5.1 Introduction

This chapter will provide an extensive discussion of insights which have been derived from statistical analysis as highlighted in the chapter below. The primary aim behind such extensive analysis is to derive meaningful insights from the result and compare it with work conducted by prior scholars in order to understand the current situation and interest from different viewpoints. The subsequent section will cover a discussion of the results derived through hypothesis testing and then a comparison of the results. This discussion will form the major aspect of the subsequent chapter where recommendations will be provided to address the challenge which is being considered in this study.

5.2 Discussion on Statistical Data

Hypothesis 1: This hypothesis was developed to examine the relationship between crude oil prices in a country and energy import dependence. Correlation analysis was conducted to examine the hypothesis in which a positive correlation (0.556) and P-value of 0.000 was noted which suggests there is a significant relationship between crude oil price as well as import dependence for energy.

Any variation in crude oil price has been noted to have a significant impact on import levels for economies which are net importers of crude oil products in the economy as also asserted in the study conducted by Yao et al., (2023). This study is based on the logical aspects which took into account the ratio of total crude oil improvement when compared to the GDP of the economy. The closer the relationship, the more significant impact has been considered of any change in price on the import level. It should be noted higher prices are expected to show negligible deviation in import level when there is a price rise. In case of a price fall, each industry and the economy is considered to act rationally and start acquiring more reserves which may again lead to a price rise. Thus, the ratio of oil consumption to GDP is a major criterion influencing price as well as total import level. The study conducted by Wang & Su (2021) should also be considered who established the conditional aspect and noted that the government acting on behalf of the economy (taking into consideration demand by all industries and reserve level), may take decisions each quarter regarding the need to acquire or continue with current oil reserves. Here, the government is

considered as a price establisher but the role of government is limited to price rise in the global market. The government may still have reserves in a quarter but may increase the price to buy more reserves in subsequent quarters. Hence, though this model established time conditions, the model does not price changes that can be made by the government and actual influence may be faced on a daily level based on how the domestic market reacts. Thus, this study established the relationship between the domestic and international oil markets even when the government makes periodic adjustments owing to the need to pay higher in the foreseeable future. A significant theme which has been noted across the discussion is the role of reserves which has not been directly considered in this empirical study, but such reserve impact on the entire economy has been noted in the study conducted by Anser et al., (2020). Reserves here have been defined in a simpler manner as the total volume of crude oil which an economy has currently. Such oil will be utilised for consumption and hence government need to maintain a balance between consumption and usage. Therefore, the government of an energy-import-dependent economy acts as a price establisher making an active attempt to mitigate direct price shock. However, the government need to slowly transfer prices. Here, it has been asserted that in case of lack of government intervention, such price will be decided freely and shock will be felt across a shorter timeframe (or on a daily basis). Thus, the government acts to delay the impact but may not be able to completely mitigate it in the case of a long-term perspective. The actual situation in the global economy is several countries are net exporters of oil products as well though such countries will always be smaller than oil-importing economies. Liu et al., (2020) noted in the study the presence of such diverse exporters who all may charge different prices. In the current situation, the price is decided by such countries coming together as a group, but here each country is considered a price establisher. In such a scenario, each country may try to shift to a similar price in order to collectively enjoy benefits and gradually shift to a collective approach. Thus, the current study noted price deviation in a longer timeframe may be much lower with a defined percentage range. In such a case, energy importing economy may face only nominal loss or gain nominal amount due to a change in partner and thus negligible impact will be visible affirming the relationship we noted even with diverse exporters.

Hypothesis 2: Subsequently, this hypothesis was developed to examine the relationship between energy import dependence and the economic growth of the country. Such has been tested with the aid of regression analysis and ANOVA table. The strength of the relationship was noted to be 0.522 (or 52.2%) and a P-value of 0.000 was noted suggesting energy import dependence has a major impact on the economic growth of the country.

Energy imports have been noted to have a significant influence on economic growth and such has also been established based on a macroeconomic model as evident from the study conducted by Adewuyi & Awodumi (2020). In this study, a comprehensive macroeconomic model has been noted which stated that crude oil consumption is related to different industries which has been noted to lead to positive growth in output per sector or the proportion of GDP which is contributed by that sector. Any change in crude oil price is noted to influence business process and hence output from that sector thus proportion of GDP will also be influenced, and hence economic growth as well. Improve dependence makes it harder for the country to establish prices rather it needs to accept higher prices in the market which can lead to a negative impact on output level in different sectors, and thus lead to a negative influence on economic growth. In this aspect, the relationship which has been observed by Sarıgül & Apak (2022) should also be considered who noted that such a relationship between energy consumption and economic growth of the country is felt in a longer timeframe and such is not significant in a shorter time frame. When energy consumption of energy-importing economies is taken into consideration, then a direct relationship can be established between import and consumption and thus may be connected here to establish a relationship between energy import and economic growth in the longer timeframe. The logical framework of the actual situation in which crude oil demand can be met by utilizing existing supply country may have in storage. Over a longer timeframe, if higher prices are sustained, the economy may have no choice but to purchase at higher prices leading to a reduction in energy consumption and hence influence may be felt on economic growth. Moreover, the study which has been conducted by Murshed et al., (2020) should also be considered in which the relationship between energy import dependence and economic growth has been established but at the same time, such has been compared by dividing the

