Industrial Development in Post-revolutionary Iran: Continuity and Reform in a Turbulent Environment

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Introduction

It is a rather daunting task to render the forces that have shaped Iranian industrial capacities and capabilities since the Islamic Revolution in 1979. First, because periods of economic stability have been short-lived whereas discontinuities have been pervasive. Structural issues that typically inflict natural resource economies have also affected Iran—high oil revenues leading to "Dutch disease" whereby an occasional high-growth spell is followed by a dramatic growth collapse, high inflation, foreign exchange shortages, and abrupt and sizable local currency devaluations. Second, in addition to such structural features, Iran has experienced a series of unusual external shocks with adverse effects on its economy—Iran–Iraq War, D'Amato sanctions against the oil industry, extensive regional instability, and prolonged tensions with the USA that led to UN sanctions. Third, in spite of interventions by policy-makers (as embodied in 5-year economic, social, and cultural development plans), key outcomes seem to follow not their stated objectives but rather a more entrenched, structural logic in need of discerning. Thus the task in this chapter is to understand the main contours of industrial transformation in Iran since the revolution: what factors have shaped this transformation? What has been the role of state policies? And finally, what improvements can be made to policies and institutional setups in order to achieve better outcomes?

In order to get a better handle on the issues involved, three bodies of literature are leveraged. First, the structuralist literature provides an alternative understanding of structural transformation, the role of manufacturing and technical change in such transformation, and the relations among growth, current accounts, and foreign exchange management (Ocampo 2014). The second body of literature is associated with renewed interest in industrial policy in the aftermath of the global financial

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crisis of 2009. It understands the process of industrialization as learning, accumulation of technological and organizational capabilities, and appropriate policies and institutional setups that foster such capabilities (see Rodrik 2007; Cimoli et al. 2009). Lastly, the chapter draws on the literature that examines the impact of resource abundance on economic and industrial development—how resource extraction influences industrial development as well as the conditions under which resource-abundant economies either successfully diversify into "competitive industrialization" or fall into "Dutch disease" (see Auty and Gelb 2001; Humphreys et al. 2007). It is through concepts formulated by such theoretical traditions that an explanation of Iran's industrial development experiences over the past forty years is offered.

Political as well as economic policy shifts over the past four decades have had lasting impacts on the Iranian economy and its manufacturing sector. These developments may be divided into four periods: (1) the period of Islamic Revolution and the war with Iraq (1979–1989), (2) the reconstruction period and its follow-up (two-term presidencies each of Mr. Ali Akbar Hashemi-Rafsanjani and Mr. Mohammad Khatami—1989–2005), (3) 8 years of populist economic agenda and heightened tensions with the West during Mr. Mahmoud Ahmadinejad's presidential tenure, and (4) the period since the inauguration of President Hassan Rouhani, whose administration has succeeded in negotiating the Joint Comprehensive Plan of Action (JCPOA) toward reopening trade and investment relations with European and Asian nations. After a brief theoretical discussion, the impact of the immediate post-revolutionary and Iran–Iraq war period on industrial activities is succinctly reviewed. However, the focus of this chapter is on the next three periods. Each is discussed rather extensively by following the developments in macroeconomic and industrial performance, examining key issues that have influenced the course of industrial development, and exploring the outcomes of various policies. Subsequently and in order to better understand the long-term dynamics and outcomes, sectoral developments in the dominant industries are probed. The chapter concludes with an examination of the future paths of industrial development open to Iran.

Theoretical Debates

There are several relevant theoretical traditions that attend to the complex issues of industrial development in resource-abundant developing economies. They include Latin American structuralism, the resource curse formulations, and the industrial policy school. They offer explanations on the sorts of macroeconomic difficulties resource-based economies face, the extent of reliance on manufacturing for economic development, forces that prolong import substitution or push toward export promotion, and the types of learning as well as technological and organizational capabilities that are required for accelerated industrialization. Let us briefly review the arguments of each approach.

One of the critical areas in which Latin American structuralists were interested was the impact of macroeconomic policies on productive transformation. The growth experience of many Latin American economies that were dominated by the export of natural resources underscored the significance of shocks to balance of payments due to price volatility of commodities. Various studies had shown that such shocks played a key role in the emergence of business cycles. To manage those cycles and restore growth and industrial development, structuralists suggested a twofold policy initiative—a supportive macroeconomic environment together with an active policy for the diversification of production structure (Salazar-Xirinachs et al. 2014). A supportive macro environment in this approach included such measures as countercyclical policies to manage business cycles and to reach high levels of aggregate demand but also competitive exchange rates and trade policies in support of diversification efforts (Ocampo 2014). As to the second initiative, it was generally suggested that diversification into more innovative activities and building technological capabilities would take place when new industries were developed or emerged (Ibid.: 48). However, in order to improve their competitive performance, these new industries would be in need of temporary support which could be offered by protecting the domestic market until enterprises enhanced their performance through learning by doing. This is the "infant industry" argument that was one of the pillars of "import-substituting industrialization" often associated with the Latin American economic development experience. Support for the development of "infant industries" was to provided through low-interest loans, higher tariffs temporarily placed on the import of goods that had local production, lower tariffs for the import of capital goods, tax relief, public procurement, and other measures. It was argued, in case foreign exchange for the purchase of machinery and technology was in short supply, capital would be borrowed from abroad to support diversification efforts and the introduction of new and innovative activities (ECLAC 1990).

Structuralists were however criticized for encouraging developing countries to overcome their backwardness by promoting advanced industries that had developed in high-income industrial countries. Developing capital-intensive industries defied the logic of comparative advantage as it placed heavy demand on capital, a highly scarce resource in developing countries (Lin 2009). Gradually, mainstream criticisms led to the formation of a body of literature that focused on the problems of resource-rich developing countries. In its "resource curse" or "Dutch disease" renditions, it argues that the introduction of revenues from natural resource sales leads to a number of problems that slow or regress economic performance (see Humphreys et al. 2007; Auty 1993; Corden and Neary 1982). One of these problem areas is the promotion of infant industry supported by structuralists. Auty and Gelb (2001: 140) argue that this policy has three flaws: first, such promotion provides rents to a select number of enterprises or entrepreneurs in a relatively nontransparent process. This process leads to misallocation of resources and causes economic distortion and corruption. Second, such industries are usually capital-intensive and create few jobs. To cope with the problems that arise in this situation, governments are pushed to provide nonproductive employment in order to avoid social tension. Third, experience shows that technology- and capital-intensive industries take some

time to mature and in the process demand foreign exchange from the primary sector. When such demands accumulate, efficiency of investment falls, and level of investment flattens or declines. Increases in those demands also create fiscal and external deficits, making growth more erratic and open to collapse (Ibid.: 141). As economic diversification does not move forward and at times regresses, growth becomes more dependent on natural resources and gets affected by their price fluctuations. For example, a rise in the price of natural resources or commodities causes an appreciation of the real exchange rate. In such circumstances, non-natural-resource exports become more difficult, while competing with growing imports is even tougher for domestic manufacturers (Humphreys et al. 2007: 5). If this situation is prolonged, it can result in premature deindustrialization.

Yet, accelerated industrial development in East Asian economies, and the fact that their policy initiatives did not conform to what was prescribed by mainstream economists, led to the emergence of a "revisionist" body of literature (Amsden 1989; Wade 1990). