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Fiscal Policy Uncertainty and Industrial Investment in Iran*

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Abstract:
Industrial investment in Iran, especially in the wake of sanctions' intensification in the 2010s, decreased significantly. The government implemented fiscal policy which has been associated with uncertainty. In this paper, using a dynamic panel model and generalized method of moments, we examined the effect of fiscal policy uncertainty on investment in 24 industrial groups in Iran over the period 2002-2020. The results indicated that the growth of fiscal level shock, resulted in a low but positive effect on investment directly. However, the coefficient of cross effect between the growth of fiscal level shock and the fiscal policy uncertainty undermined the positive effect on industrial investment. The government has had two effects on industrial investment indirectly through the demand side shock. By creating demand, it has had a positive effect on industrial investment with the cross effect between the growth of the fiscal level shock and industrial sales. However, on the other hand, the growth of the fiscal level shock has been associated with the creation and growth of fiscal policy uncertainty, so that the cross effect between the growth of fiscal policy uncertainty and the growth of industrial sales on industrial investment shows a high negative coefficient. The results of these two effects suggest that due to high uncertainty, the indirect government effect on investment in 24 industrial groups is negative, which happens through the demand-side shock. Moreover, the growth of fiscal policy uncertainty, sanctions, and interest rates, respectively, have had the most adverse effect on investment in 24 industrial groups in Iran.

1. Introduction

During the implementation of six development plans (1989-2022), world oil prices dropped repeatedly and made the fiscal policy shocks and subsequently difficult to achieve the plan's objectives. The share of Industries in GDP also

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fluctuated. Achieving desired economic growth in the development plans required new investment, notably industrial investment, however, the shortage of a foreign exchange led to the instability of fiscal policy due to lower oil prices.
Also, the intensification of financial and economic sanction since 2011 adversely affected the stability of fiscal policy to achieve target investment and growth. The average growth of investment in the fifth development plan has been minus 5.5%. In fact, the growth of gross domestic capital formation in both machinery and building has been negative during the period of the fifth development plan (Mirjalili, 2022, pp.29-37).
Iran's economy trapped in the upper middle income level for more than five decades. Total factor productivity and human capital have the greatest impact on avoiding the middle income trap. To this end, more industrial investment and training are needed. Enhancing investment help avoiding the middle income trap in Iran. By investing in the skills needed to work in the R & D activities and capability, Iran can produce high quality industrial products. With these measures, Iran can mitigate the dependence on oil and escape the middle income trap (Mirjalili and Saadat, 2020, p.10).
As a matter of fact, an issue in the Iran's economy is the low investment in industries, especially in the 2010s, which industrial investment dropped following the tightening of economic sanctions and the drop of oil proceeds. The theorists of economic growth and development consider the creation of a safe and stable environment to be the most important variable affecting investment (Tehrani and Sayah, 2020).
In Iran's economy, the role of the fluctuations of fiscal policy on the low industrial investment is needed to be considered which happens either by low government budget allocation for investment in industry or by private investment.
Our hypothesis is that the uncertainty of the budget balance or the government's budget deficit (fiscal policy uncertainty index) results in the low industrial investment in Iran. As fiscal policy is a powerful instrument to stimulate industrial investment, through this tool, the government plays an important role in influencing industrial investment. The government budget (fiscal policy index) includes government revenues and expenditures. The budget revenues of the government include oil revenue and taxes, and the government expenditures include the capital and current expenditures. Instability and uncertainty in each of these government budget categories (fiscal policy index) affect the behavior of industrial investment through the following channels:
The first channel is the uncertainty of government budget revenues through the impact of oil revenue uncertainty on the industrial investment. As the government budget is highly dependent on the oil revenue, external shocks such as the intensification of economic sanctions since 2012 has led to a decrease in the oil revenue, and left the imbalance budget. Subsequently, the government

budget deficit happened and we have witnessed a decrease in foreign exchange revenues and economic growth (Heydarian et al., 2021). The instability of foreign exchange market in the 2010s and uncertainty in the investment environment, affected industrial investment through this channel. Moreover, the intensification of financial sanctions on Iran resulted in reducing the imports of capital and intermediate goods and disrupted the imports of industrial parts and machinery, investment and production of industrial products in Iran (Heydarian et al., 2023). We considered this aspect in our modeling.

The second channel is the uncertainty of government budget revenues through the impact of uncertainty of tax revenue on the industrial investment. On the government's tax decisions, as shown in Figure (1), there is a correlation between the growth of oil revenue and tax revenue. When the oil revenue has grown, we did not worry about the growth of tax revenue. Figure (1) shows the inverse relationship between the growth of oil revenue and tax revenue in 1974, 1993, and 2010. In Iran's economy when the oil revenue did not grow, we focused on the growth of tax income. In figure (5), the inverse relationship between the growth of oil revenue and tax revenue illustrated for 1994 to 1998, 2004, 2005, 2014.

Therefore, in this way, the uncertainty of oil revenue can lead to the tax reforms (change and fluctuation of tax rates and tax base) and tax uncertainty, which make difficult the profit prediction by industrial investors who pays taxes. In such a situation, due to tax uncertainty, investment is postponed and there will be a decrease in the industrial investment.

According to Hadian and Tahvili (2014), long-term tax fluctuations have had an adverse impact on the investment of the private sector in Iran. Tax reforms can make it difficult for investors to predict relevant variables and thus increase uncertainty, which is known as "tax uncertainty". When taxes are included as a part of investment costs in capital budgeting, we should pay attention to the effect of tax reforms on the behavior of industrial investment.

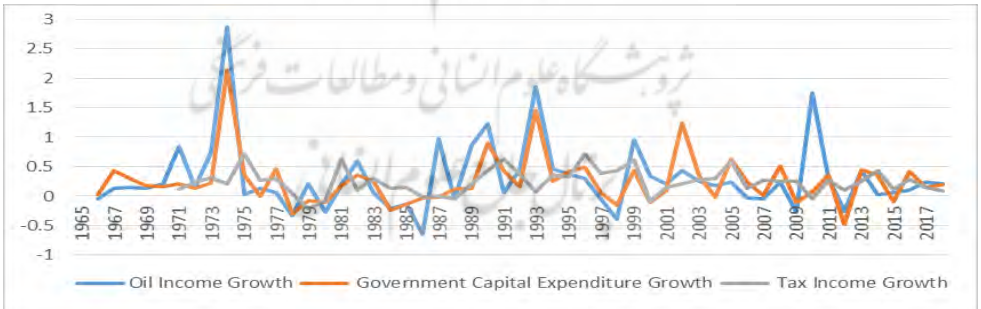


Figure (1): Tax revenue growth, oil revenue growth, and government capital expenditure growth

Source: Calculations of the authors based on the time series data of the Central Bank of Iran, 2021.

The third channel is the uncertainty of government budget expenditures, which happens through the impact of the uncertainty of government expenditures on industrial investment. As illustrated in figures (2) and (3), the trend of government's capital expenditures has fluctuated over the past decades and affected by the volatility of oil revenues. Therefore, the uncertainty of oil revenue over the past decades has led to the instability of the allocation of government's investment budget and uncertainty in the government investment. In fact, by the shock and the intensification of the economic sanctions since 2012, the government's capital expenditures decresed, so that in 2012 it returned to the lowest level of government's capital expenditures during the previous decade, i.e. 2000s.

Furthermore, according to Suri et al. (2011), uncertainty in the share of government consumption expenditures also caused a significant decrease in the economic growth in Iran through the reduction of investment. However, the stable component of government consumption expenditures had a positive effect on investment.

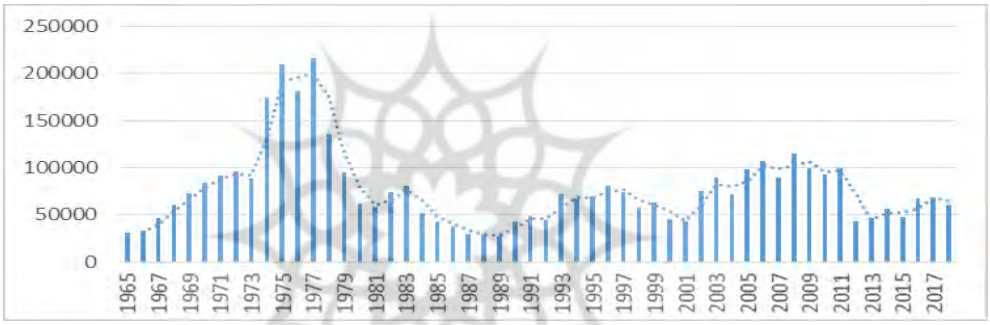


Figure (2): Government capital expenditures at constant prices during 1965-2018 (in billion Rials)

Source: Calculations of the authors based on the time series data of the Central Bank of Iran, 2021.