economy into three sectors namely agriculture, industry, and service segment. The industrial segment is noted to have a direct influence but on the other hand, influence is also noted in the agriculture and service segment due to the need to utilize different equipment which needs crude oil products. Thus, the influence has been noted across different segments but at the same time, each segment will have a proportional influence. Energy import dependence is thus noted to firstly influence the industrial segment of an economy and then agriculture and service-based, thus collectively influencing the economic growth of the region. Another logical model has been established in the study conducted by Gibbi & Khan (2023 who also asserted the existence of a relationship between energy import dependence and economic growth. This study considered the aspect of economic expansion which is termed as an increase in total output by any sector and requires more energy consumption despite the role of innovation and making the business process more efficient and less energy-intensive. The need for additional fuel consumption may be lower but such would still be positive. An increase in price and energy import dependence may make such expansion tough. This logical model is considered more relevant as such has been noted to suit in case of a fall in price in which different industries might engage in more consumption of energy and thus showcase an increase in economic growth.

Hypothesis 3: This hypothesis examined the relationship between crude oil prices as well as environmental impact, which was examined with the aid of correlation analysis. A positive correlation was noted with a strength of 0.508 and a P-value of 0.000, which suggests that there is a significant relationship between crude oil prices as well as environmental impact.

The influence of prices of crude oil and environmental impact has also been covered in the study which has been conducted by Yadav et al., (2020). A significant observation has been provided in the prior study which noted that the economy which has been dependent on crude oil cannot achieve socioeconomic goals of sustainability or environmental goals due to the higher level of carbon footprint which is generated daily from the consumption of fossil fuels. Regarding the price of fuel, it has been noted that a significant increase may decrease a certain proportion of domestic oil consumption and consumption in each sector for different activities, but still, there will be a significant carbon footprint from continuous usage which will still have an

impact on the environmental footprint. The current study has also analyzed the aspect of renewable energy and noted such in the current timeframe and even in the foreseeable future, may not be possible to completely eradicate the environmental impact as existing infrastructure promotes the usage of crude oil. Further, the study which has been conducted by Ani et al., (2020) has also affirmed the relationship which noted it to primarily stay significant owing to the large use case which is noted regarding the consumption of oil. Additionally, here the scholars also explored different aspects in terms of damage to the environment which consists of not only carbon oxide generation but also of other pollutants like nitrates and sulfates, which may stay longer in the air than regular carbon oxides and hence may cause negative damage to environment based on prior energy consumption trends. This argument hence established the notion that oil prices, when lower, may witness higher levels of consumption which has been established to lead to higher levels of pollutants and thus may cause significant damage to the environment even if the prices go higher in the foreseeable future. Thus, this established the crucial aspect of price and consumption volatility and such needs to be reviewed across a longer timeframe than daily volatility. When considering the influence of crude oil price and the environment, an extensive study which has been conducted by Agbalagba et al., (2021) should also be considered, in which it noted environmental impact is diverse and needs to be considered from the aspect of soil, water, and air. Volatility in crude oil prices can lead to changes in consumption but such changes will not be stationary rather the impact will be felt in different proportions in different sectors and both personal as well as commercial use, thus environmental impact on different attributes (soil, water and air) which has been covered above will be a different and overall significant impact on the environment may be noted. Division of environmental impact on different aspects aids in understanding how price change may lead to usage change which may lead to change in impact across different aspects but impact will still be significant. In this aspect, the study conducted by Hassanshahian et al., (2020) should also be reviewed which noted that considering crude oil price as a singular variable for influence on environmental impact may be harder as the economy depends not only on the consumption of direct crude oil but also different crude oil-related products. At the same time, the economy has extensive infrastructure which involves

refining as well as distribution aspects. Further, oil in existing storage might be used to meet sudden price deviation. In such a complex scenario the influence on the environment due to oil consumption will remain the same unless there is a significant price rise and continuance across a longer timeframe, in which case, an earlier study of the impact on different attributes of soil, water, and air becomes relevant hence asserting crude oil price to have a significant impact on the environment.

