THE ROLE OF THE PETROCHEMICAL SECTOR IN ECONOMIC DIVERSIFICATION IN SAUDI ARABIA

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Overview

This work is a part of the large research study that deals with the representation of the petrochemical sector in KAPSARC Global Energy Macroeconometric Model (KGEMM). It examines the impact of the driving forces on the petrochemical sector and the role of the sector in the economic, energy and environmental developments in Saudi Arabia. There are at least four reasons for a deep study of the petrochemical sector. *First*, the National Industrial Development and Logistics Program (NIDLP 2020) and the National Transformation Program (NTP2020) of Saudi Vision 2030 (SV2030) identify the petrochemical sector as a leader in diversifying the Saudi economy. SV2030, the Kingdom's development roadmap, has set aspirational targets for the diversification of the Saudi Arabian economy for the period 2016-2030. For example, Non-oil GDP growth is expected to double compared to 2016. Non-oil exports to increase to 50% of non-oil exports from 16% in 2016. Achieving these and other goals will require rapid growth in the sectors identified in the SV2030 realization programs, and petrochemicals is one of them. *Second*, this sector is the main driver of Saudi non-oil exports. It is worth noting that its share in non-oil exports averaged 62.3% during 1991-2019. The so-called export-led growth concept states that exports can be an engine for long-term economic growth. In this respect, the development of the petrochemical sector and its exports can contribute significantly to the diversification of the non-oil sector's production and exports. *Third*, the government has provided significant support for the development of the sector in the form of investment and energy incentives in the past and plans to continue this support in the coming years in line with SV2030. *Fourth*, there is a favorable environment for the development of the sector when it comes to production inputs such as cheap energy and feedstock. Against this background, this study aims to better understand the developments in the petrochemical sector and their impact on the economy, energy, and environment in Saudi Arabia, and to derive policy insights that can be useful in the decision-making process.

Data & Methods

With the aim above, the objective of the study is to develop 2-stage modeling framework: *In the first stage*, representations for the petrochemical sector are developed. Precisely, long-run equations and Equilibrium Correction Models are estimated for value added, employment, investment, feedstocks (ethane, LPG, naphtha, methane), and exports (chemicals and plastic-rubber). Annual time series data are used for the estimations. The estimations start in different years, mainly in the 1980s and end in 2019 depending on the data availability. *In the second phase*, the estimated equations and identities are integrated into the KGEMM framework. This allows us to simulate KGEMM up to the year 2035 with different policy and research scenarios. KGEMM is a policy analysis tool for examining the impacts of domestic policy measures and global changes on economic, energy, and environmental relations in Saudi Arabia. KGEMM consists of nine blocks interacting with each other to represent economic, energy and environmental linkages in Saudi Arabia as Figure 1 illustrates.
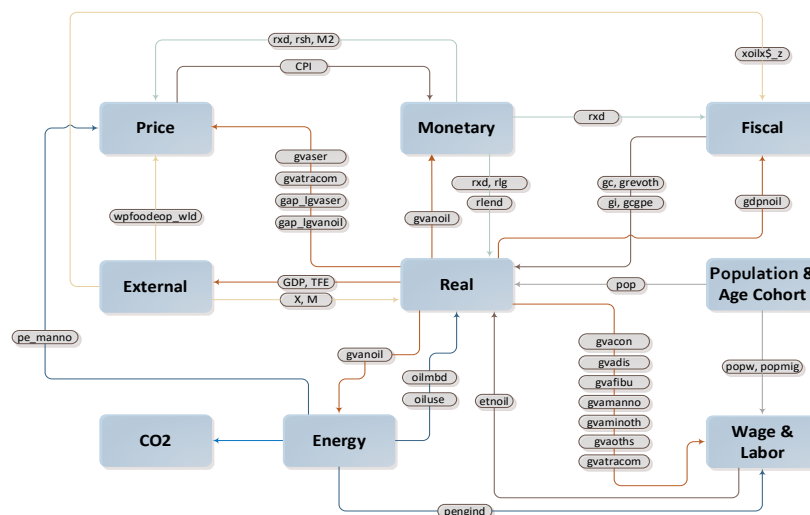

Figure 1. KGEMM structure

Information such as KGEMM theoretical foundation, econometric methods, variables, and database can be found in Hasanov et al. (2020).