Many economists and policymakers are convinced that widespread uncertainty may cause an adverse recovery (e.g. IMF, 2012). At the same time, an emerging strand of literature has focused on the measurement and effects of uncertainty, creating different dimensions and channels of uncertainty transmission (Baker et al., 2016).

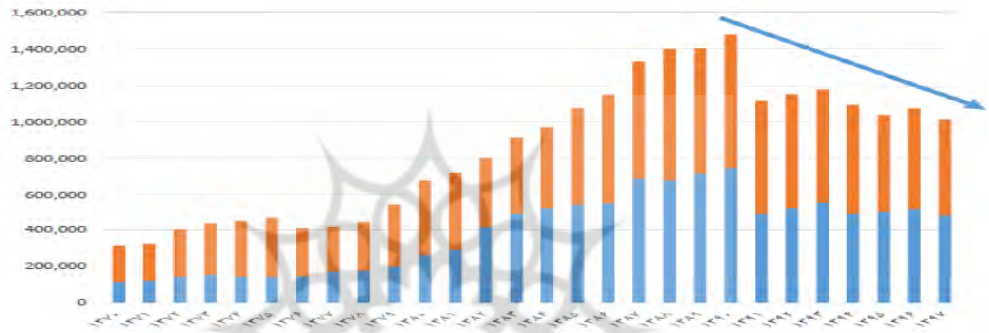
In the uncertainty model of Bloom et al. (2014), in the short term, when the economy faces an uncertainty shock, the effects of fiscal policy on the production are reduced by approximately three quarters. The reason for the ineffectiveness of fiscal policy is that companies postpone their hiring and investment plans in case of increased uncertainty. The adverse effects of fiscal policy uncertainty may happen due to the lower hiring and investment by firms, higher financing costs due to risk primia, and lower consumption expenditures as a result of

precautionary savings (Beckmann and Czudaj, 2020). Therefore, in this paper, we examine the effect of government fiscal policy uncertainty on investment in 24 industrial groups in Iran.

After introduction, in section 2, we analyze the process of industrial investment in Iran. Section 3, discuss the theoretical and emperical literature, and the contribution and distinction of our investigation. Section 4, provides the specified model structure. In section 5, we explain the data sources and section 6 discuss the results and finally, in section 7, we close the paper by conclusions.

2. Industrial investment in Iran

To examine the situation of capital accumulation in Iran's economy, the trend of fixed capital formation is depicted in figure (3).



Note: capital formation in building ❑ capital formation in Machinary ❑

Figure (3): Gross fixed capital formation in plants, equipments and properties at constant prices of 2011 (in billion Rials)

Source: Central Bank of Iran, Economic Report and Balance Sheet, 2020.

Gross fixed capital formation in 2019 and 2020, based on the Central Bank's time series, were 976,690 and 1,001,313 billion rials, respectively. According to figure (3), by the tightening of sanctions since 2011, gross fixed capital formation indicated a diminishing trend. Therefore, over the period of a decade from 2011 to 2020, on average, about 4.44% of fixed capital formation reduced annually.

However, another reason for decreasing industrial investment goes back to 2000s during which net investments get out of the industry sector and have gone to the services i.e. to real estate and other services. According to figure (3), the share of industry in the total net investment was less than 9% on average during 2004-2010.

Since 2011, in the wake of intensification of sanctions, the net investment of the industry has been negative. In 2017 and 2018, there was a large immigration of

investment from industry sector to service sector -mainly to real estate and other services. Due to high volatility, these figures are presented in Table (1). According to Table (1), the industry sector has suffered the most compared to other sectors, and the share of net investment in industry has dropped.

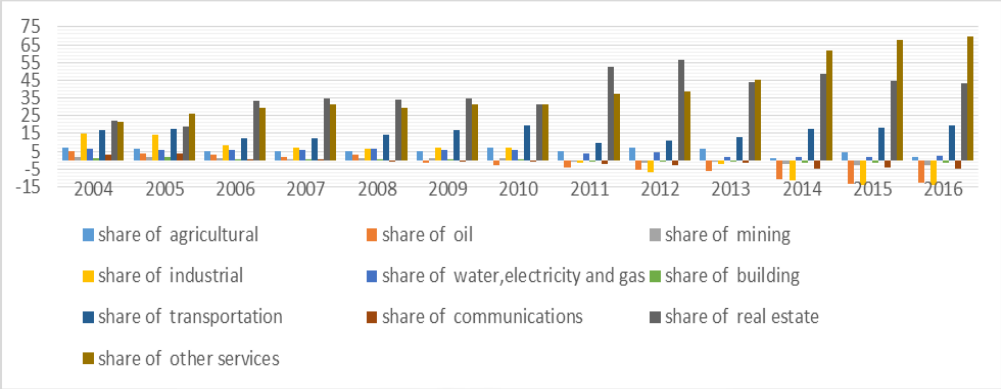


Figure (4): Share of net investment of economic sectors to total net investment (at constant price in 2011) (in percent)

Source: Authors' calculations based on the Central Bank's net capital stock statistics, 2020.

Table (1):Share of net investment of economic sectors to total net investment (2017-2018)

year	share of agricultural	share of oil	share of mining	share of industrial	share of water,electricity and gas	share of building	share of transportation	share of communications	share of real estate	share of other services
2017	-3.48	-67.98	-22.03	-131.11	-0.25	-12.73	14.59	-28.48	106.37	245.12
2018	-17.89	-79.51	-29.53	-192.6	-6.88	-18.21	-27.88	-37.53	62.59	247.52

Source: Authors' calculations based on the Central Bank's net capital stock statistics, 2020.

The share of industry sector on average during 2004-2010 was less than 9% of the total net investment, and despite the intensification of economic sanctions since 2012 and net negative investments in the 2010s, as illustrated in figure (5), the industry sector has maintained a share of over 20% of GDP over the period 2004 to 2020. The share of industrial group in GDP is illustrated in figure (5).

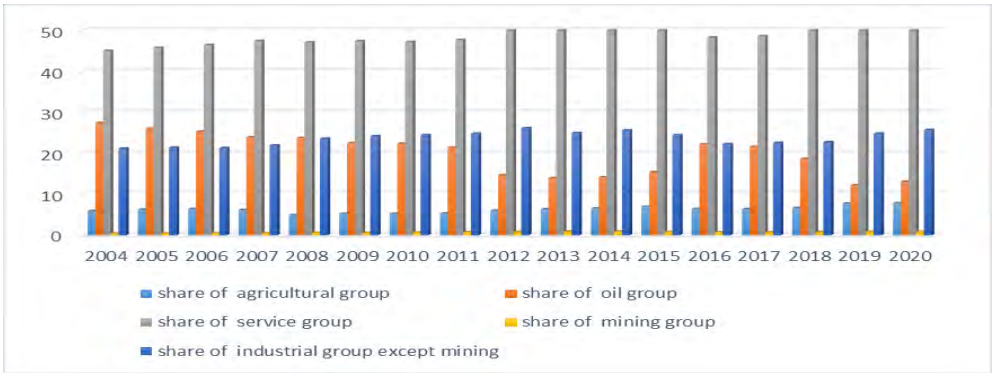


Figure (5): share of economic activities in GDP at constant prices of 2011(in percent)

Source: calculations of the authors based on the national accounts statistics of the Central Bank of Iran.

After examining the low relative share of investment in the industry sector, the situation of industry subsectors need to be scrutinized, because investment in industry sub-sectors in Iran has an asymmetric distribution. According to figure (6), many manufacturing industries had less than one percent of the total investment in the industry sector. Investment in Iran's industry sector is focused on basic metal and non-metallic mineral industries which are based on mineral reserves.

