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Dissecting Global Oil Shocks: Implications for Taiwan's Output, Inflation, and External Sector

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Abstract
This investigation evaluates how fluctuations in international petroleum prices reverberate through the Taiwan macroeconomy over the period January 2001 to September 2023. Monthly observations are assembled for a representative set of indicators, including industrial output, consumer price inflation, central-bank policy interest rates, broad money supply, nominal exchange rates, merchandise imports, merchandise exports, and outward foreign direct investment. To disentangle structural shocks, the analysis decomposes oil-price movements into supply disturbances, global aggregate demand shifts, and oil-specific demand innovations, then traces their dynamic effects by means of a structural vector autoregression framework augmented with appropriate identification restrictions. Empirical estimates reveal that supply-side disruptions in the crude-oil market exert only muted and transitory influences on domestic activity, prices, and external balances. By contrast, shocks arising from worldwide demand expansions and from precautionary or speculative changes in oil-market expectations transmit swiftly to Taiwan variables, generating pronounced increases in industrial production, consumer prices, and policy interest rates, while simultaneously depreciating the won and widening both import and outward investment flows. These differential responses underscore the openness of the Taiwan economy and its sensitivity to global demand conditions rather than to pure supply constraints. The evidence therefore suggests that policy authorities should prioritise strategies that harness buoyant external demand, through diversification of export markets and support for high-value manufacturing, while maintaining vigilant monetary and exchange-rate policies to cushion inflationary pressures stemming from oil-specific demand surges. Future research could incorporate sectoral disaggregation to refine policy recommendations and anticipate evolving energy-market dynamics more effectively.
Keywords: Oil Price Shocks, Macroeconomic Transmission, Structural Vector Autoregression, External Demand
JEL Codes: E32, Q43, F41, C32

1. INTRODUCTION

The global oil market has historically been shaped by a series of significant geopolitical and economic events, with the 1970s serving as a pivotal period. During this decade, a series of oil crises emerged, largely triggered by geopolitical tensions in the Middle East and deliberate production cuts by major oil-exporting countries. These disruptions led to unprecedented spikes in oil prices, which in turn had profound and widespread consequences for the global economy. The resulting oil price shocks contributed to the phenomenon of stagflation—a unique economic condition characterized by persistently high inflation rates occurring alongside rising unemployment and stagnant economic growth—in many advanced and developing nations (Hamilton, 2013; Mustapha, 2022; Kilian, 2008). Since the turn of the twenty-first century, oil prices have continued to display considerable volatility, influenced by both supply and demand dynamics. In the early 2000s, fluctuations were driven by shifting patterns of global economic activity and significant developments within the energy sector. The reduction in global demand for crude oil and a rise in crude oil supply would take place because of the prolonged economic recession. Among these supplies of crude oil, a significant amount was supplied due to the booming shale oil drilling activity taking place in the USA, which resulted in sustained low oil price levels for a long period (Muhieddine, 2018; Baumeister & Kilian, 2016; Baffes et al., 2015).

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In past years, geopolitics has again proved its influence in determining the price of global oil. For instance, at the beginning of a conflict in between Russia and Ukraine, the price of West Texas Intermediate crude oil rose to the highest level it had since 2013, showing more uncertainty with supply worries among international markets by May 2022 (IEA, 2022; Federal Reserve Bank of St. Louis, 2022). But a tremendous upward move was followed by rather considerable downward correction during the months after it, which saw a notable thirty-one percent decline in oil prices. This pattern reflects that of an environment that is volatile and sensitive to both political shocks and market fundamentals (World Bank, 2023). It follows at least two principal levels of disruptions in oil production, coming as a result of geopolitical tensions, other than the strategic cuts in production by important oil-exporting countries. Geopolitical events, such as armed conflicts, instability in the political scenario in oil-producing areas, and the imposition of international sanctions, usually result in an extremely constrained supply of oil, which, combined, creates upward price pressure in almost every international market (Kilian & Murphy, 2014; Hamilton, 2013; Modibbo & Saidu, 2023; Nili & Asadi, 2024).

Global economic activities have also been important determinants of movements in price. For example, in recent years, during the worldwide recovery from the impact of the financial crisis in 2008, worldwide economies and industries began to recover with renewed demand for oil (Baumeister & Kilian, 2016; Sina, 2019). In contrast, the COVID-19 pandemic brought about a near-universal decline in oil consumption, with widespread lockdowns and travel restrictions, and a severe recession in both the manufacturing and transportation sectors. This collapse in demand during 2020 resulted in dramatic declines in oil prices and even temporary situations where certain oil benchmarks traded at negative values (IEA, 2020; World Bank, 2021). In addition to these fundamental drivers, speculative trading in oil futures markets has become an increasingly influential determinant of price volatility. The behavior of traders and institutional investors, who react to real-time news, economic forecasts, and expectations regarding future supply and demand, can lead to rapid and sometimes dramatic swings in oil prices. Anticipation of potential disruptions in vital shipping routes, the possibility of new sanctions targeting major oil-producing countries, or even rumors of changes in production policies can drive prices higher, irrespective of any immediate change in actual oil supply (Fattouh et al., 2013; Alquist & Kilian, 2010; Imran et al., 2019; Osabuohien, 2021; Dumitru & William, 2023). As a result, market sentiment and speculation often amplify price movements beyond what would be expected from supply-and-demand fundamentals alone.

These variables include crude oil production, the worldwide index for real economic activity, real oil prices, and a few other macroeconomic variables related to Taiwan, including industrial production, inflation, the interest rate, money supply, exchange rates, imports and exports to and from, and outward foreign direct investments. The period considered is January 2000 to September 2023, thus enabling the long- and short-term elasticities between oil market dynamics and the Taiwanese economy to be assessed. The findings reveal that oil supply shocks tend to contract the economy in the short run. Specifically, following a negative supply shock, Taiwan's economic growth rates, inflation rates, and import volumes are initially reduced; outward foreign direct investment remains unaffected during the initial phase. This is consistent with previous studies finding that oil supply shocks suppress industrial activity and, in general, lead to a depressed economy mainly through raising production costs and reducing the competitiveness of export-oriented sectors. On the flip side, oil demand shocks are associated with increases in global real economic activity and tend to have expansionary impacts on the Taiwan economy. In particular, these shocks increase industrial production and raise inflation, which prompts the monetary authorities to increase interest rates in an attempt to contain inflationary pressures. Imports also rise due to the existence of high domestic and global demand for goods and services. Foreign direct investment experiences slight positive growth, indicating that favourable conditions exist for outward investment by firms in Taiwan when global demand environments are stronger. The sector-specific oil demand shocks—that is, changes in oil prices not occasioned by broad changes in global demand—exhibit initial positive impacts on economic growth and inflation, which are later counteracted by an economic slowdown as the intricate mechanisms of interaction between trade balances and currency and price level begin to take effect. The interaction between imports, exports, and the exchange rate demonstrates how susceptible the Taiwan economy is to international energy market developments, thereby emphasizing how adaptive policies vary per climatic condition. Taiwan benefits more from shocks to global aggregate demand than to specific demand for oil. The induction of global demand activates higher industrial production, exports, and relative currency stability that, in turn, provides persistent economic growth. These findings indicate the need for Taiwan, as an export-oriented economy, to promote further economic integration and negotiate trade deals that will ensure the export competitiveness of its industries. It urges policymakers to make use of the opportunities provided by rising global demand through fostering innovations and diversifying export markets while undertaking measures to mitigate the short-term inflation impact due to a good global demand environment with smart macroeconomic policies.

2. LITERATURE REVIEW

The numerous studies led by scholars have sought to understand the intricacies surrounding oil price fluctuations through the disentanglement of various sources underlying oil market shocks. In this regard, Kilian's (2009) contribution to a milestone has been modeling a trivariate structural vector autoregression framework based on global oil production, real economic activity, and real oil price. Such a methodological approach permits identifying and disentangling three distinct flavors of oil shocks: supply shocks-from unanticipated change in the global oil production; changes in aggregate demand with no relation to oil supply disruptions; and specific demand oil shocks meant for sudden alterations in precautionary demand for oil as a result of possible future supply shortfalls. Kilian's advancement in understanding the dynamics behind oil prices is significant enough for appreciation by both researchers and policymakers regarding the different types of oil shocks that might exhibit heterogeneous macroeconomic effects. It is very important to discriminate among these shocks to assess their impacts on such key economic variables as output, inflation, and trade balances, and to formulate

accompanying policy responses aimed at each shock according to its distinctive character. Different techniques of empirical investigation have been applied in subsequent research to further rectify the identification and quantification of oil price shocks. For instance, Peersman and Van Robays (2009), as well as Baumeister, Peersman, and Van Robays (2010), made use of structural vector autoregression frameworks to analyze the sources and effects of movements in oil prices. Their results highlight that the economic effects of oil shocks differ widely by region, with the Euro area and the United States responding differently to the same types of oil price shocks. The implications of these regional differences stress the need for context-specific analysis and indicate how knowing the source of oil price volatility would assist macroeconomic management and policy formation.

Based on prior developments in the empirical modeling of oil market dynamics, Kilian and Murphy (2012) proved, through the addition of sign restrictions, constraints on oil supply elasticity, and responsiveness of real economic activity, that demand and supply shocks within the global oil market can be well captured. Furthermore, this methodological innovation presented increased confidence in disentangling the factors underlying oil price fluctuations. Kilian and Murphy (2014) instead added the incorporated aspect of speculative demand into that framework by utilizing advanced or comprehensive oil inventory data from Energy Intelligence Group, which covers oil stocks more widely across the globe. Their analysis showed that speculative demand accounts for 40% of price increases during some episodes in history, including spikes during the points of 1979, 1986, and 1990; however, it accounted for less than 5% of price increases during the boom between 2003 and 2008. This demonstrated the significant but sporadic effect of speculative activity on oil price formation, especially during periods of strong geopolitical tension.

Besides that, Baumeister and Peersman (2013) presented a more refined view on the identification of oil supply shocks by using sign restrictions with a change of volatility over time. Thus, supply disruptions would now be better understood in terms of oil price dynamics. Ratti and Vespignani (2013) also took a structural VECM wherein the real price of oil and oil production were treated as endogenous variables. Their model allows one to assess the shocks coming from the global oil supply, the aggregate demand, and the oil-specific demand alongside the effect of real broad money supply for both developed and developing economies. They, however, attributed the unexplained shocks in their model to precautionary demand due to the future supply shortfalls. These empirical works had theories in parallel to developed over time. Thus, Basak and Pavlova (2016) contributed by building a dynamic multi-good and multi-asset model that disentangles the effect of flows from institutional investors from traditional supply and demand determinants on commodity futures prices, their volatility, and co-movement. It also investigated the implications of financialization for spot commodity prices and levels of inventory.

Baumeister et al. maintained a Bayesian perspective by reviewing the historical relative importance of supply and demand shocks to oil price fluctuations. According to this research, having a historical perspective, supply shocks have turned out to be much more important than estimated, demand shocks affecting global economic activity more immediately but less persistently. Recently, with the advancement of methodologies, the identification of oil market shocks has seen improvement. A novel approach was proposed by Kanzig in 2021 by using institutional features of OPEC by taking high-frequency data to identify oil supply news shocks and provide more intricate views of how changes in market expectations concerning oil supply affect oil prices and general macroeconomic outcomes.

The effects of oil price shocks on macroeconomic performance have been empirically tractable for a long time. Seminal contributions in this literature have repetitively shown that changes in oil prices are critical in determining the economic outcomes particularly through production cost, consumer prices, inflation, trade balance, and aggregate economic growth (Barsky & Kilian, 2001; Bernanke et al.,1997; Kilian, 2008; Blanchard & Riggi, 2009; Kilian & Hicks, 2013). Hamilton's early empirical work indicated an association between fluctuations in oil prices and subsequent economic recessions among advanced economies from 1983 onward. This suggested a larger decomposition of macroeconomic stability traced to oil price shocks through the increased production costs for firms, increased prices for consumers, and disruption of resource allocation and investment decisions. The above-mentioned early studies have indicated various channels by which oil price volatility might transmit to the wider economy. Rising oil prices tend to feed into inflation through higher energy costs, inducing countercyclical policy responses in the form of elevated interest rates by central banks. These would raise the cost of borrowing, potentially curtailing price-sensitive investment by businesses and household consumption (Hamilton, 2005). Conversely, declines in oil prices tend to enhance disposable income for consumers and cut firms' input costs, and thereby can foster economic growth albeit often in a rather asymmetrical fashion in terms of the macroeconomic responses to oil price rises versus declines (Garzon & Hierro, 2021; Moshiri & Banihashem, 2012; Deheri & Ramachandran, 2023; Bruna & Tran, 2023; Ge & Sun, 2024; Zhang & Shang, 2023).

Recent studies have just begun to cross the ocean of macroeconomic effects of oil price variability, extending the literature to emerging markets and a wider array of economic variables. The evidence was found regarding oil issues on domestic inflation and industrial output, on trade balances, exchange rates, and capital flows (Vlastakis et al., 2020; Syed & Bouri, 2021; Samuel, 2023; Marc et al., 2025). Besides, oil market shocks may, from time to time, produce different impacts across countries that are oil-dependent, depending on the kind of currency involved, economic structure, and policy framework. Methodologically, important developments have been attained in oil-price modeling shocks and their macroeconomic repercussions. Antolin-Diaz and Rubio-Ramirez (2018) introduced narratives' sign restrictions into structural vector autoregression models, melding the analysis of historical events with econometric methods to boost the identification and robustness of estimated shocks to oil markets and shocks to monetary policy. Other works have changed the methodological path adopted by people like Jimenez-Rodriguez (2022), who employed a time-varying parameter VAR approach linked to oil prices, global economic activity, and monetary policy, thus allowing for changes in the relationships involving the three through time. Bayesian estimation methods have further improved the models by

enhancing accuracy and interpretability (Primiceri, 2005; Negro & Primiceri, 2015). Recent empirical evidence provides further clarification of the macroeconomic effects of oil price shocks. Jimenez-Rodriguez (2022) finds that unexpected disruptions in oil supply consistently lead to downturns in global economic activity, while unanticipated expansions in aggregate demand tend to boost output. Oil-specific demand shocks, however, typically have only short-lived effects, particularly in the context of major economic events. In a related analysis, Degirmen, Tun, Saltik, and ul Rehman (2023) examine the role of oil price shock uncertainty in shaping key macroeconomic variables across both oil-exporting and oil-importing nations. By applying a block-exogeneity structural vector autoregression model to a sample of twelve developing countries active in oil trade, their study underscores the complex dynamics between global energy markets and broader macroeconomic trends.

Oil price changes do not similarly affect national economies; they are instead differentiated by a country's structural aspects and its relation to global conditions in energy markets. Moshiri and Kheirandish (2024) demonstrate that whereas oil-exporting countries, especially developing ones, tend to benefit from high oil prices, the extent of these benefits is, to a certain extent, diminished by the global trade dynamics. Conversely, generally, developing oil-importing countries seem to have experienced adverse developments from the rising oil prices with a time lag of about a year, though this may not necessarily be statistically significant, and trade linkages have hardly played any role in alleviating the impacts.

The deep economic dislocations triggered by sharply falling prices of crude oil during the COVID-19 pandemic testify to the sensitivity of both oil-exporting and oil-importing countries to global shocks (Atif et al., 2022). High oil prices generally push up production and transportation costs, causing consumer prices to rise and inflationary pressure to increase. Inflation, in turn, would weaken the purchasing power of households and slow economic growth owing to reduced or deferred expenditure by consumers (Peersman & Van Robays, 2009; Lee & Song, 2009; Moshiri & Banihashem, 2012; Moshiri & Kheirandish, 2024). Effects of oil price changes on national currencies exhibit significant asymmetries as well. According to Zhu, Li, and Huang (2023), oil prices bear a stronger and more persistent relationship with the currencies of oil-exporting countries, which appreciate against oil price rises. Conversely, the somewhat weaker and much more variable relationship between oil prices and oil-importing nations' currencies is suggestive of the divergent economic structure and external vulnerability faced by each of these nations.

A large number of studies have been conducted regarding the effects of oil price shocks on the economy of Taiwan, accentuating the structural vulnerability of this import-dependent country, whereas, on the other hand, oil prices have had a significant bearing on the economic performance of Taiwan relative to other economies. The study also comments that a reduction in oil price would by no means ensure an increase in Taiwan's exports, an important finding attributed to the industrial organization of Taiwan and the sophistication of its value chain. Other studies have observed a dynamic interaction between oil prices, currency, and macroeconomic variables: An and Heedon (2011) found that an initial oil price shock appreciates the Taiwan dollar, but, after the increase of oil imports and domestic production with inflationary pressures, the currency comes under depreciation pressure. Cunado et al. (2015) studied the pass-through effects from oil price movements onto the exchange rate in the oil-importing economies and concluded that central banks' policy interventions of both Japan and Taiwan—namely the interest rate adjustment, exchange rate management—counteract the destabilizing effect of oil price shocks.

According to Park and Shin (2018), taken together with the short-term financial conditions, international dependencies on imported energy become crucial in Taiwan's economy. Financial market variables govern the short-term macroeconomic response because oil price volatility affects the economy in the long run, mainly because of the continued dependence on imported energy. The trade effects of price shocks in oil have been specified by Baek (2023) to apply such price shocks by breaking down the source of oil price shock because the transmission of effects through trade into the exporting and importing channels would depend on the trading partner as well.

The research further indicated by Baek (2024) added, among other findings, that aggregate demand and oil-specific demand shocks primarily drive Taiwan's economic growth, both in the short and long terms, with asymmetric effects of demand shocks on long-term growth. This shows that developments on the demand side tend to carry more macroeconomic importance than do disruptions on the supply side in Korea's economic path. According to Park and Meng (2024), "oil price shocks have had relatively greater impacts on inflation in the long run, whereas higher oil prices depress industrial production and their effects on unemployment become weaker over time, which indicates adaptive behavior in the labor market and industrial sector contexts." These collective effects of research show that the multifaceted, dynamic relationship between oil price and macroeconomic indicators is happening in Taiwan and could have a significant impact on the economic policy as well as risk management strategies of a very interconnected and energy-dependent environment.

3. RESULTS AND DISCUSSION

This analysis seeks to use a monthly dataset for the period January 2001 to September 2023, as selected by the uniform availability of industrial production records and other macroeconomic series (Bank of Taiwan, 2023), in order to investigate the impact of oil price shocks on macroeconomic indicators in Taiwan. The analysis encompasses several worthwhile macroeconomic variables. Crude oil production is a measure of the world oil supply, expressed in thousands of barrels per day, data from the U.S. Energy Information Administration (EIA, 2023). The index of world real economic activity on the industrial commodity market constructed by Kilian (2009) is a better indicator of international business cycles and is sourced from the U.S. Department of Energy. The real price of crude oil is derived from a price index reported monthly by the U.S. Energy Information Administration: U.S. Crude Oil Imported Acquisition Cost by Refiners in U.S. Dollars per Barrel (EIA, 2023). Following the standard empirical protocols in the literature, this nominal price

series is deflated using the United States Consumer Price Index to provide the real price of oil (Kilian, 2009). For macroeconomic variables in the Taiwan economy, the Economic Statistics System (ECOS) from the Bank of Taiwan is used, with variables reported monthly in index form (Bank of Taiwan, 2023). Industrial production measures economic growth, inflation is measured from the Taiwan Consumer Price Index, and interest rates are considered the prevailing monetary policy stance. Other key variables relate to broad measures of money supply, the Taiwan won exchange rates against major currencies, import and export price indices, and outward foreign direct investment. To enhance interpretability and to control for seasonal and structural changes, all of these key variables are converted to year-on-year percentages with regard to crude oil production, industrial production, money supply, exchange rate, imports and exports, and foreign direct investments. Such transformation fits an appropriate model into the standard empirical practices concerning macro and energy market research and analysis for a better dynamic effect description concerning oil price shocks (Cunado et al., 2015; Kilian & Murphy, 2014). This motivates modeling impulse responses to oil price shocks concerning the Taiwan economy.

The impulse response analysis based on the structural vector autoregression developed in this study seeks to investigate the effects of oil price shocks in the Taiwan economy. In this analysis, three types of oil price shocks are differentiated: oil supply shocks, aggregate demand shocks coming from the world economy, and specific demand shocks from oil markets. Each of its types of shocks was evaluated on the basis of its effect on several key macroeconomic variables, such as the changes in the rates of economic growth, inflation, interest rate, money supply, exchange rate, imports, exports, and foreign direct investments. Figures 1 and 2 depict the impulse responses of the macroeconomic variables in Taiwan to one standard deviation of structural innovation corresponding to each shock. Each response is accompanied by a 68% confidence band, which captures the statistical uncertainty in the estimates. The results in Figure 1 suggest that an oil supply shock has an immediate negative impact on economic growth for the first nineteen months, after which the negative growth passes with a slow recovery, suggesting that during disruptions of oil supply and energy-cost hikes, the economy experiences short-term contraction. Yet thereafter, the modest recovering phase is perceived as a short-lived recovery, which seems to reverse after around forty months post-shock. Some empirical findings seem to verify the earlier studies. Jo and Shim (2024) provide a rationale for the limited as well as transitory effects of oil supply shocks on industrial output, asserting that these impacts are, by and large, small-scale and tend not to last for very long. Such findings are corroborated by Cunado et al. (2015), who also observed an impact of oil supply shocks on macroeconomic performance in oil-importing economies as generally short-lived.

Inflation resulting from an oil supply shock shows an initial decline, lasting for as long as forty months, before it begins to recover to baseline levels. This pattern points towards a temporary lowering of the price levels thought to result from a decrease in aggregate demand and lower economic activity. Such dynamics are consistent with oil supply disturbances indirectly depressing price pressures in oil-importing economies through reduced consumption and industrial output (Jo & Shim, 2024). In the case of interest rates, the dynamics after an oil supply shock follow a more tempered adjustment pattern. The interest rates decrease slowly, with downward movement starting from the fourth month after the shock and extending up to around forty months. This graduality shows the general tendency of monetary authorities to act with caution while stabilizing the economy against oil price shocks on inflation and growth (Cunado et al., 2015).

The money supply contracts sharply at the moment of the shock, with the contraction going on for about twenty months. An increase in money supply starts about thirty-five months after the shock, probably as economic activity stabilizes, and policy interventions begin to have their effect. The initial contraction in money supply could have represented the monetary authorities' response against inflationary risks or an adjustment to diminished demand for credit in the wake of weak economic growth. Beginning in the wake of the oil supply shock, the exchange rate appreciates rapidly for a short period, up to about ten months. The positive response steadily wanes, and by the forty-fifth month, exchange rates would have reverted to pre-shock levels. Detailing further, imports and exports take a hit immediately after the shock. Their exports suffered for the shortest span, in fact fading within six months, whereas imports took much longer to recover and were adversely affected in some forty months. Attributing this drop mostly to the direct link between crude oil imports being disrupted as a result of the supply shocks, the reductions in exports may be a function of Taiwan's manufacturing and exports being heavily intertwined with imported petroleum products. As domestic reserves are directed toward local demand, fewer resources remain to be used for export-oriented production.

The oil supply shocks had short-lived effects on the economic situation in Taiwan because of extremely essential structural adjustments that have increased the capability of country to resist disruptions in energy supply. Many oil-importing nations set up strategic storage facilities to store reserves during an ample supply. Such strategic stockpiling ensures effective management of temporary supply disruptions, limiting the vast negativity expected on economic activities. In the case of Taiwan, even though there are no remarkable domestic crude oil reserves, strategic oil reserves have been developed and managed with full resilience. Overall, this strategy for energy security further strengthens national stability while ensuring obedience of the economy to normal functions in times of global oil supply disturbances (International Energy Agency, 2023). The conclusions put forth in this study point to just how vital such reserve management is, amongst other mitigating actions against the macroeconomic impact of oil supply shock, while showing Taiwan's capability to enhance energy security in the face of external risks.

According to what can be gleaned from the results displayed in Figure 2, the impulse response analysis indicates how the Taiwan macroeconomy responds to a one-standard-deviation structural innovation in global oil demand. Economic growth shows a positive response immediately after a shock to global demand phenomenon observable in the increase in the aggregate industrial production index, for about five months, after which the effect decreases gradually to fade completely by around fifteen months. The initial increase in growth can be considered to arise from the export of goods

and services by Taiwan that took immediate advantage of the rising global demand and international economic conditions (Jo & Shim, 2024). The finding implies that if global economic activity strengthens, Taiwan industries are in a better position to withhold upward production costs since the larger demand for exports acts to sustain their growth against upward pressure on input prices. The inflation, which reacted to the shock in demand, recorded a high increase, which was sustained for an approximate duration of ten months before returning to its baseline in the next thirty months. The very first inflationary pressures emanating from increased production costs and high demand were, in most instances, passed through to consumers, with a corresponding adjustment in price levels upward, and gradually absorbed by the economy thereafter (Cunado et al., 2015).

Figure 1

The reaction of the interest rate to a global oil demand shock exhibits a marked increase that is both significant and
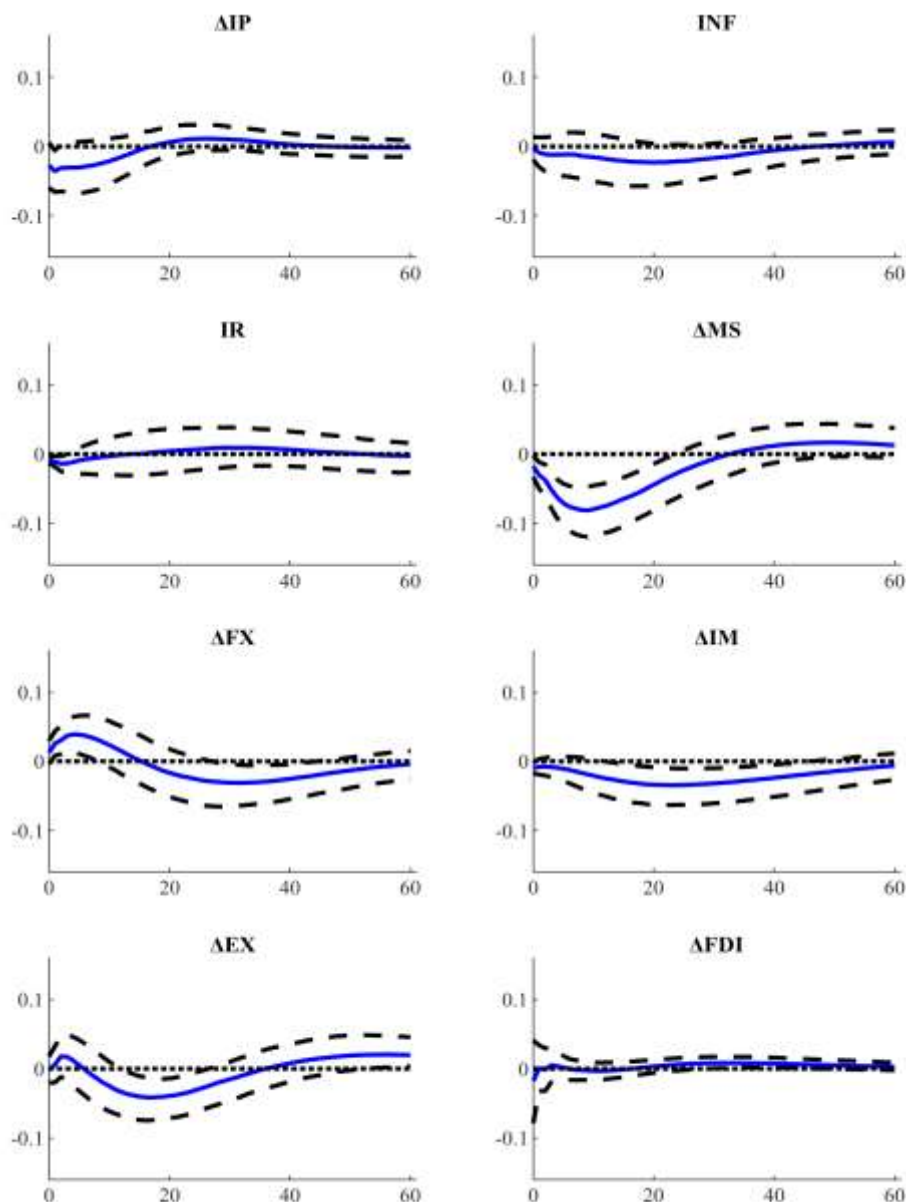

prolonged, attaining its peak approximately at month thirteen, with gradual tapering thereafter on a five-year horizon. This implies that the Bank of Taiwan, in response to the increased inflationary pressure of the shock, does apply a tightening monetary policy. Raising the interest rate is the usual policy response to curb inflation by restraining excess demand and acting as a bulwark for inflationary expectations (Cunado et al., 2015). In the immediate aftermath of the demand shock, the money supply exhibits a modest increase. This initial rise likely reflects a greater demand for liquidity as both firms and households seek additional funds to accommodate higher transaction volumes and respond to rising price levels. Central banks may accommodate this demand for a brief period to ensure smooth financial functioning before subsequently tightening monetary conditions as inflationary risks persist (Jo & Shim, 2024).

The exchange rate response is characterized by an initial decline, which represents an appreciation of the Taiwan won against the United States dollar. The appreciation is driven by capital inflows, as higher domestic interest rates make Taiwan assets more attractive to international investors. Additionally, the positive outlook for export-driven sectors, following a global demand shock, encourages further investment in Taiwan's financial markets. Over time, however, this

initial appreciation is reversed, with the exchange rate beginning to depreciate around the twentieth month. The subsequent depreciation reflects a market correction, as investors adjust their expectations in response to evolving economic conditions and as the initial stimulus effects wane (Park & Shin, 2018).

Figure 2
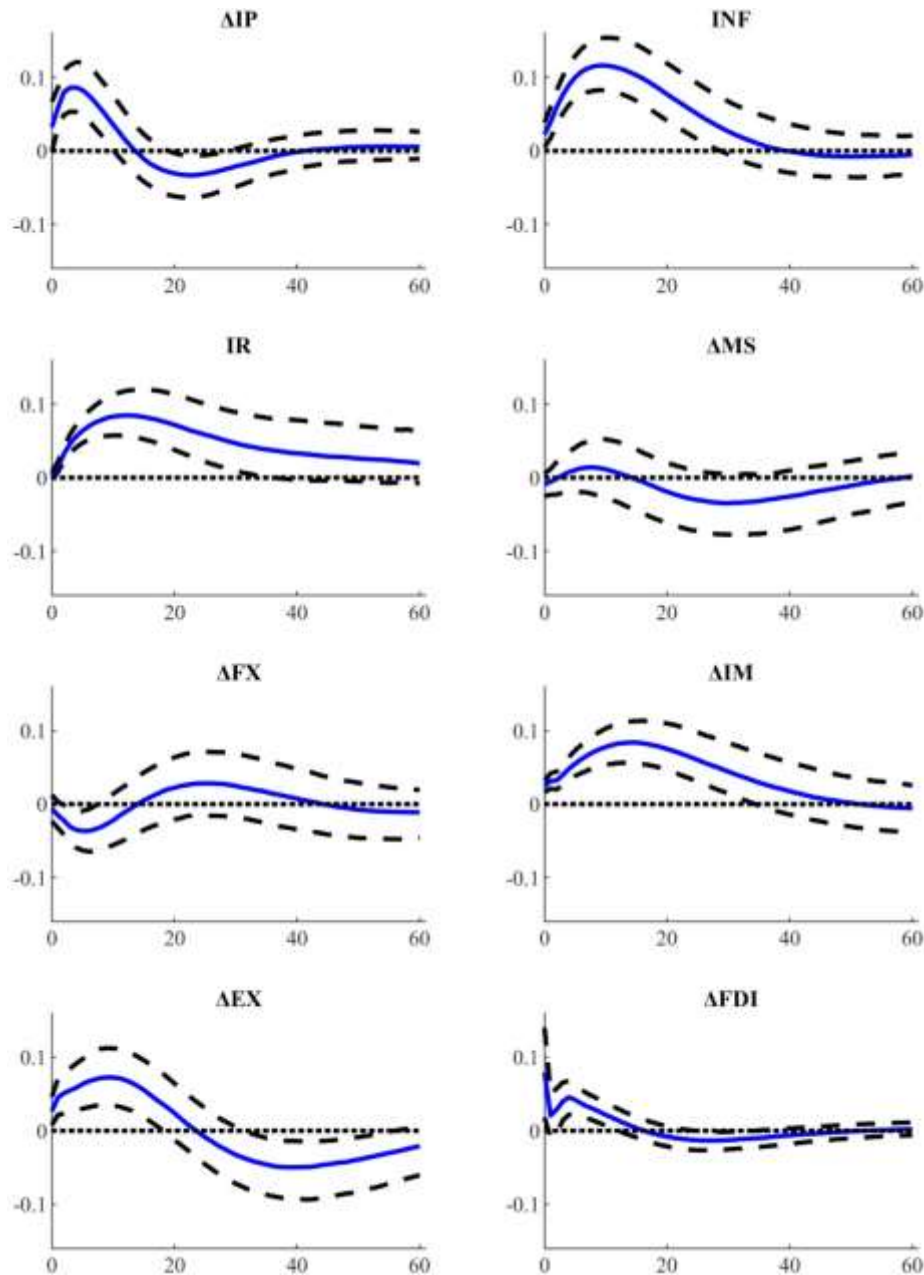
The response of imports to a global aggregate demand shock is characterized by a marked increase, peaking approximately five months after the initial shock and gradually stabilizing by the thirtieth month. This rise in imports is driven by Taiwan's dependence on foreign materials that are crucial for the production of its principal export goods, which include electronic integrated circuits, automobiles, refined petroleum products, automobile components, and flat panel displays. As global demand for Taiwan products accelerates, domestic producers ramp up production, necessitating a corresponding increase in the importation of essential intermediate goods. However, as the effects of the demand shock wane and economic conditions become more restrictive, the rate of import growth slows, reflecting an adjustment to more sustainable levels (Park & Shin, 2018). Exports followed a similar course after an initial boost due to a demand shock; the greatest gains appeared within the first few months. The view suggests that external demand has played a crucial role in sustaining Taiwan's export sector. As international demand stabilizes, so too does export growth, indicating that the effects of a positive global demand shock are most pronounced in the short term and tend to dissipate as the global economy reverts to equilibrium (Baek, 2024). Foreign direct investment abroad shows a modest but immediate increase following the shock, likely resulting from the initial appreciation of the Taiwan won. This currency appreciation reduces the cost of overseas investment for Taiwan firms, thereby providing an incentive to expand internationally. As the currency subsequently depreciates and the domestic economy adjusts, the rate of foreign direct investment growth levels off (Cunado et al., 2015).

