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The Impact of Oil price Shocks and Exchange Rate Volatilities on Production of Iranian Manufacturing Industries

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Abstract: This study evaluates the effect of oil price shocks and exchange rate volatilities on production of manufacturing industries in Iran. In this research,Vector Autoregressive (VAR) Model is applied for the period starting from 1994 to 2013. Value Added of industries is used as a dependent variable, while exchange rate, oil price, import of intermediate and capital goods, labor wage and resource cost are considered as independent variables. Results of this study show the exchange rate shocks has a negative impact on the value added of industries, while the impact of the long-term oil price shock is almost steadily ascending. The results of variance decomposition show among the variables exchange rate volatilities and oil price shocks have the greatest impact on the production of Iranian manufacturing industries in the long-run.

Classification JEL: E32, F31, L16, L60, Q43

Keywords: Manufacturing Industries, Exchange Rate Volatilities, Oil Price Shocks

1. INTRODUCTION

Industrialization has caused increase in production, employment, efficiency, and performance. It plays an important role in economic growth and development. As many researchers consider industrialization the same as development (Griffin, 1999). A strong and significant correlation between manufacturing industries and Gross Domestic Product (GDP)has been validated by experimental studies as well, So that the growth of manufacturing industries has had a significant impact on GDP growth (Krueger, 1983; Salehi Esfahani, 1991; Lee, 1994). That is why Su and Yao (2016) have introduced the manufacturing industries as thekey engine of economic growth.

From Hirschman's (1958) point of view, development of the industrial sector facilitates the growth of other economic sectors (such as agriculture and services). The close relationship between the sectors of

industry, agriculture and services provides the most important proof of this claim. As thrive of industries have led to more production, employment and income. Increase in income has led to an increase in investments and savings and as a result it boosts the supply and demand of products and services.

Various factors affect the trend of industrial development of countries, including the impact of capital market (Cable, 1985 and Victor *et al.*, 2013), impact of technology (Soete, 1985 and Somsuk *et al.*, 2012), impact of labor productivity and efficiency (Kalleberg and Berg, 1987) and the impact of oil price and exchange rate on imports and exports and eventually the impact on domestic production through them. Much of industrial production is independent of imports of intermediate and capital goods. Concerning their role in exports, the importance of the role of oil and its exchange reserves in supply of intermediate and capital goods could be realized.Therefore, due to manufacturing dependency on import and import dependency on oil revenues, any changes or fluctuations in foreign exchange earnings affects domestic production. Thus, this study aims to evaluate and analyze this issue.

In other words, this study tries to address the question of how much production in Iranian manufacturing industries is affected by currency fluctuations and oil price shocks.

After this introduction, theoretical framework is offered. The third section will review previous studies. In the fourth part, the research methodology and data analysis are described. Section five analyzes the findings of research and, finally, in the sixth part, conclusions and recommendations are provided.

2. THEORETICAL FRAMEWORK

This study assesses the effect of oil price shocks and exchange rate volatilities on production of Iranian manufacturing industries. According to empirical evidences, provision of the cost of raw materials as well as intermediate and capital goods - that encompasses a large part of imports of intermediate and capital goods- plays a significant role in the development of the industries. Since the imports of intermediate and capital goods in developing countries such as Iran have a great effect on the industrialization process, any barrier or fluctuation in provision of the cost of raw materials and intermediate and capital goods, required for industrial production, has inhibitory effects on the growth and development of the industry.

Disruptions and shocks can act both permanently and temporarily. Permanent shock is a disorder that persists for a long time in the economy, such as productivity shock, caused by technological developments, that will affect the economy for almost a long time. Transient shock is a disorder that affects economy only for a short time such as rising demand shock caused by seasonal changes.

1.2. Effect of exchange rate fluctuations on production

Exchange rate fluctuations affect aggregate demand through imports, exports and money demand through the channel of the cost of imported intermediate goods. The result of these effects on production and the price depends on the initial economic state of the countries. The effect of exchange rate fluctuations, the demand side by using the import-export activity, can be investigated. Another factor is the decline in investment which is influenced by fluctuations of the exchange rate. In most developing countries, domestic investment is highly dependent on imports of capital goods so that it gets exploited after the integration of capital and domestic resources. In such circumstances, a rise in exchange rate and currency devaluation increases import costs and a decrease in imports of capital goods lowers and domestic investment and consequently reduces aggregate demand.

