Johnson & D. Moggridge (Eds.), *The collected writings of John Maynard Keynes* (Vol. 7). New York, NY: Cambridge University Press. https://doi.org/10.1017/UPO9781139524278

Keynes, J. M. (1937). Alternative theories of the rate of interest. *The Economic Journal, 47*(186), 241-252. https://doi.org/10.2307/2225525

Knotek II, E. S. (2007). How useful is Okun's law? *Economic Review-Federal Reserve Bank of Kansas City, 92*(4), 73. Retrieved from

https://search.proquest.com/openview/f95722f4644acdece29467e1d4402f98/1?pq-origsite=gscholar&cbl=47211

Kregel, J. (1988). Irving Fisher, great-grandparent of the general theory: Money, rate of return over cost and efficiency of capital. *Cahiers d'économie politique, 14*(1), 59-68. https://doi.org/10.3406/cep.1988.1058

Levine, L. (2013, January 7). *Economic growth and the unemployment rate*. Retrieved from http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=2003&context=key_workplace

Marx, K., & Engels, F. (1990). *Capital* (Vol. I). London, UK: Penguin Classics.

Mattoscio, N., Bucciarelli, E., Odoardi, I., & Persico, T. E. (2012). An examination of Okun's law: Evidence from European target countries. *Annals of the University of Oradea, Economic Science Series, 21*(2), 237-243.

Nordt, C., Warnke, I., Seifritz, E., & Kawohl, W. (2015). Modelling suicide and unemployment: A longitudinal analysis covering 63 countries, 2000–11. *The Lancet Psychiatry, 2*(3), 239-245. https://doi.org/10.1016/S2215-0366(14)00118-7

Okun, A. M. (1965). The gap between actual and potential output. *Proceedings of the American Statistical Association*. In E. S. Phelps, (Ed.), *Problems of the modern economy.* New York, NY: Norton.

Pasinetti, L. L. (1981). *Structural change and economic growth: A theoretical essay on the dynamics of the wealth of nations*. Cambridge, UK: Cambridge University Press Archive.

Peck, J. R. (2014, April). *Can hiring quotas work? The effect of the Nitaqat program on the Saudi private sector.* Retrieved from http://economics.mit.edu/files/9417

Prachowny, M. F. (1993). Okun's law: Theoretical foundations and revised estimates. *The Review of Economics and Statistics, 75*(2), 331-336. https://doi.org/10.2307/2109440

Ramady, M. A. (2010). *The Saudi Arabian economy: Policies, achievements, and challenges*. New York, NY: Springer Science & Business Media.

Rochon, L. P., & Seccareccia, M. (Eds.). (2013). *Monetary economies of production: Banking and financial circuits and the role of the state.* Cheltenham, UK: Edward Elgar.

Smith, A. (1817). *An inquiry into the nature and causes of the wealth of nations* (Vol. 2). London, UK: Methuen.

Wray, L. R., & Forstater, M. (2004). Full employment and social justice. In J. Knoedler & D. Champlin (Eds.), *The institutionalist tradition in labor economics* (pp. 253-272). Armonk: ME Sharpe.

Notes

Note 1. The Nitaqat program imposes a quota system on private companies, requiring them to hire a minimum number or percentage of native Saudi workers.

Note 2. Many economists maintain that high employment levels stimulate technical innovation. From this, one can logically conclude that the reverse must also be true: that unemployment inhibits innovation.

Note 3. $i = (1,2,3,4,5,6$ or Saudi Arabia, the United Arab Emirates, Kuwait, Oman, Bahrain, and Qatar).

Note 4. $t = (1, \ldots, 22\ or\ 1994, \ldots\ldots, 2014)$.

Note 5. All oil prices based off of Brent Crude prices; the benchmark price for global oil purchases.

Note 6. To proceed with this method, I first found the average real GDP per worker in Saudi economy by dividing the total real GDP by the total number of employees in Saudi labor force. I then multiplied total number of unemployed Saudis by this number (average real GDP per worker) to determine total loss in the GDP.

Note 7. "Average product" method estimate was determined as follows: finding the total real GDP for non-oil sector and dividing it by the total number of employees in this sector (total employees in the Saudi labor force minus the total employees in the oil sector) to get the average real GDP of non-oil sector per worker. The result was then multiplied by the total number of unemployed people.