Results

In this conference presentation, due to space constraints, we focus only on petrochemical sector exports and their impact on the diversification of the non-oil export and value-added. Therefore, we report here only the long-run equations estimated for two export products, i.e., chemicals and plastic-rubber. We specify Saudi Arabia's exports as a function of trading partner income, the real effective exchange rate (REER), a measure of international competitiveness, and domestic production capacity, all in the natural logarithm (log) transformation following the export literature. The REER is defined as the nominal effective exchange rate (an increase in the REER implies an appreciation of the Riyal) times the ratio of domestic prices to foreign prices (which are specific to chemicals and plastic-rubber). Table 1 documents the estimation results.

Table 1. Long-run estimation results for exports of chemicals and plastic-rubber

	Log(chemicals export)	Log(plastic-rubber export)
Log(foreign income)	0.30**	1.05**
Log(domestic production capacity)	0.44*	0.88**
Log(real effective exchange rate)	-0.14**	-0.13**

Note: Deterministic terms are dropped to save space; As a proxy for domestic capacity, non-oil value added and petrochemical value added are used in the chemical export and plastic- rubber export equations; **, * are the statistical significance at the 10% and 5% levels, respectively. All the dependent and explanatory variables are integrated order of one process according to the unit root test results and long-run relationship in the equations are confirmed by the cointegration tests, such as Engle-Granger.

Plastic-rubber exports have a one-to-one relationship with trading partner's income and domestic production capacity, while chemical exports show relatively small response to these determinants. Similarly, both export products show a statistically significant response to the REER, albeit with small magnitudes.

Next, we simulated KGEMM in two scenarios: Basecase scenario, in which we made no changes-the Saudi economy moves forward as it is in 2022. Scenario 1, in which we increased foreign prices for exports of chemical and plastic-rubber by 10% for the period 2022-2035. Table 2 contains the simulation results.

Table 2. Deviation of scenario 1 from the basecase, % change.

Year	Exports		Non-oil		Share of	
	Chemicals	**Plastic-rubber**	**Export**	**Value-added**	**Non-oil export in total**	**Non-oil value-added in GDP**
2022	1.49	1.37	0.88	0.14	0.74	0.06
2025	1.53	1.44	0.89	0.22	0.70	0.09
2030	1.58	1.54	1.04	0.33	0.79	0.13
2035	1.67	1.70	1.27	0.51	0.93	0.20
Average	**1.57**	**1.51**	**1.02**	**0.30**	**0.79**	**0.12**

The simulation results show that, on average, a 10% increase in foreign prices leads to an increase in exports of chemicals and plastic-rubber in Scenario 1 by about 2% compared to the basecase. This also leads to an increase in total non-oil exports and value added by 1% and 0.3%, respectively. Consequently, the shares of non-oil exports in total exports and non-oil value added in GDP (as diversification indicators) increase by 1% and 0.1%, respectively.

Conclusions

The main conclusion of the analysis is that petrochemical exports can make a positive contribution to the development and diversification of the non-oil sector. Policymakers may wish to take measures to increase exports of chemicals and plastic-rubber. In this context, they should consider that plastic-rubber exports are more responsive to foreign income and domestic production capacity than chemical exports. The real exchange rate also plays an important role in the behavior of both products' exports. Since the fixed exchange rate of the Riyal to the U.S. dollar is followed in Saudi Arabia, policymakers should pay attention to the relationship between domestic and foreign prices. In this regard, measures to maintain the stability of domestic prices for chemicals and plastic-rubber are important for growth and diversification of non-oil exports and value-added.

References

Hasanov, Fakhri, Frederick L. Joutz, Jeyhun I. Mikayilov, and Muhammad Javid. KGEMM: A Macroeconometric Model for Saudi Arabia. KAPSARC Discussion Paper. No. ks-2020-dp04. 2020.