On the supply side, it could be argued that positive shocks in exchange rate (depreciation of national currency) in developing countries increase the cost of imported intermediate goods and, consequently, make the imports of intermediate goods (production input) more expensive, which can have a negative effect on production. Fluctuations in the real exchange rate also affects the real sector by creating uncertainty in future price of goods and services. Economic brokers take their decisions on production, investment and consumption based on information that the price system provides for them. Unreliable and unpredictable prices, due to the uncertainty in exchange rates, have a negative effect on the decision-making process for production and investment. Furthermore, uncertainty in exchange rates increases the risk in economic environments which increases interest rates, reduces investment and therefore has a negative effect on production. Moreover, the increase in exchange rate fluctuations and its following uncertainty leads to risk increase in international trade and also it increases the trade costs which results in decrease in trade and eventually production.

2.2. The impact of oil price fluctuations on production

In theoretical framework, energy (oil) is considered as one of the production inputs in economic production functions. The shock of oil price fall in countries dependent on foreign exchange earnings from export of crude oil convinces the governments to apply more limitations on imports of goods and services so that they save foreign exchange to provide the country's needs and repay their foreign obligations on time.

Assuming constant situations, when an input price is increased, the most profitable product level is reduced. From the perspective of different schools of economics, the most important factors affecting economic growth are capital and labor, both specialist and non-specialist. In new theories of growth, the energy factor has also entered the model but its importance is not the same in different models. Some ecological economics believe that energy is a major factor and the only factor involved in production, and labor and capital are mediating factors that require energy to be employed. On the other hand, neo-classical economists believe that energy is not an important factor in economic growth and by its impact on labor and capital effect economic growth indirectly. Obviously, if energy is a production input, increasing its price leads to increase in production costs, product prices and decline in employment. Increasing oil price also affects the demand side of the economy that can be seen in exporting countries. The shocks of oil price increase result in increase in exchange earnings and thereby imports. In these countries, depending on the imports of capital or consumer goods, different influences are expected. Economics experts do not consider the shocks influenced by falling or even rising oil price in favor of oil exporting countries. Affected by oil price decrease, often governments are forced to apply more restrictions on imports of goods and services in order to meet the country's essential needs and repay the foreign obligations punctually through foreign currency savings. Considering the fact that in Iran, imports of capital goods and raw materials required by manufacturing sectors constitute more than 80 percent of total imports, restrictions on imports may have adverse effects on the country's manufacturing sector. The inevitable consequence of such a situation is the collapse of the country's industry and rising unemployment in the society.

3. LITERATURE REVIEW

Although plenty of studies and investigations have been carried out on the importance of manufacturing industries and the impact of business, economic and financial fluctuations on them, no study has been

found in the literature on the main objective of this research, which is the effects of exchange rate and oil price shocks (both) on production of manufacturing industries. The aim of this study is fill this gap. However there are many studies not relevant to the subject directly, but they are a great help to the advancement of the current investigation. Some of these studies are mentioned as follows.

Among the studies evaluated the impact of exchange rate shocks on economic growth, the following papers can be mentioned:

Bodnar (1993) examined industry-level exchange rate exposures for Canada, Japan, and the USA. He modeled exposure as a function of industry characteristics. His results show the relation between exposure and industry characteristics is broadly consistent with economic theory, for all three countries.

Griffin and Stulz (2001) investigated the economic significance of exchange rate and industry shocks for industries across the world. They focused on stock market valuation and not on economic activity. The results of their study indicate the industry effects are more important than exchange rate effects. In other words, they found exchange rate shocks have almost negligible impact on the value of industries across the world, it could be that the stock markets fails in taking exchange rate shocks into account, so that exchange rate are important but their impact is irrationally ignored by the stock market.

Sanginabadi and Heidari (2012) investigated the effects of exchange rate volatilities on economic growth of Iran over the period (1988:Q1_2007:Q4). They used the Autoregressive Distributed Lag (ARDL) bounds test approach to level relationship. Their results show a significant relationship between Iranian growth volume and real exchange rate volatility. The long- run results of ARDL model show that the effect of exchange rate volatility on economic growth is negative.

Grossmann *et al.* (2014) employed a panel vector autoregressive model (PVAR) to study the dynamics of the overall exchange rate volatility. PVAR estimation results, based on panel data for 29 economies, are used in simulating impulse response functions. They found the feedback effects from exchange rate volatility to macroeconomic and financial variables are much stronger for developing countries relative to developed economies.

Among the studies evaluated the impact of oil price shocks on economic growth, the following papers can be mentioned:

Berument and Ceylan (2005) examined the impact of oil price shocks on the economic growth of the selected MENA countries that are either net oil- exporter or net oil- importer. By using VAR model and impulse response function, they found oil price shock have significantly affected the output growth of all selected countries.