Mirjalili and Komijani (2001) examined the mechanism of strategic trade and industrial policy for the promotion of industrial production and exports in Iran. The results suggested three advantageous industries in Iran to promote industrial production and exports which are: basic metals, non-metallic mineral products and chemical materials and products respectively (Mirjalili and Komijani, 2001, pp.31-66)

Mirjalili et al. (2009) explored industrial priorities in the provincial level to specify the priorities for industrial investment. They employed a synthesis of factor analysis and numerical taxonomy for two digit ISIC codes to derive industrial priorities for investment. The results indicated the priorities of investment in industries as follows: non-metallic mineral products and textiles. However, the production of basic metals and chemicals had a rapid growth, but have neglected in industrial investment at the provintial level and need to be considered in the industrial development (Mirjallili et al. 2009).

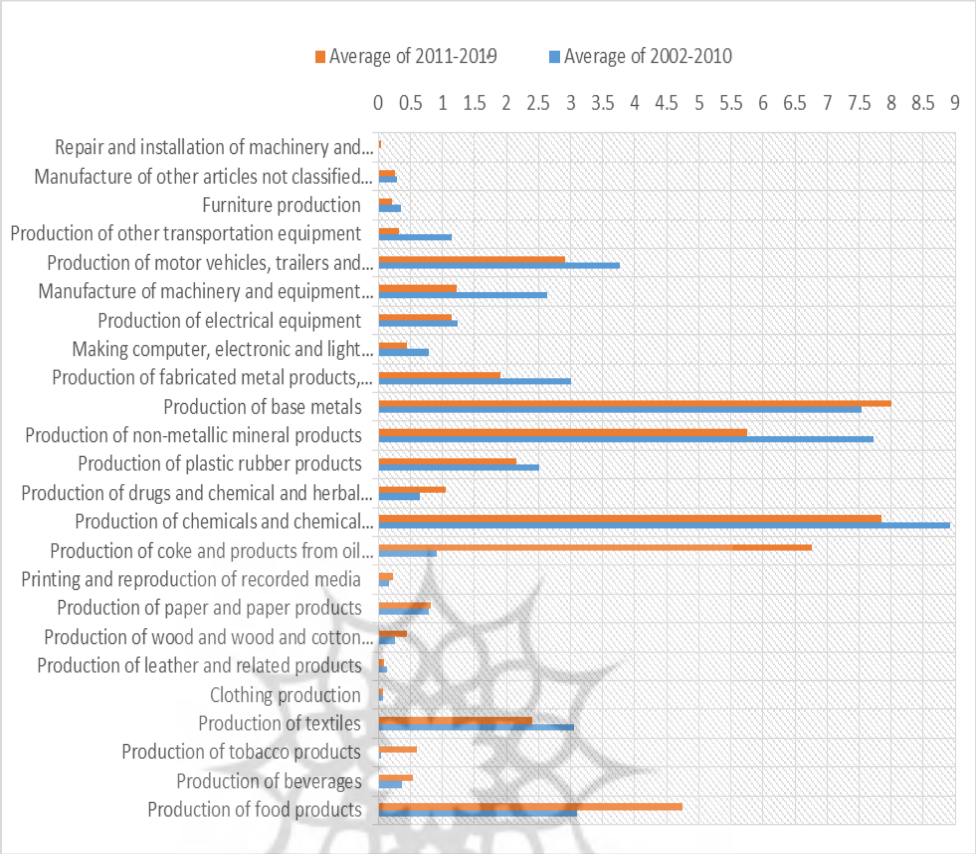


Figure (6): The average share of industries in total fixed capital formation; enterprises with 10 employees and more according to ISIC two-digit codes, in the 2000s and 2010s (in percent)

Source: Calculations of the authors based on the results of data for industrial enterprises with 10 or more employees, Iran Statistical Center, 2021.

Therefore, the investment trend in the industry sector and its sub-sectors suggests that the most investments happend in the production of basic metals, chemical products and non-metallic mineral products. Over the period of 2002 to 2019 this trend of investment and production has continued. The identical results indicated in Mirjalili and Komijani(2001).

3. Literature review

In economics, uncertainty is different from risk. Risk is the probability of achieving the expected cash flow (or expected rate of return). In risk, the outcome is unknown, however, the probability distribution governing that

outcome is known. In uncertainty, we face with an uncertain outcome and an uncertain probability distribution (de Groot and Thurik, 2018).

Uncertainty is due to the lack of knowledge and information. The basic premise of neoclassical economics is that investors behave rationally and use their experience and theoretical knowledge in the decision-making process, however, when the future is uncertain and there is insufficient information to guide investors, those who invest in such circumstances behave irrational such as the herding behavior that happens after an unusual event in the capital market (Jackson and Orr, 2019).

Investors have to make decisions under uncertainty, and investments always include uncertainty element. The level of uncertainty will vary and Hargitay and Yu (1993) classified this as a "spectrum of uncertainty" where the lowest level of uncertainty is absolute certainty and indicates risk-free cash flows. The highest level of risk for cash flows is perfect uncertainty, and is aligned with what economists call knightian uncertainty.

Investors and businessmen, and those sensitive to policy shifts, become concerned and anxious about the changing economic landscape, especially if some policy changes are considered potentially reversible. This encourages behavior that Rodrik (1991) describes as exemplifying rational behavior, such as delaying spending, investing, and expanding activities to remove much of the uncertainty remaining after a policy shift. The delay in private investment caused by high policy uncertainty can be severe enough to moderate and reduce investment growth, and then cease economic growth (Jackson and Orr, 2019).

Justiniano and Giorgio (2008) indicated that the reduction of volatility in US investment shocks is the main reason for the reduction of GDP growth volatility during the two decades leading to 2004. According to Roderick (1991), in addition to the effects at individual and enterprise levels, wider adverse effects may be felt on the levels of import-export, exchange rate, savings and even socio-political stability. The longer, more controversial or irregular the policy-making process, the greater the uncertainty and its effects (Bloom, 2009).

According to Keynes, capital expenditure depends on the expectation of investment profitability and interest rate. Expectations about the future profitability of the investment are more important than the interest rate. Keynes calls expected profits under the title of marginal efficiency of capital. Making investment decision is an issue, because the equipments and buildings that are purchased, now produce commodities that will be sold in the uncertain future. Expectations about the future demand and costs, need many calculations, associated with fear and hope, as well as complicated facts that affect these investment decisions.

The uncertainty of firms about the future return of investment decisions is at the core of Keynes' explanation of business cycles. In Keynes' analysis, instability

(extreme fluctuations) in the marginal efficiency of capital creates shocks that are transmitted to real aggregate demand, that is, the main source of economic fluctuations in the product market, (IS) or caused by the real economy. Through the multiplication factor, any disturbance in capital expenditure will affect on aggregate product.

In the early Keynesian theories of business cycles developed by Harrod, Samuelson and Hicks, the interplay of the multiplier and the acceleration mechanism play an important role. There was an expansion of theoretical background and, empirical studies on uncertainty and investment.

In economic theory, uncertainty shocks can be important in explaining economic fluctuations: firms may react to an increasingly uncertain environment by adjusting their workforce and reducing investment, financial intermediaries may be more reluctant to lend, and households may increase their willingness to save (Bloom, 2014). The existing literature has introduced several measures of uncertainty (Bloom, 2014). The economic policy uncertainty index by Baker et al. (2016) is a combination of three key words, uncertainty, policy and economy, which encompass the uncertainty of the fiscal and monetary policies (Baker et al., 2016).

In this paper, we focus on the uncertainty of fiscal policy. Fiscal policy may be a source of uncertainty for economic activists for several reasons (Anzuini and Rossi, 2020). Fiscal policy indicator, that is, the government budget balance includes tax decisions and government expenditures that directly affect firms. The increase in fiscal policy uncertainty affects the real sector of the economy. In addition, the Ricardian equivalence propositon directly argues that uncertainty about the maturity and other characteristics of the debt structure will increase the discretionary savings of households (Barro, 1996), which will affect investment through this channel (Beckmann and Czudaj, 2020).