Hypothesis 4: Similar to another hypothesis, here the relationship between alternative energy adoption as well as economic growth was examined. This was done with the aid of correlation analysis. A positive correlation value was noted with a value of 0.856 and a P-value of 0.000, which established that an alternative hypothesis can be accepted to establish that the economic growth of the country can be linked to adoption of alternative energy sources

Renewable energy has been noted here to have a significant impact on the economic growth of the country. A risk-based model which included both economic and financial aspects has been adopted in the study conducted by Wang et al., (2022) was asserted that earlier adoption of renewable energy will come with significant costs of engaging both in public awareness and development of traditional energy systems in such a manner that it suits the requirement in the utilization of renewable energy. In such instances, the impact will be negative as such will require extensive investment which might have been invested in another sector for economic growth. However, the study has asserted that once such a threshold (investment required for utilization) is crossed, a positive net is expected of renewable energy adoption on the economic growth of the country. The current study does not consider the threshold but even when considering the threshold, overall influence is positive over a longer timeframe. Similarly result has also been noted in the study conducted by Shahbaz et al., (2020) who asserted positive impact was witnessed in 58% of 38 countries of which data was collected from 1990 to 2018. Two aspects need to be considered, firstly the latter study did not take into account new advancements since 2018 and secondly, significant influence is still noted. The current study has extended this and established a positive relationship between renewable energy adoption and the economic growth of India. Further, this study has combined such economic growth as well as environmental aspects and connects the results which have been derived in this

hypothesis with the influence of crude oil on energy import dependence as well as environmental impact. Thus, this study connects each aspect establishing the significant influence of renewable energy adoption on economic growth and such develop on the logical inference that infrastructure for renewable energy must have grown from 2018 to the current timeframe. While analyzing the relationship between growth and adoption of renewable energy, the study conducted by Oliveira & Moutinho (2021) should also be considered who noted the influence of renewable energy adoption on economic growth has been witnessed in all countries except less developed economies. Through logical analysis, India currently can be considered as a developing economy which is making active investments in both the development of renewable energy sources and utilization of such energy across different sectors and personal consumption as well. This leads to affirmation of the argument presented by prior scholars of relationship being evident in developing economies which has been established through empirical analysis. For less developed economies, the latter study considered the need for technology and loans, which is considered crucial and has been discussed as a factor which can negatively influence energy adoption in the short-term, but still such is considered an essential investment if the long-term benefit is being considered. A long-term empirical relationship has also been noted between economic growth as well as the adoption of renewable energy as evident from the result which has been established in the study conducted by Kasperowicz et al., (2020). Thus, one major inference which becomes clear from the analysis of different studies which are based on different regions is the relationship becomes visible as well as significant only in the longer timeframe. In a shorter timeframe, significant deviation may be noted which may be both positive as well as negative based on existing energy infrastructure, crude oil price, and macroeconomic situation. On a longer timeframe, a positive relationship is noted in which the economy is considered to take a rational decision which will promote the growth of renewable energy resources and develop adequate facilities to ensure such energy can be used by diverse sectors. Therefore, from logical analysis, this is expected to contribute to positive economic growth

Hypothesis 5: This hypothesis was developed to examine the relationship between policy framework and alternative energy adoption. Regression analysis and ANOVA

table analysis were conducted. Regression analysis established the strength of the relationship as 0.877 or 87.7%. ANOVA table analysis noted a P-value of 0.000, which suggests that an alternative hypothesis can be adopted or there is a relationship between policy framework and alternative energy adoption.

The influence of legal policies has been also noted in the logical framework which has been conducted in the study by Olujobi et al., (2023). Here, the two aspects were considered which the government might think regarding energy regulation, firstly ensuring energy security in the economy from price fluctuations and secondly, meeting environmental and sustainability targets. For both of these, a legal policy is considered as a prerequisite as such would establish the need for taking action to promote renewable energy consumption and at the same time, ensure each process gets covered in a specific timeframe in case of systematic adoption and transition process. Legal policy establishment is considered a significant aspect which will ensure each stakeholder takes dedicated action. Further, this study does not discuss penalties and fines but rather considers them to be dependent upon specific governments. The current study acknowledges such can have both aspects which can involve both incentives as well as penalties and shall be decided based on the macroeconomic situation of the economy. To add to this, Qurbani & Rafiqi (2022) asserted that different legal regulations and guidelines which are established take into account the environment as a dedicated entity for which all stakeholders must engage in protection. This aspect when established legally is considered a significant change in the policy framework under which citizens of the economy are expected to protect the environment which will lead to the adoption of renewable energy resources. This study also took into account the substance, content, and problem which legal policy aims to address through renewable energy adoption. A clear as well as comprehensive policy is noted to have significant benefits but on the other hand, a policy which has no clear implications or direction may not lead to significant change. Thus, the assertion in the current study is considered valid but requires a strong and dedicated policy which establishes a clear plan. Here, plan clarity is considered in terms of what changes are expected in each industry and energy network and by when each change will be implemented to not disrupt traditional economic activities. Further, Chang et al., (2021) noted legal policies as a significant factor based on the entire energy

ecosystem. The shift from a crude oil economy to an economy which is focused on renewable energy requires significant investment in pipelines and also major changes in technology as well as consumption habits. All of these are expected to be addressed through dedicated legislation, in such a case it has been noted that legal policies can have a significant impact on the adoption of alternative energy sources in the economy. Thus, the current study has noted the influence of legal policies, but the discussion here expands it to the need for systematic and comprehensive policies which cover different aspects, provide subsidies or penalties based on macroeconomic aspects and current needs and establish dedicated targets while also establishing accountability for different stakeholders. Therefore, such regulations are noted to significantly influence the adoption of alternative energy sources across the economy including all sectors and personal usage.