Lee and Ni (2002) analyzed the effects of oil price shocks on demand and supply in various industries. They used impulse response function to do this matter. Their results indicate that for industries that have a large cost share of oil, such as petroleum refinery and industrial chemicals, oil price shocks mainly reduce supply. In contrast, for many other industries, with the automobile industry being a particularly important example, oil price shocks mainly reduce demand.

Anshasy *et al.* (2005) examined the effects of oil price shocks on Venezuela's economic performance over 1950 to 2001. They found two long- run relations consistent with economic growth and oil price shocks. Furthermore, they found that this relationship is important not only for the long run performance but also for short-term actuations. In the similar research, Hamilton (2003) asserted that Oil price increases

are much more important than oil price decreases, and increases have significantly less predictive content if they simply correct earlier decreases.

Elder and Serletis(2011) and Rahman and Serletis (2011) investigated the effect of oil price volatility on US economic activities within the auto regressive system framework. The results of these two studies have shown that oil price fluctuations lead to a reduction in the average growth rate of economic activities.

Asgari (2013) investigated the long term relationship between oil price and economic growth in Iran for the period starting from1971 to 2007. By employing Johansen-Jusilius cointegration, the results of his study show increasing price of crude oil in Iran as an oil- exporting country, has a positive and significant effect on economic growth.

Aye *et al.* (2014) investigated the effect of oil price uncertainty on the South African manufacturing production using monthly observations covering the period 1974 to 2012. They quantified the responses of manufacturing production to positive and negative oil price shocks. Their results show that oil price uncertainty negatively and significantly impacts on South Africa's manufacturing production. They also found that the responses of manufacturing production to positive and negative shocks are asymmetric.

Aliyu (2009) evaluated the impact of oil price shock and real exchange rate volatility on real economic growth in Nigeria on the basis of quarterly data from 1986 to 2007. The empirical analysis starts by analyzing the time series properties of the data which is followed by examining the nature of causality among the variables. His Findings show that oil price shock and appreciation in the level of exchange rate exert positive impact on real economic growth in Nigeria.

4. DATA AND METHODOLOGY

The aim of this study is to investigate the impact of oil price shocks and exchange rate volatilities as well as three other effective variables (import of intermediate and capital goods, labor wage and resource cost) on manufacturing industries' products in Iran. The sample period runs from 1994 to 2013. The data for value added of industries and exchange rate have been obtained from Economic Time Series Database of Central Bank of Iran (tsd.cbi.ir). The data of crude oil price (U.S. dollar/BBL) has been obtained from Organization of the Petroleum Exporting Countries' (OPEC) official website and the data of import of intermediate and capital goods, labor wage and resource cost have been extracted from Iranian Statistic Department.All data transformed into logs.

The estimated model can be expressed in the equations 1 and 2:

$$VA = f(OP, EXR, RC, LW, IIC) \tag{1}$$

$$LnVA_{it} = \beta_0 + \beta_1 LnVA_{it-1} + \beta_2 LnOP_{it-1} + \beta_3 LnEXR_{it-1} + \beta_4 LnRC_{it-1} + \beta_5 LnLW_{it-1} + \beta_6 LnIIC_{it-1} + \varepsilon_{it} \tag{2}$$

where $LnVA_t$ is value added of industries, $LnOP_t$ is oil price, $LnEXR_t$ is exchange rate, $LnRC_t$ is resource cost, $LnLW_t$ is labor wage, $LnIIC_t$ is import of intermediate and capital goods, β_0 is the constant parameter and ε_t is the error term.

In studying the behavior of multivariate time series, it is necessary to notice the interaction of these variables in a simultaneous equations model System. If equations of a structural pattern include the lagged

variables, it is called a dynamic simultaneous equation model. In such a model, some variables are considered endogenous and some are exogenous or predetermined (exogenous plus lagged endogenous). Structural equation modeling approach of time series applies economic theories to model the relationship between variables. The heaviest criticism of structural patterns is the invalid constraints (such as zero constraints) imposed on the model parameters in order to reach identification. In fact, economic theories do not provide information on the short-term parameters or the model dynamics. Usually, theories define static or long-term relationships between variables.

Sims (1980) believes that the classification of variables into endogenous and exogenous is arbitrary and unacceptable. This type of classification does not include the feedback among the variables, and leads to inaccurate estimate of coefficients. The lack of the correct specification of dynamic pattern in the traditional approach may lead to poor predictions and rejection of economic theories. These problems have prompted economists to use the non-structural approach to model the relationships between several time series variables. One of these approaches is the VAR approach that it is employed in this study.

Using the VAR models is valuable due to employment of fewer variables compared to other econometric models. These simply made models do not require prior knowledge about the causal relationships between variables. In addition, VAR models could be of use in many cases which predicting a time series using structural models is impossible or difficult. In general, the VAR models provide better results when using dynamic data structure in analyzing the dynamic relationships betweenvariables. So the specification of short-term structural relationships or structural knowledge of causal relationships among the variables is not required in these models. The use of the VAR models is inevitable, especially when there is no detailed information of how the real world process or the determinants of model variables work. The mathematical form of a two-variable VAR system is as follows:

$$y_{1,t} = c_1 + A_{1,1}y_{1,t-1} + A_{1,2}y_{2,t-1} + \varepsilon_{1,t} \tag{3}$$

$$y_{2,t} = c_2 + A_{2,1}y_{1,t-1} + A_{2,2}y_{2,t-1} + \varepsilon_{2,t} \tag{4}$$

where: y denotes the pauses of the model variablesand A_{ij} is the matrix of the model coefficients. ε_{ij} may be simultaneously correlated, but with amounts of its lag and the right-hand side variables of equations are uncorrelated.

This study is classified based on data from industry for 20 years. Using panel data with fixed effects provides a perfect solution for misdiagnosis of regression, particularly when the effects of time are dominated by the special effects of each country. The following panel regression model is considered in the form of equation 5.

$$Y_{it} = \beta_{1,t} + \beta_2 X_{i,t} + \varepsilon_{i,t}, \tag{5}$$

In the above equation, i represents the ith cross-sectional unit and t represents the tth time period. It is assumed that there are a maximum of cross-sectional units and time periods.

One of the most important features reflected by these models with high accuracy is the effect of various shocks and fluctuations on one variable, which been carried out by variance decomposition and impulse response function.

Variance decomposition by partitioning the variance of forecast error of a certain variable (e.g. value added of industries in this study) into proportion attributable to shocks in each variable in the system, including its own; can provide an indication of these relativities. A variable that is optimally forecast from its own lagged values will have all its forecast error variance accounted for by its own disturbances (Sims, 1982).

Impulse response function essentially maps out the dynamic response path of a variable (e.g. oil price in this study) due to a one-period standard deviation shock to another variable (e.g. value added of industries in this study).

5. MODEL ESTIMATION AND ANALYSIS

The aim of this study is to investigate the impact of oil prices shocks and exchange rate shocks along with three other effective variables on industrial production of the manufacturing industries in Iran. Before estimating the model, the stationarity of variables needs to be investigated. Nonstationarity of variables will lead to invalid estimation of coefficients and spurious regression. In this part, the Levin, Lin and Chu unit-root test is employed to study the stationarity of the log of the research variables. The results of this test are shown in Table 1.

Table 1
Results of the Unit Root Test

Varible	*Without Trend*	*With Trend*
Value Added	-4.3658	-3.0628*
Wage	-4.7642	-2.4370*
Exchange Rate	-4.7188	-2.4017*
Resources Cost	-9.7103	-3.5884*
import of intermediate and capital goods	-16.6013	-7.9837*
Oil Price	-16.6572	-9.7750*

Note: * indicates rejection of null hypothesis of no co-integration at 5%.
Source: Authors' Calculations

As the results in Table 1 and the stationarity test indicate, the logs of the variables are made stationary by eliminating the time trend and there is no need for subtraction.

In this study, to determine the appropriate number of lags in the VAR model, first, the criteria of the selection of the order of the VAR, i.e. the Akaike (AIC), Likelihood Ratio (LL) and Schwartz-Bayesian (SBC) were applied. Then, to make sure, as common in experimental tasks, the significance of the occurrence of the variables' various lags was investigated using the F statistic. Based on the above criteria, the occurrence of two lags in the model is confirmed.

In using a VAR model which involves the lags of all the variables of the model, the first thing we need to do is to make sure of the significance of the determined model with regard to the number of the lags selected. This is so important that if the number of the lags is not set correctly, the result will just be attaining an invalid model.

Therefore, it is necessary in using any VAR technique to first test the significance of the model. As the results of the model estimation summarized in Table 1 show, the first lag of the variables used is significant. This is obvious from the F test values, as well as the R-sq. The summary of the results of the model estimation is presented in Table 2. The values of F statistic and R-sq for the first equation (Main) were respectively 383.8 and 0.98 that suggest an appropriate specification of the model. For other equations, too, these values indicate an appropriate and acceptable level of specification.

After making sure of the significance of the chosen model, the significance of the number of the selected lags is investigated. The criterion in this regard is for all calculated roots to be less than one. That is, if all the resulted roots lie inside the unit circle, the calculated VAR model is significant. In this regard, as can be concluded from Table 3, the values of the roots confirm the realization of the fact that the lags are significant.

After making sure of the significance of the VAR model and the lagged coefficients, computing coefficients could be examined. Since this model merely expresses the relationship between the variables available in the system and yet there is no economic justification for it, the results of the analysis of the coefficients are ignored and only its main applications in the analysis of the behavior of the variables and the interactions among them are discussed. These applications are known as "the short-term dynamic" and will be studied in the form of the two functions: the impulse response function (IRF) and the variance decomposition (VD).

Table 2
Results of the VAR Estimation

Equation	*Parms*	*RMSE*	*R-sq*	*F*	*P>F*
Value Added	30	0.89	0.98	383.82	0
Wage	30	0.05	0.99	83.46	0
Oil Price	30	0.07	0.93	281.87	0
Exchange Rate	30	0.1	0.91	199.91	0
import of intermediate and capital goods	30	0.63	0.97	751.1	0
Resources Cost	30	0.04	0.95	371.27	0

Source: Authors' Calculations

Impulse Response Functions

As mentioned earlier, impulse response functions are the tools through which the dynamic movements of variables can be identified. In this function, the impact of a standard deviation shock in each of the selected system variables on all of the variables is evaluated. In chart 1, the results for the impact of a standard deviation shock in all system variables on the value added of industries is presented. This has been done to allow probe into how the industries' production varies according to the commercial and economic shocks as well as other variables of the model.

In chart 1, the vertical axis represents the effect of the shock in the research variables, including capital, raw materials, oil prices, exchange rate and wage on the value-added of industries and the horizontal axis shows the impact of time of the shock. Given that the data used are of annual type, the impact of time of the shock on the horizontal axis is, therefore, interpreted on an annual basis.

Table 3
Results of determination VAR lag length criteria

Lag	*Equation*	*Coef.*	*Std. Err.*	*t*	*P>|t|*	*[95% Conf. Interval]*	
First	Value Added	0.55	0.07	8.02	0.00	0.41	0.68
First	Wage	0.23	0.11	1.98	0.04	0.02	0.47
First	Oil Price	-0.23	0.07	-3.13	0.00	-0.12	-0.17
First	Exchange Rate	0.94	0.04	2.3	0.02	0.01	0.17
First	import of intermediate and capital goods	-0.22	0.09	2.16	0.02	0.19	-0/2
First	Resources Cost	-0.89	0.04	-2.31	0.19	-0.22	-0.04
Second	Value Added	0.93	0.05	1.88	0.05	-0.02	0.21
Second	Wage	-0.73	0/04	-1.71	0.05	-0.31	-0.16
Second	Oil Price	0.04	0.07	0.57	0.57	-0.10	0.18
Second	Exchange Rate	0.03	0.05	0.53	0.59	-0.08	0.13
Second	import of intermediate and capital goods	-0.07	0.04	-1.84	0/52	-0.09	-0.22
Second	Resources Cost	-0.11	0.08	-1.98	0.05	-0.28	-0.06

Source: Authors' Calculations

As the chart 1, the impact of shock from all these variables on the value added of industries is significant and determining in the short term (2-year period). Yet, the only effective shock in the long term is the shock from the oil prices and exchange rates while other shocks have short-term impact.

As it is observed, the exchange rate shock affects production. Although its initial severity decreases after two years (lower slope), the trend of its effect is stable and does not disappear. It can imply that with increase in the exchange rate, imports of intermediate and capital goods will decline and a negative impact is left on the value added of industries.

The impact of the long-term oil price shock, is almost steadily ascending, so that even in the long term (8 years), recovery from its effects is not expected. This probably implies the existence of long-term direct and indirect relationships between oil prices and the growth of industrial production in Iran indicating that with growth in the oil prices and currency revenues, the importation of intermediate and capital goods increases and this in turn expands domestic production.

Also, the results of examining the impulse response function of the shocks from other variables on the value added of industries reflect and confirm the above result. The positive shock from the capital and technology (import of intermediate and capital goods) has a positive effect on industrial production within 6 annual courses, and after 6 years, the shock's effect suffers a decline and disappears.

The shock from raw material prices has a downtrend at first, and then takes an uptrend along the horizontal axis.The effect of this shock, too, completely disappears in the long term after 8 years.

Similarly, the impact of labor costs shock has an uptrend in the beginning and then takes a downtrend along the horizontal axis. It is very likely that after some time courses (maximum 15 years), its effect will completely disappear.