In the theoretical discussions of Gomes et al. (2012), it is stated that in countries where public finance resources are unstable, households and firms may expect changes in tax rates or future government spending plans (and therefore expect changes in important variables such as net profit, disposable income, etc.), but they may not be sure of the timing as well as the size of those changes.

Even in countries with stable public finance, if the policy process is polarized and fiscal frameworks are weak, fiscal policy uncertainty may rise (Kontopoulos and Perotti, 2002).

In these countries, policy uncertainty translates into fiscal policy uncertainty, because changes in government and changes in political coalitions in the government can lead to unpredictable or irregular changes in fiscal policy. Even in stable and solvent countries with a sound fiscal framework, policy uncertainty shocks caused by unexpected events can affect economic activities and lead to lower growth and lower employment by increasing precautionary savings and postponing investment. Therefore, an environment with low fiscal uncertainty is

the key to the success of expansionary policies and even the smooth implementation of contractionary policies (Anzuini and Rossi, 2020).

Anzuini and Rossi, (2020) indicated that the appropriate effects of standard expansionary policies in Italy are neutralized by contractionary policies resulting from their uncertain implementation. Government expenditures and tax revenues constitute a significant part of the GDP, thus significant uncertainty about these figures can make a big difference in the formation of decisions of many economic activists and as a result fiscal uncertainty plays a prominent role in the transmission of fiscal policy.

3-1-Budget uncertainty and investment

Regarding the budget deficit, it's financing method and macroeconomic environment are of great importance, because it can have different economic effects by impacting on the level of income and wealth of people. The government budget deficit in Iran is financed through the following methods: 1. Borrowing from private sector through bond(sukuk) issuance. 2. Foreign Borrowing 3. Borrowing from the central bank 4. Using National Development Fund's resources 5. Selling government property.

When taxes are included as a part of the investment costs in the investtment budget, one should also pay attention to the tax rates and tax bases. Regarding taxes, tax reforms can make it difficult for investors to predict the relevant variables and thereby increase uncertainty, which is known as tax uncertainty (Hadian and Tahvili, 2014).

In addition to the change and amendment of the law, it is possible that there is still uncertainty regarding the tax policy. This issue happens when the tax law is complicated. In this case, the investors use a simple model to measure the amount of tax paid for the investment project, while the authorities of fiscal affairs determine the tax according to the tax laws. As a result, when a firm decides to invest, two different amount can be considered for tax: the planned tax and the actual tax, which can be different. From the investor's point of view, even if the tax policy does not change, the difference between these two values can be important. This type of uncertainty is called model-specific tax uncertainty. Fiscal uncertainty affects on long-term investment projects, while model-specific tax uncertainty can affect on any investment project with any time horizon (Hassett and Gilbert, 1998:18).

3-2-Empirical literature

Empirical studies could be devided based on whether they included the uncertainty index in the fiscal policy model? And if they included, what is the determinant of fiscal policy uncertainty index? Accordingly, the empirical literature can be divided into four categories:

The first category deals with tax uncertainty and investment. The second category deals with the uncertainty of government expenditures and investment,

and the third category deals with budget uncertainty (including both tax uncertainty and government expenditure uncertainty) and investment. Finally the fourth Category deals with the effect of fiscal policy (budget deficit) on investment.

First, tax policy uncertainty and investment;

Hassett and Metcalf (1998), examined uncertain tax policy and investment and answered whether random tax policy hinder investment? They compared the impact of tax policy uncertainty on the level of firm and aggregate investment and the investment behavior when the uncertainty is the result of a shock caused by the Geometric Brownian Motion (GBM) model, and while the random discrete jumps happens in the tax policy. Expectations about the possibility of tax policy changes have an adverse effect on profits, compared to delaying investment, and investment can be reduced by increasing tax policy uncertainty. The simulation of mass investment indicates that capital formation has an inverse relationship with the increase of uncertainty in the traditional Brownian geometric motion model, but it can increase in the random discrete jumps model.[1]

Second, uncertainty of government expenditures and investment;

Romer and Romer (2010) estimated the macroeconomic effects of tax changes based on a measurement of fiscal shocks for the United States during 1950-2007 using VAR model. The results indicated that the effects of tax changes on production are more related to actual changes in taxes than the news about future changes in taxes. Also, in response to tax increases, investment strongly decreases.

Suri et al. (2011), investigated the impact of uncertainty in government consumption expenditure through the investment channel and crowding out of private investment on Iran's economic growth during 1968-2000 using GARCH model. The results indicated that uncertainty (unstable part) in the share of government consumption expenditures, and a decrease in investment, give rise to a significant decrease in the economic growth. However, the stable part of government consumption expenditures has had a positive impact on investment.

Emami and Ahmadi (2011), explored the uncertain effect of government current and capital expenditures on private sector investment in Iran during 1959-2006 using a Vector Error Correction Model (VECM). To measure the uncertainty of government's current and capital expenditures, they employed EGARCH[2]. The results indicated that the uncertainty of the government's current and capital expenditures in the long term has an adverse impact on private investment.

Ricco et al. (2016), examined the effects of fiscal policy communication on the propagation of government expenditure shocks by measuring an index of the coordination impacts of policy communication on the expectations of private

[1] A jump process is a type of stochastic process that has discrete movements, called jumps, with random arrival times (Cont and Tankov, 2003) but in GBM, the movement is continuous (no discontinuity).

[2] Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH)

agents during 1981-2012 in the United States. They employed ETVAR[1], and the Bayesian technique. The results suggest that in the periods with low uncertainty (low disagreement in predicting future government expenditures), the reaction of increased investment is greater, which leads to stronger effects of fiscal policy in periods of low uncertainty and on the contrary, in the periods with high uncertainty (high disagreement on the government's fiscal policy), it reduces the reaction of investment to the shock of government spending (fiscal policy).

Heydarian et al., (2021) examined the impact of financial sanctions on fiscal policy, investment and economic growth using intervention time-series analysis over the period 2005-2017. Financial sanctions targeted the government's oil revenues and increased financing costs. Sanctions adversely affected the fiscal position of the government and created uncertainty for investment budget which resulted in the budget deficit and lower growth. In this regard, blocking of assets and restricted access to foreign exchange resources, reduced investment, and production and ultimately reduced economic growth. The results indicated the adverse effect of financial sanctions on government investment budget and economic growth in the short-run. However, during 2010-2014, when severe and multilateral financial sanctions were imposed, investment and economic growth has slowed down. Nevertheless, in the long run, financial sanctions have had a weaker adverse effect on investment and economic growth.

Heydarian et al., (2022) examined the impact of financial sanctions on Foreign Direct Investment(FDI) in Iran during 2005-2019 using the intervention model. They discussed three periods. From 2005 to 2010, financial sanctions which adversely affected FDI. From 2011 to 2015, severe and multilateral financial sanctions, adversely affected FDI. In the third period, i.e., 2016-2019, when the withdrawal of the United States from JCPOA happened, it adversely affected on FDI inflow. Altogether, during 2005-2019, financial sanctions adversely affected FDI inflow in Iran.

Third, budget uncertainty (including both tax uncertainty and government expenditures uncertainty) and investment;

Bloom et al. (2007), explored the uncertainty and investment dynamics for 672 British industrial production companies during 1972-1991 using panel data model and GMM. The results indicated that with higher uncertainty of (partial) irreversibility, investment response to demand shocks decreases.

Uncertainty makes companies more cautious on investment. This finding has been confirmed both numerically for a model with a combination of adjustment costs, time-varying uncertainty and aggregation of investment decisions and time, and empirically for a combination of industrial production enterprises. These cautionary effects of uncertainty are large—from the lower quartile of the uncertainty distribution to the upper quartile, they typically halve the first-year

[1] Expectational Threshold VAR

investment response to demand shocks. This suggests that firms' responses to any policy stimulus during a high uncertainty, such as September 11, 2001, may be much weaker.

Hadian and Tahvili (2014), examined the effect of fiscal policy fluctuations and uncertainty on private investment in Iran during 1973-2009 by calculating two indicators," budget deficit fluctuations" and "tax fluctuations" and using the GARCH method. The also employed ARDL model to explore a neoclassical investment model. The results indicated that budget deficit fluctuations only in the short term and with a lag and tax fluctuations only in the long term have an adverse effect on private investment in Iran.

Fernandez et al. (2015), investigated the impact of fiscal volatility shock on economic activity, and discussed how unexpected changes in the fiscal policy uncertainty affect on economic activity. They utilized quarterly data from 1970 to 2014 available in the United States. They clearly distinguished between fiscal shocks and fiscal volatility shocks.

Another feature is that; uncertainty is about temporary changes in fiscal policy. This is a deliberate choice because it is clear from the work of Bi, Leeper, and Leith (2013) and previous studies that uncertainty due to permanent changes in fiscal policy has important effects on economic activity. Therefore, they examined a different question: how an economy reacts to an unexpected and temporary increase in fiscal policy uncertainty. First, they estimated tax and expenditure processes for the United States with time-varying fluctuation to find evidence of time-varying fluctuation. Second, they estimated a VAR model for the US economy using time-varying fluctuation (volatility). They filtered out the effects of fiscal instability shocks on capital tax rates, per capita product, per capita consumption, per capita investment, real wages, per capita work hours, per capita GDP, and three-month average of Fed rate. The results indicated a moderate but long-term contraction in production, consumption and investment. Third, they introduced taxes and expenditures into a new Keynesian DSGE model. In both the VAR and New Keynesian DSGE models, the results suggest that unexpected changes in fiscal volatility shocks can have a significant adverse effect on economic activity. A very important point is that most of production reduction is caused by the decrease in investment (both in the VAR model and in the New Keynesian DSGE model) and among the aforementioned variables, investment has the most adverse effect on the fiscal instability shock (both in the VAR model and in the New Keynesian DSGE model).

The features of the new Keynesian DSGE model that make it possible to materialize the effect of fiscal policy shock in the real economy among others are as follows: sticky prices and wage downward rigidity, adjustment costs in the investments, imperfect competition through product differentiation, and mark up pricing in the New Keynesian DSGE model (Mirjalili, 2015, pp. 423).

Ghirelli et al. (2019), explored macroeconomic effects of economic policy uncertainty for Spain and provided further evidence on the relationship between uncertainty and economic activity.
To this end, they developed proxy indicators of economic policy uncertainty and economic activity in Spain. In addition, they found that fiscal uncertainty shocks had significant adverse effects on private consumption. Adverse reactions to investment on capital goods are larger in terms of size, but disappear fast.
Beckmann and Czudaj (2020), investigated the effects of fiscal Policy uncertainty on the real sector of Germany. They provided a new measure of fiscal policy uncertainty based on the difference between expert forecasts about the future budget balance of the German economy and the actual budget balance. They measured fiscal uncertainty for the German economy over the period of November 1995 to April 2018. Also, they examined the effect of Germany's "debt brake" on the uncertainty of fiscal policy. They explained the adverse impact of fiscal policy uncertainty on the real economy in Germany through lower employment and investment by firms, higher financing costs as a result of precautionary savings due to the risk premium and lower consumer spending.
Anzuini et al. (2020), examined the impact of fiscal policy uncertainty on the business cycle in Italy during1981 -2014. They employed a new measurement for fiscal policy uncertainty in Italy. The results indicated that unexpected increase in fiscal policy uncertainty has had an adverse impact on the Italian economy. An implication of the result is that the same change in the government budget can have different effects depending on whether it is accompanied by a decrease or increase in the fiscal policy uncertainty. Therefore, neglecting fiscal policy uncertainty may partially explain why the size (and sign) of fiscal multipliers in the empirical studies is different.
Mirjalili and Karimzadeh (2021) examined how National Development Fund resources can be utilized as a fiscal policy tool to reduce fluctuation and uncertainty in the fiscal policy in Iran. In order to reduce the volatility adverse effects of oil prices, the sovereign wealth fund in Iran could be helpful to stabilize industrial investment and production. Using DSGE model, they explored different scenarios for managing Fund resources to reduce fluctuations and uncertainty of fiscal policy. A scenario, without any stabilizer Fund and two scenarios for stabilizer Fund. In a scenario, all oil revenues are deposited to NDF and a part of the fund as much as interest rate in the OECD countries plus 70% of long-run oil revenues invested in the economy. The Results indicated that the management of oil revenues by the Fund is an appropriate policy to reduce the economic fluctuations and uncertainty in the industiral investment in Iran.
Aye (2021) examined the impact of fiscal and monetary policy' uncertainty on the economic activities in South Africa during the period 1990-2019 using a Partial Least Squares Structural Equation Model (PLS-SEM). The results suggest

that increased fiscal policy uncertainty on the reduction of investment in South Africa was significant.

Wen et al. (2022) explored how fiscal policy uncertainty affects firm's investment in innovation in the China's new energy industry during 2007- 2019. The results suggest that fiscal policy uncertainty has significantly reduced investment in innovation in the new energy companies, and its adverse effect is mainly due to the reduction in the government support to innovation in investment.

Akbarzadeh et al. (2018) investigated the investment and growth constraints in Iran's economy during 2001 to 2016 using the HRV and grounded theory methods. Based on the growth diagnostics decision tree, they explored the limitations and find that the weakness in financing investment is the main constraint for private industrial investment, entrepreneurship and growth in Iran. Also, weakness in the stable functioning of fiscal policy i.e. the government capital expenditures contributed in this bottleneck. Reducing the uncertainty of investment and improve financing can be very effective and will reduce fluctuations in the industrial investment in Iran.

Fourth, the effect of fiscal policy (budget deficit) on investment without considering the uncertainty of budget deficit;

Hojjati et al. (2005), explored the fiscal policy implications for private investment in Iran, to understand how government revenues and expenditures affect on private investment during 1963-2001 using an ARDL econometric model. The results suggest that government revenues have an adverse effect and government expenditures have a positive effect on private investment in Iran.

In terms of government revenues, the impact of tax revenues on private investment has been negative and the impact of oil revenues and other revenues on private investment has been positive. Also, the results indicate that the impact of fiscal policy on private investment was not immediate. Moreover, the budget deficit encourages private investment. While the results of Mousavi and Zaire's (2007) indicate the adverse impact of budget deficit on private investment in Iran during 1963-2005.

Izad-khasti and Arab-Mazar (2016) found an adverse effect of budget deficit on investment in Iran and focused on the corporate income tax and government fiscal indiscipline. They investigated the effects of efficient fiscal and tax policies on private investment in Iran using impulse-response function, variance decomposition and Johansen's co-integration analysis during 1978-2014. The results of impulse-response function suggest that a positive shock in fiscal and tax variables at the beginning of the period causes an increase and then decreases in the ratio of private investment to GDP. Also, the results of Johansen's co-integration analysis suggest the crowding out effect and the negative relationship between fiscal (public capital expenditures) and tax variables (the ratio of corporate tax to total tax revenue) and the ratio of private investment to GDP in

the long run. The reason for different results on the (positive and negative) effects of the budget deficit on investment can be traced to including uncertainty in the budget deficit variable. The effect of budget deficit along with high uncertainty on the investment is different from the same amount of budget deficit when associated with low uncertainty.

Among the first three categories, the third category covers the first and second categories, therefore, it seems more inclusive, as the budget balance or deficit include both the expenditures and government revenues as well.

In previous studies such as Gali and Perotti (2003), Golinelli and Momigliano (2009), Fernandez et al. (2015), Beckmann and Czudaj (2020), Anzuini et al. (2020), Anzuini and Rossi (2020), budget balance considered as the core determining factor of the fiscal policy uncertainty index.

The studies that examined fiscal policy uncertainty based on survey data are Ricco et al. (2016) and Beckmann and Czudaj (2020). Their contribution was based on the difference between expert forecast of future budget balance, and the actual budget balance for the United States and Germany respectively. Other studies employed the proxies or reaction functions to consider fiscal policy uncertainty (Fernandez et al. (2015), Anzuini et al. (2020), Popiel (2020)).

The literature that explicitly models fiscal policy uncertainty mostly relies on the estimation of fiscal policy reaction function to identify fiscal policy uncertainty (Fernandez et al. (2015), Anzuini et al. (2020), Popiel (2020)).

Therefore, we employed an uncertainty index for Iran through government's fiscal reaction function, measured by Safari et al. (2024) which follows Fernandez et al. (2015), Popiel (2020) and in particular, Anzuini et al. (2020) that proposed a new measurement for fiscal policy uncertainty.

3-3-Contribution

Our contribution is to use and include the effects of fiscal policy uncertainty on both the shock of the government's fiscal level and the shock of demand. Hadian and Tahvili (2014) is aligned with our argument. However, our contribution lies in four areas. First, we employed government's fiscal reaction function to measure fiscal uncertainty index for Iran, as measured by Safari et al. (2024). GARCH has been utilised in previous studies to measure uncertainty in Iran. However, GARCH cannot separate an instability shock from a level shock. Given that fiscal policy will be affected by two types of shocks: level shocks and fiscal policy uncertainty shocks, therefore, we estimated uncertainty using particle-filter estimation by coding in MATLAB software. Particle filter is a Bayesian estimation.

Second, instead of focusing on the effect of fiscal policy fluctuations on the entire private investment, we focused on industrial investment in Iran.

Third, we examined the effect of fiscal policy uncertainty on the industrial investment in Iran including 24 industrial groups according to ISIC two-digit

codes. In fact, we benefited from data of industrial sub-sectors in detail and not the average of the entire industry, because if we take the average of the entire industry, we will lose the effects of uncertainty on each industrial sub-sector. Including subsector data in the estimation, due to higher number of observations, makes the econometric estimation more valid.
Fourth, our study covers the 2010s, a decade that Iran's economy faced with increasing pressure of economic sanctions on Iran, the uncertainty of fiscal policy, the high budget deficit of the government and the drop in industrial investment in Iran.

4. Model specification and dynamic panel method

We initially specify the econometric model to explore the effects of fiscal policy uncertainty on the industrial investment in Iran. The empirical model is based on Bloom et al. (2007) Bloom (2000) which indicated that the real capital accumulation series chosen by a firm under partial irreversibility has the same long-run growth rate as the hypothetical capital accumulation series chosen by the same firm under no-cost reversibility, essentially because the gap between these two series is limited.
This suggests that the logarithms of the two series should be combined and thus provides an incentive to consider the capital accumulation adjustment. This cumulative result shows that

$$logK_{it} = logK_{it}^{*} + e_{it} \quad (1)$$

Where K_{it} denotes the real capital accumulation of firm i in period t, K_{it}^{*} denotes the capital accumulation of the firm in the absence of adjustment costs, and e_{it} denotes a fixed error term. This hypothetical frictionless level of capital accumulation is defined as follows:

$$logK_{it}^{*} = C + logsale_{it} \quad (2)$$

Where Y_{it} denotes the (real) sales of production group i in the period t and C denotes the unobserved effects of the production group reflecting the possible fluctuation of all enterprises in the components and response to the cost of using capital (Chetty, 2007). This formulation is consistent with, for example, the frictionless demand for capital for a firm with constant returns to scale of the CES production function and the same elasticity of demand, and implies that the logarithms of real capital accumulation and real sales together are combined, provided that the cost to the user of capital is constant. This does not mean that real capital accumulation and its assumed frictionless level are equal on average, since the error term e_{it} does not imply a zero mean. However, the partial irreversibility framework implies that e_{it} will be serially related in a very complex way. Any brief description of these dynamics should be considered as an approximation.

A baseline error correction representation of the dynamic relationship between $logK_{it}$ and $logK^{*}_{it}$, using equation (1), is as follows:

$$\Delta logK_{it} = C + \beta_1(sale\ growth_{it}) + \beta_2\left(logsale_{i,t-1} - logK_{i,t-1}\right) + \vartheta_{it} \quad (3)$$

Where C is again unobserved production group effects and ϑ_{it}، denotes a serially uncorrelated error term. A key feature is that the coefficient θ in the error correction term must be positive, so that any production group with a level of capital accumulation lower than its target will eventually adjust its investment upwards and increase it and vice versa.

In which, $\Delta logK_{it} \approx \left({I_{it}}/{K_{i,t-1}}\right) - \delta_i$ is approximated, so that I_{it} is the gross investment and δ_i is the depreciation rate. The investment made in the previous year in the industry can be the effective basis for the new year's investment in that industry, therefore, as an explanatory factor, we add an investment lag in equation 3.

The increase in the interest rate result in the decrease in investment (variable r in equation 4). The reaction of the government's fiscal policy has two sides. On the one hand, it affects investment by creating a fiscal level shock (as in terms of the budget for capital expenditures and direct investment or oil revenue level change). The variable added to equation 3.

This fiscal policy reaction is associated with creating uncertainty in the fiscal policy (such as the realization of the government budget is unpredictable). Therefore, there is a cross effect between the growth of the fiscal level and the uncertainty of fiscal policy, which affects investment, and for them, these two effects make sense together. The variable added to equation 3.

In addition, the government (the reaction of fiscal policy) has two effects on investment through the demand side shock channel. The first effect is that, with the growth of the fiscal level (such as the change of current expenditures, subsidy allocation and tax change[1]) and the creation of demand, it affects the growth of industrial sales. Therefore, in a cross effect between the growth of the fiscal level and the growth of industrial sales, it affects investment.

The second effect is that the fiscal level growth (fiscal policy reaction) is associated with the creation and growth of fiscal policy uncertainty, which has a negative and inverse effect on the growth of sales and the demand side. Thus, a cross effect between the growth of fiscal policy uncertainty and Sales growth affects investment. To test the impact of uncertainty through the demand side shock channel, the cross effect between uncertainty growth measure

[1] The growth of the fiscal level is derived from the fiscal response function of the government of Iran, in which the function is the result of the response of the government's expenditures, the change in the oil revenue and the government's tax policy, etc., in the balance of the structural budget and the balance of the annual cyclical budget of the government.

($uncertainty\ growth_t$) and current sales growth ($sale\ growth_{it}$) is added to equation (3).

A negative coefficient in this cross effect shows that at higher levels of uncertainty, investment response to demand shocks is lower.

In addition, to test the non-linearity of the investment response to demand shocks, the sales growth $(sale\ growth_{it})^2$ is added to equation (3). A positive coefficient on this squared term is consistent with the notion that there is a convex relationship between investment and demand shocks and reminds us that our samples are dominated by observations of the firms with positive gross investment. Adding the mentioned elements in the specification of equation 3, will give us the specifications in equation (4).

$$\begin{aligned}\frac{I_{it}}{K_{i,t-1}} = C + \beta_0 \frac{I_{it-1}}{K_{i,t-2}} + \beta_1 (sale\ growth_{it})^2 + \beta_2 \left(logsale_{i,t-1} - logK_{i,t-1}\right) \\ + \beta_3\ fiscal\ level\ shock\ growth_t \\ + \beta_4 (fiscal\ level\ shock\ growth_t * uncertainty\ growth_t) \\ + \beta_5 (uncertainty\ growth_t * sale\ growth_{it}) \\ + \beta_6 (fiscal\ level\ shock\ growth_t * sale\ growth_{it}) + \alpha_1 r + \delta_i \\ + \vartheta_{it} \qquad (4)\end{aligned}$$

As Iran's economy faced with severe economic sanctions since 2012 and supply-side shock happened, the government budget is adversely affected. The instability of the government's investment budget in dealing with sanctions can affect the industrial investment. To this end, we employed a dummy variable in the model (sanctions in equation 5) to test and consider the direct effect of sanctions on industrial investment.

The sanctions imposed on Iran hindered the sales growth and made a demand shock on investment. In order to consider these effects, we include the cross effect of sanctions and sales growth in equation 5. Also, as a control variable, we add a variable in the industrial investment, i.e. industrial value added growth ($value\ added\ growth_{it}$) into the specified model - equation 5. Thus, according to equation (5), the effect of economic sanctions on the industrial investment in 24 groups included in the specified model. Therefore, we have the followings:

$$\begin{aligned}\frac{I_{it}}{K_{i,t-1}} = C + \beta_0 \frac{I_{it-1}}{K_{i,t-2}} + \beta_1 (sale\ growth_{it})^2 + \beta_2 \left(logsale_{i,t-1} - logK_{i,t-1}\right) \\ + \beta_3\ fiscal\ level\ shock\ growth_t \\ + \beta_4 (fiscal\ level\ shock\ growth_t * uncertainty\ growth_t) \\ + \beta_5 (uncertainty\ growth_t * sale\ growth_{it}) \\ + \beta_6 (fiscal\ level\ shock\ growth_t * sale\ growth_{it}) + \alpha_1 r + \gamma_1 sanction_t \\ + \gamma_2 (sanction_t * sale\ growth_{it}) + \theta_1 value\ added\ growth_{it} + \delta_i \\ + \vartheta_{it} \qquad (5)\end{aligned}$$

The intercept i denotes a specific production group out of 24 production groups of industrial workshops with 10 workers and more in Iran. The intercept t denotes the time period that includes 2002 to 2020, that the information available on these workshops.[1]

As there is a non-linear independent variable in the model and the lag of dependent variable appeared as an explanatory variable in equation 5, we estimate a dynamic panel with the generalized method of moments (GMM) instead of ordinary least squares (OLS). To estimate the model, we employ STATA.

5. Data

The data sources employed in this paper are presented in Table (2).

Table 2: Sources of data for the panel

Data	Source
Gross investment, sales value, value added of 24 production groups individually.	the results of the statistical plan of industrial workshops including 10 workers and more, Iran Statistical Center, 2002-2020.
Capital accumulation by 24 production groups	Its statistics are not available, in order to estimate the capital stock for each activity in the first year (2002), it was calculated according to Berlrmann and WesselhLoft (2014) and Rezaei et al. (2017).
Producer price index of the industrial products in terms of industrial activities in Iran	official data published by Iran Statistical Center, available upto 2019 (at constant prices of 2019)
Economic sanction	considered as a dummy variable until 2011 with a value of zero, and from 2012 with a value of one.
Bank interest rate	Time series data of the Central Bank of Iran
Financial level shock, Iran's FPU[2] index	calculated by Safari et al. (2024) by coding in MATLAB software

The summary of the data is provided in table (3).

Table (3): variables and descriptive statistics

variable	observation	Mean	Standard Deviation
$\frac{I_{it}}{K_{i,t-1}}$	450	.5359431	.1730807
$(sale\ growth_{it})^2$	450	.091301	.0277834
$(\log sale_{i,t-1} - \log K_{i,t-1})$	450	7.483791	.0484293
$fiscal\ level\ shock\ growth_t$	450	-.667112	.0832541
$fiscal\ level\ shock\ growth_t * uncertainty\ growth_t$	450	-.2209408	.0336986

[1] we use the ratio of variables ($\frac{I_{it}}{K_{i,t-1}}$), in which the current price without converting the numerator variable and the denominator variable to a fixed price (as the price effect is in both the numerator and the denominator, when we divide them, the price effect is offset).

[2] Fiscal Policy Uncertainty

$uncertainty\ growth_t * sale\ growth_{it}$	450	.0147586	.0035565
$fiscal\ level\ shock\ growth_t * sale\ growth_{it}$	450	-.0923498	.0324853
r	450	16.05556	.132058
$sanction_t$	450	.5	.0235965
$sanction_t * sale\ growth_{it}$	450	.0216933	.0098077
$value\ added\ growth_{it}$	450	.0741586	.0128459

Source: Authors' calculations

6. Results

6.1. stationary test

We employed Fisher-type unit-root test Based on augmented Dickey-Fuller tests to examine the stationary of the variables. As shown in Table (4), the null hypothesis for the existence of the unit root is rejected and therefore, variables are stationary.

Table (4): Fisher unit root test results for the variables

variable	statistic	P-Value
I / K	-18.5587	0.0000
(sale growth)^2	-30.8099	0.0000
Log sale - log k	-8.1628	0.0000
fiscal level shock growth	-13.2971	0.0000
fiscal level shock growth* uncertainty growth	-16.1091	0.0000
uncertainty growth *sale growth	-27.1713	0.0000
fiscal level shock growth * sale growth	-33.4528	0.0000
r	-6.5358	0.0036
Sanction *sale growth	-20.0312	0.0000
value added growth	-24.2295	0.0000

Source: Authors' calculations

6.2. Co-linearity and coefficient of correlation

For co-linearity test, we utilized the correlation coefficients between explanatory variables. If the correlation coefficients are relatively high, it means strong co-linearity. Correlation coefficients of the variables of the model are depicted in table (5).

Table (5): Correlation coefficients of the variables

	I / K	value added growth	Log sale - log k	(sale growth)^2	fiscal level shock growth * sale growth	fiscal level shock growth	sanction	Sanction *sale growth	r	uncertainty growth *sale grwth	fiscal level shock growth *uncertainty
I / K	1.00										
value added growth	0.4144	1.0000									
Log sale - log k	-0.0356	-0.0486	1.0000								
(sale growth)^2	0.0424	0.2078	-0.0291	1.000							
fiscal level shock growth * sale growth	-0.0368	-0.2133	0.0062	-0.738	1.0000						
fiscal level shock growth	0.0258	-0.0060	0.0685	-0.070	0.2676	1.0000					
sanction	-0.0778	-0.0193	0.2564	-0.006	0.1232	0.3838	1.000				
Sanction *sale growth	0.0008	0.5269	-0.0015	0.319	-0.1184	0.0292	0.104	1.0000			
r	-0.0284	0.0966	0.1854	-0.005	0.1169	0.4725	0.734	0.1458	1.000		
uncertainty growth *sale growth	0.0468	0.4850	-0.0018	0.324	-0.5755	-0.1091	-0.008	0.4710	0.012	1.000	
fiscal level shock growth* uncertainty growth	0.0229	0.0036	-0.0265	-0.026	0.2021	0.8516	0.124	-0.0208	0.158	-0.13	1.000

Source: Authors' calculations

For a regression, when the correlation coefficient between explanatory variables is greater than $\sqrt{(R^2)}$, it is a sharp linearity. However, $\sqrt{(R^2)}$ for the model is 0.51. Therefore, for such a case, the results of the correlation coefficients for the model variables are negligible.

In addition, one way to examine the co-linearity of the variables is calculating the variance inflation factor (VIF). Chatterjee et al. stated that the value of VIF should not exceed 10. The VIF results for the model are illustrated in table (6).

Table (6): Values of VIF for model variables

variable	VIF
I / K	
(sale growth)^2	3.27
Log sale - log k	1.08
fiscal level shock growth	6.83
fiscal level shock growth* uncertainty growth	5.31
uncertainty growth *sale growth	2.68
fiscal level shock growth * sale growth	4.66
r	2.90
Sanction *sale growth	2.09
Sanction	2.33
value added growth	1.61

Source: Authors' calculations

6.3. The model estimation

Table (7): Model Estimation in the Dynamic Model

Investment Model			
Results of estimation of the model by generalized method of moments			
dependent variable: $\frac{I_{it}}{K_{i,t-1}}$			
variable	**coefficient**	**z -statistic**	**P-Value**
C	.2799212	1.03	0.304
$\frac{I_{it-1}}{K_{i,t-2}}$	.0171645*	3.68	0.000
$value\ added\ growth_{it}$	5.096388*	19.76	0.000
$(log sale_{i,t-1} - log K_{i,t-1})$	.2219126*	25.01	0.000
$(sale\ growth_{it})^2$	.2464733*	4.82	0.000
$fiscal\ level\ shock\ growth_t * sale\ growth_{it}$	.0928424**	1.88	0.060
$fiscal\ level\ shock\ growth_t$	.2523295*	7.78	0.000
$sanction_t$	- .2861738*	- 9.43	0.000
$sanction_t * sale\ growth_{it}$	- 2.82229*	- 21.59	0.000
r	- .0961713*	- 7.62	0.000
$uncertainty\ growth_t * sale\ growth_{it}$	- 4.636461	- 17.13	0.000
$fiscal\ level\ shock\ growth_t * uncertainty\ growth_t$	- .4848479	- 7.88	0.000
N	25	-	-
NT	400	-	

Note: *=Significant at 5%, **=Significant at 10%.

Finally, by estimating the dynamic model, we need to conduct tests to confirm the accuracy of the results. The results are provided in table (7).