The macroeconomic impact of a positive global aggregate demand shock is broadly expansionary for Taiwan's export-driven economy. Economic growth, inflation, and interest rates all rise in the short term, while Taiwan initially appreciates before depreciating as equilibrium is restored. Imports increase to support the production of export goods, which also experience significant short-run gains before stabilizing. There is also a modest rise in foreign direct investment as firms capitalize on favorable currency conditions. The impulse response analysis for oil-specific demand shocks reveals a different pattern. Economic growth initially rises for about ten months after the shock, reflecting the stimulative effects of short-term increases in oil demand. During this period, Taiwan is likely to draw upon its strategic oil reserves to sustain production. However, as high oil prices persist, the growth response reverses, and the economy enters a downturn that fades by approximately thirty-eight months. This downturn can be attributed to rising production costs, particularly in industries heavily dependent on oil-based inputs, which ultimately constrain output and limit economic expansion (Jo & Shim, 2024). The price level responds with a modest increase for about fifteen months, indicating that higher oil prices are passed through to consumers, raising overall production and living costs before these effects diminish.

4. CONCLUSIONS

This study analyzed the macroeconomic repercussions of international oil price shocks on Taiwan's economy from January 2001 to September 2023, distinguishing the roles of supply-side disruptions, global aggregate demand expansions, and oil-specific demand innovations. Using a structural vector autoregression approach and a robust set of monthly economic indicators, the analysis provides a nuanced understanding of how each type of oil shock propagates through Taiwan's real economy, prices, monetary conditions, external sector, and capital flows. The empirical results indicate that supply-side oil shocks, such as abrupt reductions in global crude production due to geopolitical events or OPEC actions, exert only modest and transitory influences on Taiwan's economic output, inflation rate, and trade balances. These findings are consistent with the growing body of international research demonstrating that oil-importing economies with established strategic reserves, resilient production networks, and diversified supply chains are increasingly adept at buffering the short-run effects of supply interruptions. In Taiwan's case, rapid adjustments in import sourcing and the effective deployment of reserve stocks appear to mitigate much of the immediate contractionary risk associated with global oil supply disturbances. In contrast, shocks driven by global aggregate demand, such as synchronized expansions in worldwide industrial activity and consumption, transmit robustly and rapidly to Taiwan's economy. The analysis reveals that positive global demand shocks are associated with sharp increases in Taiwan's industrial production, a notable uptick in consumer price inflation, and pronounced responses in central bank policy rates. It will be worth comparing these results with those of studies on the other export-oriented economies in Asia, where global demand conditions tend to dominate macroeconomic dynamics, dwarfing the effects of supply disruptions of oil. Oil demand shocks - also referred to as oil shocks - will generate an even more complex macroeconomic response than changes that are related to expectations and precautionary stockpiling or speculation in the market. Initially, output and inflation are both inflated, but these effects tend to be short-lived and frequently reverse as high, persistent oil prices erode profit margins, depress domestic demand, and either reduce or diminish external competitiveness. This emphasizes the sensitivity of Taiwan's economy to oil market sentiment shifts as well as the need to fine-tune the monetary and fiscal policy frameworks to be able to respond to real and anticipatory movements in oil prices. The differential incidence of these three classes of oil shock thus epitomizes the openness of Taiwan's economy and its pronounced vulnerability to external forces. Evidence suggests that Taiwan is much more resiliently insulated from the most debilitating effects of oil supply interruptions; however, it remains susceptible to fluctuations in the world economy and to speculative behavior in international energy markets. The Taiwan macroeconomic landscape is thus increasingly contingent on anticipating and responding to global moving conditions and how and when synchronized upswings or heightened intensity occur in the world energy market.

These issues raise several policy implications. First, diversification in Taiwan's export markets and improved value-added content in manufacturing will bolster Taiwan's economy against external shocks while allowing it to take advantage of increasing world demand periods. Second, permanent vigilance in monetary and exchange rate policy should combat inflationary spurts resulting from oil demand shocks, meaning that rising input costs cannot pass through to wider price instability. Third, further reduction of vulnerability to the volatility of the global oil market will depend on enhanced strategic oil reserves, renewable alternatives, and energy efficiency initiatives. Finally, since oil-specific demand shocks can arise from sudden changes in expectations or speculative behavior, enhanced monitoring of financial market indicators with improved communication among monetary authorities and market participants can strengthen policy responses in periods of high uncertainty regarding oil prices.

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