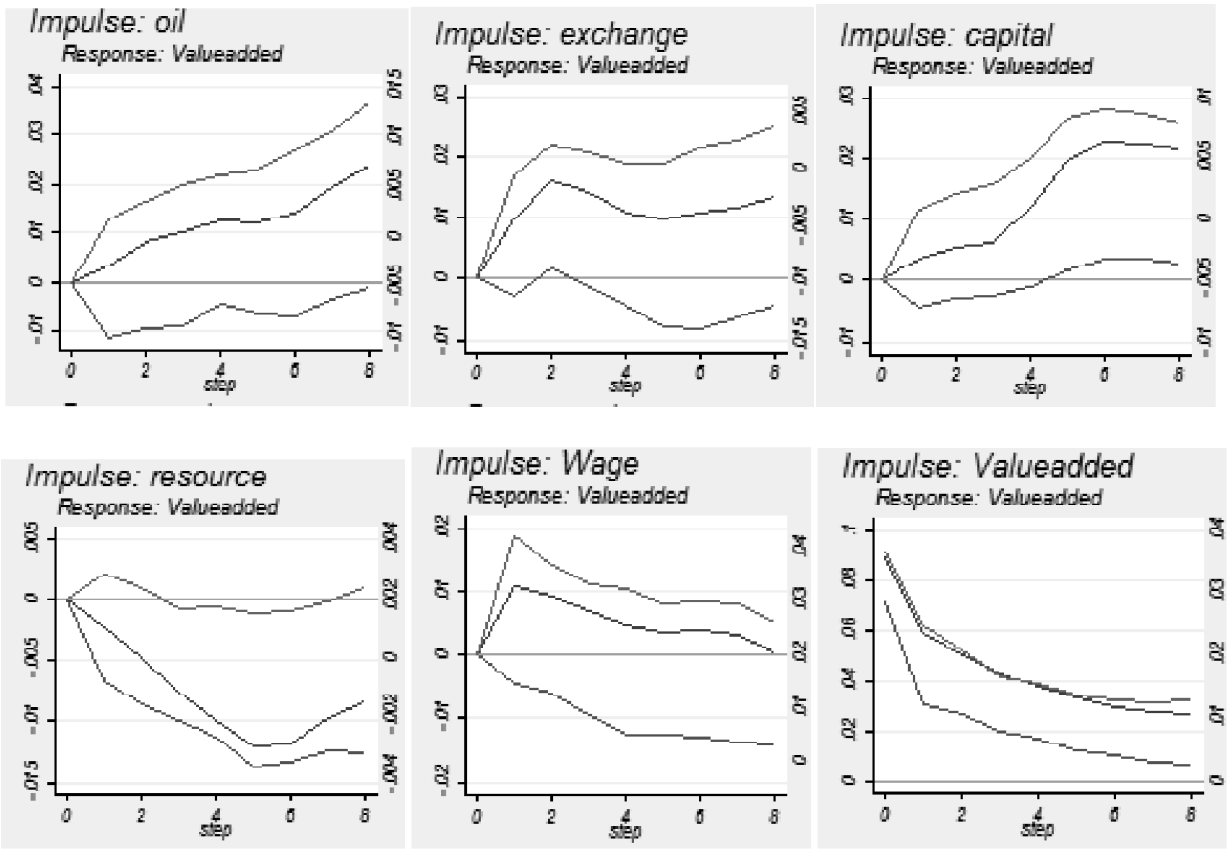

Chart 1: Results of the Impulse Response Functions

Source: Authors' Calculations

Finally, the effect of value added shock on its own is also a short-term declining shock. Although it has the largest effect on the industrial production in the short run, it gradually loses its effect and will be neutral over time, hence with no effect in the long run, so that after eight periods, it will not have any significant impact in effect.

As shown in the attached table, the shock imposed by each of the variables discussed takes a downtrend after two annual courses and gradually loses effect. Ultimately, it leaves an effect at the level of production variable or value added of industries. The only variable that shows a continuous and long-lasting effect is the oil prices. As illustrated in the graph of the impulse response function and the table associated with it, the shock caused by the increase in the oil prices almost steadily results in the moderate increase in production or the value added of industries.

Variance Decomposition Function

In this method, the share of shock exerted on different variables of the pattern is specified in the variance of the prediction error of a variable in the short and long-term. For example, if a variable is optimally predictable based on its lagged values, the prediction error variance is solely explained on the basis of the impulses exerted on it. By decomposing the prediction error variance, the contribution of each variable's

fluctuations is divided in response to the impulses exerted on the variables of the model, thus we will be able to longitudinally measure the share of each variable in the changes of other variables. This function, like the impulse reaction function is calculated usingVAR model and is applicable to the analysis of short-term dynamics. In this function, the prediction error for each of the selected variables is considered and then the share of all the system variables is accounted in its justification.

Variance decomposition is an important tool for examining the sources of fluctuations in a particular variable. By decomposing the prediction error variance, the effect of each variable on other variables can be measured longitudinally. In general, it must be said that variance decomposition besides immediate reaction, which is sometimes called momentum accounting, is considered an important method for investigating the relationship between variables. The results of variance decomposition are shown in Table 4. These results indicate the percentage of participation of each of the impulses ε_{2t}, ε_{3t} | ε_{4t} | ε_{5t} | ε_{6t} in explaining the variables' changes. Given that the error in every year is calculated on the basis of a year ago, it consistently increases during the course under investigation. The source of this error is a change in the current values and future impulses.

Table 4
Results of Variance Decomposition

Time Period	*Wage*	*Import*	*Resources Cost*	*Oil Price*	*Exchange Rate*	*Value Added*
1	0	0	0	0	0	0
2	0.114853	0.1074163	0.0434736	0.0991168	0.1211452	0.4798707
3	0.1133598	0.1296343	0.0420022	0.1153707	0.1241105	0.4221927
4	0.1102561	0.1208224	0.0417454	0.1278308	0.1331089	0.4018377

Source: Authors' Calculations

According to Table 4 in which the results of variance decomposition for the value added of industries are shown, the most important factor and variable in determining the value added changes is the lags of the variable itself.The effect of these lags was 47% in the second course, 42% in the third course and 40% in the fourth course. That's an average of about 45%. So it means that about half of the changes are due to the lags of the variable itself.Moreover, in the first period, 11% of these changes were related to wages, 10% to import, 4% to raw resources, 9% to oil prices and 12% to the exchange rate. In the fourth period, exchange rate shocks and oil price shocks have the greatest impact on the production of Iranian manufacturing industries, after the lags of value added.

According to the results presented in chart 2(a) in the Appendices, that concerns the value added changes, it can be seen in the short run, production or the value added of industries are often affected by their own lags and this implies that the future values of this variable, too, can be predicted with high-precision.

In the Chart 2(b) in Appendices, it is seen that the price of raw materials especially in the early years is mostly affected by the price of the immediate materials and technology and, over time, the effect of the exchange rates and oil prices becomes larger. In addition, this diagram illustrates that the effect of wages of the workforce on the price changes of the raw materials is little and ignorable.

In the Chart 2(c) in Appendices, as can be seen, the price of oil shows a behavior similar to that of the exchange rate and its changes can, to a large extent, be attributed to its own lags. In the same vein and with regard to the economic fundamentals, we expect that the impulses and changes of the exchange rates and oil prices are not influenced by internal variables, but are often affected by international macroeconomic issues.

In the Chart 2(d) in Appendices, it is observed that none of the variables has a prominent role in determining the exchange rate changes and here, too, the exchange rate is affected to a large extent by its lags or in other words its previous values.

In the Chart 2(e) in Appendices, as it is observable, the oil prices and the exchange rate have the most effect on the changes in the price of the capital and technology inside the country. And this is in line with both the theoretical foundations and the logic and our expectations because the venture capital and the technology utilized by industries are often among the imported items and hold a direct relationship with the exchange rate. Moreover, changes in the oil prices, on the one hand, affects the price of the imported goods by affecting global prices, and, on the other hand, by impacting the state's budget, causes changes in the terms of granting loans and the government's support of industries with the aim of supplying the necessary capital and technology.

In the Chart 2(f) in Appendices, the two variables production of industries and wage play the greatest role in explaining the changes and impulses of the wages of the workforce. The role of wage lags in determining and explaining the current wages is the indicator of the concept of adhesion and flexibility of wages in reaction to negative shocks. And the role of industrial production in labor force wages is also quite obvious, that is in economic prosperity and improved economical conditions, labor wages increase to some extent.

As can be observed, the results of the variance decomposition also yield outcome confirming the reaction function. Thus, changes in the real value added of industries accounted for the highest share in justifying the variance error of this variable, though, after two courses, this effect start decreasing and instead, the share of oil prices and exchange rate in explaining long-term variations of production increases.

6. CONCLUDING REMARKS

This study evaluates the effect of oil price shocks and exchange rate volatilities on production of manufacturing industries in Iran. In this research, Vector Autoregressive (VAR) Model is applied for the period starting from 1994 to 2013. Value Added of industries is used as a dependent variable, while exchange rate, oil price, import of intermediate and capital goods, labor wage and resource cost as well as its own (value added of industries) are considered as independent variables. Levin, Lin and Chu unit-root test is employed to study the stationarity of the log of the variables. The results of this test show the logs of the variables are made stationary by eliminating the time trend and there is no need for subtraction.

The results of examining the impulse response function indicates the exchange rate shocks decline imports of intermediate imports and therefore a negative impact is left on the value added of industries, while the impact of the long-term oil price shock is almost steadily ascending. This probably implies the existence of long-term direct and indirect relationships between oil prices and the growth of industrial production in Iran indicating that with growth in the oil prices and currency revenues, the importation of intermediate and capital goods increases and this in turn expands domestic production.

The results of variance decomposition show among the variables exchange rate and oil price shocks have the greatest impact on the production of Iranian manufacturing industries in the long-run, after the lags of value added.

From a policy perspective and based on the results of impulse response function this study suggests due to positive impact of oil price shocks on production, Iranian government can increase domestic demand and industrial growth by injection of oil revenues to import of intermediate and capital goods. Based on the results of variance decompositionand vital role of crude oil in Iranian economy, this study suggests stimulating and making greater investments in productive sectors that can increase economic growth and employment.Moreover, exchange rate volatilities should be stabilized and controlled by the central bank to lead economy as an export-based industry.

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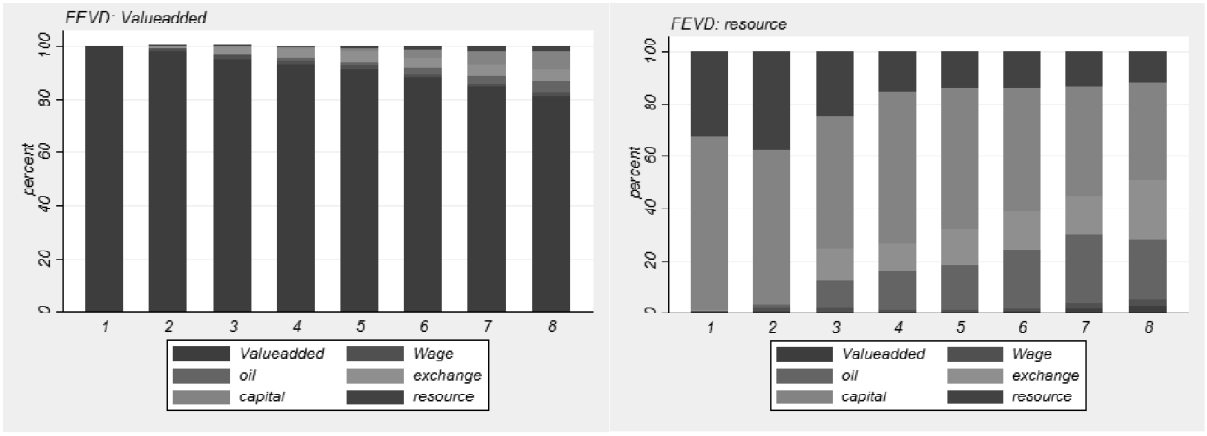
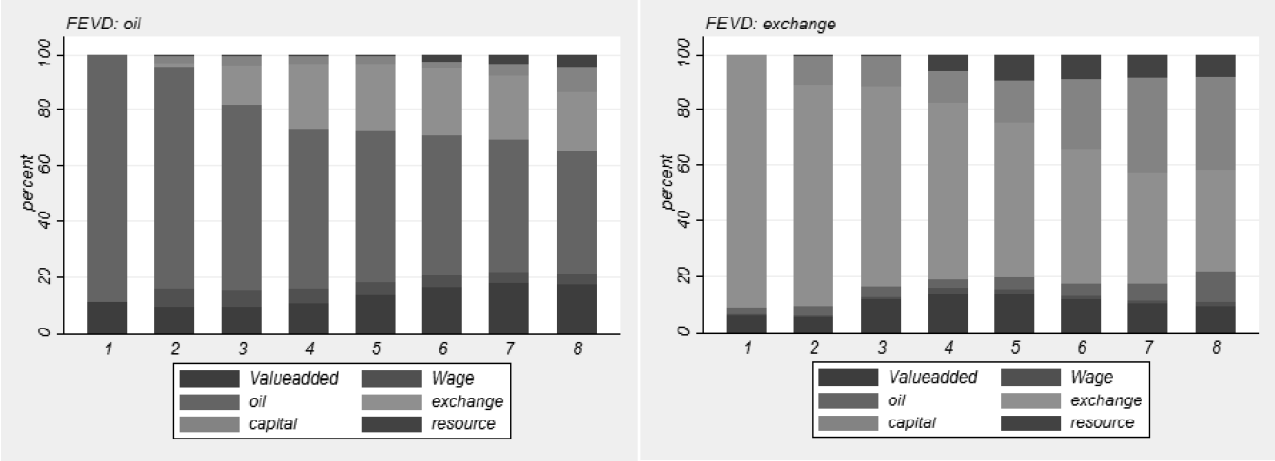
APPENDICES

Chart 2: Results of Variance Decomposition (VD)



(a) VD results for Value Added

(b) VD results for Resource Capital



(c) VD results for Oil Price

(d) VD results for Exchange Rate