Table (8): Tests to validate the results of the dynamic model estimation

Essential tests			Investment Model
The Arlano-Bond test for auto correlation	AR(1)	z -statistic	-2.4248
		P-Value	0.0153
	AR(2)	z -statistic	-.47098
		P-Value	0.6377
Sargan test		statistic χ^2	18.03015
		P-Value	1.0000

Source: Authors' calculations

In terms of the results of the Arlano-Bond test for auto-correlation, the null hypothesis on non-existence of autocorrelation for the first order between the difference of error terms is rejected. For the second order, this hypothesis has not rejected. Thus, the degree of auto-correlation of error term is the first order. Therefore, it can be said that the Arlano-Bond method is a suitable method for

estimating this model and eliminating the fixed effects. Also, based on Sargan test results, null hypothesis on non-existence of auto-correlation of error terms with instrumental variables or in fact validity of instrumental variables is not rejected and instrumental variable of the model (second order lagged dependent variable) is a suitable variable for estimating the parameters. Thus, the results are valid.

6.4. Interpretation of the results

According to theoretical principles, the increase in the interest rate has led to a decrease in industrial investment over the period. The direct impact of government on investment in 24 industrial groups indicates that the reaction of government's fiscal policy through the fiscal level shock has led to a direct positive effect, although low (+0.25) on investment in 24 industrial groups. Howevder, since the government's fiscal level shock has been accompanied by uncertainty in the fiscal policy, when the actual budget is not predictable, thus, there will be a negative cross-effect between the fiscal level shock and the fiscal policy uncertainty on investment (-0.48 units). The result of these two effects suggest that high fiscal policy uncertainty makes the direct impact of the government on industrial investment as negative. The results are in accordance with the theoretical background and empirical results of Rico et al. (2016) and Anzuini et al. (2020).

In addition, on the indirect impact of the government on industrial investment, the government had two effects on the industrial investment through the demand side shock channel. The first effect happens through the growth of the fiscal level shock (change in the government current expenditures, subsidy allocation, and tax change). The creation of demand has had a positive effect on the growth of industrial sales, so that the cross effect between the growth of the fiscal level shock and the growth of industrial sales on investment in 24 industrial groups over the period was positive (+0.09).

However, the second effect, i.e. the growth of the fiscal level shock (the reaction of the government's fiscal policy) has been associated with the development and growth of fiscal policy uncertainty. The negative cross-effect between the growth of fiscal policy uncertainty and the growth of sales on investment is significant (-4.6). The results of these two effects indicate that with high uncertainty, the indirect effects of the government, through the demand side shock channel, has been negative on investment in 24 industrial groups. The results are in accordance with the theoretical background and empirical findings of Bloom et al., (2007, 2014).

There is a positive non-linear relationship between sales growth and investment in the industries, which indicates a convex relationship between demand shock and investment which is in conformity with the theoretical background.

During the 2010s, Iran's economy faced with more sanctions, in which the direct effect of the sanctions on investment in 24 industrial groups was negative. Various aspects of the negative impact of sanctions on Iran's economy have also been shown in Mirjalili's review (2021).

In relation to the indirect effect of sanctions on industrial investment, the sanctions have prevented the effect of sales growth and demand shock on industrial investment. Hence, the negative cross effect between sanctions and sales growth on investment in 24 industrial groups has been significant (-2.8).

The adjustment coefficient between sales and capital accumulation in the previous period, although it suggests a positive effect on investment, but it happened at a slow movement (+0.22).

7. Conclusion

The most positive effect on investment in 24 industrial groups in Iran is the growth of value added in industries. The most adverse effect on investment in industries has been by growing uncertainty of the fiscal policy, sanctions, and banks' interest rates, respectively.

The growth of the fiscal level shock (reaction of the fiscal policy - such as the increase in the level of capital expenditures) the government has directly affected on investment, although it was low, however, it was a positive effect. On the other hand, the growth of the fiscal level has been associated with the development and growth of the uncertainty of fiscal policy, which has been offset by the cross effect of the growth of fiscal level and the uncertainty of the fiscal policy on investment. Therefore, the results of these two effects have shown the adverse effect of the government on industrial investment over the period.

The government has had two effects on industrial investment indirectly, through the demand side shock channel. On the one hand, by the demand, the cross effect between the growth of the fiscal level shock (such as the increase in the level of government current expenditures, the allocation of subsidies and the reduction of the tax level) and the growth of sales of industries has had a positive effect on industrial investment. However, on the other hand, the growth of fiscal level shock has been associated with the development and growth of fiscal policy uncertainty, so that the cross effect between the growth of fiscal policy uncertainty and the growth of industrial sales on industrial investment has been significantly negative. It indicates that the uncertainty of fiscal policy shows its negative effect on industrial investment more than the demand side shock channel.

The result of these two effects show that with high uncertainty, the indirect role of the government, through the demand side shock channel, is negative on investment in 24 industrial groups in Iran. The results suggest that, there is a positive non-linear relationship between sales growth and industrial investment in Iran which shows the convex relationship between demand shock and

investment. Also, the intensification of financial sanctions from 2012 onward has directly had a negative effect on investment in 24 industrial groups. The sanction indirectly, has hindered the effect of sales growth and demand shock on industrial investment in Iran. Therefore, the negative cross effect between sanctions and sales growth on investment in 24 industrial groups in Iran has been significant.

All in all, with the uncertainty of the fiscal policy along with the shock of the government's fiscal level and the sanctions of the 2010s imposed on Iran's economy, it is expected that the positive reaction of investment to the demand shock and the current sales growth of the industry will be much less.

The results also suggest that the government, in order to strengthen industrial investment needs to increase the growth of the fiscal level shock, along with reducing the uncertainty of fiscal policy. Otherwise, the positive effect of increasing the growth of the fiscal level shock will be offset by the uncertainty of fiscal policy.

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نااطمینانی سیاست مالی و سرمایه‌گذاری صنعتی در ایران

چکیده

سرمایه‌گذاری صنعتی در ایران به ویژه در پی تشدید تحریم‌ها در دهه ۲۰۱۰ به میزان قابل توجهی کاهش یافت. دولت سیاست مالی را اجرا کرد که با نااطمینانی همراه بود. در این مقاله با استفاده از مدل پانل پویا و روش گشتاور تعمیم یافته، به بررسی تأثیر نااطمینانی سیاست مالی بر سرمایه‌گذاری در ۲۴ گروه صنعتی ایران طی سالهای ۱۳۹۹-۱۳۸۱ می‌پردازیم. نتایج نشان می‌دهد، رشد شوک سطح مالی به طور مستقیم بر سرمایه گذاری اثر هرچند پایین اما مثبت گذاشته است. با این حال، ضریب اثر متقاطع بین رشد شوک سطح مالی و نااطمینانی سیاست مالی، اثر مثبت بر سرمایه‌گذاری صنعتی را خنثی کرده است. دولت به طور غیرمستقیم نیز از طریق شوک طرف تقاضا دو اثر بر سرمایه گذاری صنعتی گذاشته است. از سویی، با ایجاد تقاضا، تاثیر مثبتی بر سرمایه گذاری صنعتی با اثر متقاطع بین رشد شوک سطح مالی و فروش صنعتی داشته است. از سوی دیگر، رشد شوک سطح مالی با ایجاد و رشد نااطمینانی سیاست مالی همراه بوده است، به‌طوری که میزان اثر متقاطع میان رشد نااطمینانی سیاست مالی و رشد فروش صنعتی بر سرمایه گذاری صنعتی، ضریب منفی بالایی را نشان می‌دهد. نتایج این دو اثر حاکی از آن است که به دلیل نااطمینانی بالا، اثر غیرمستقیم دولت بر سرمایه گذاری در ۲۴ گروه صنعتی منفی است که از طریق شوک طرف تقاضا اتفاق می‌افتد. همچنین رشد نااطمینانی سیاست مالی، تحریم‌ها و نرخ سود بانکی به ترتیب، بیشترین تأثیر منفی را بر سرمایه گذاری در ۲۴ گروه صنعتی ایران داشته است.

کلمات کلیدی: تحریم‌های اقتصادی، تراز بودجه‌ای، شوک‌های مالی، سرمایه‌گذاری صنعتی، نااطمینانی سیاست مالی.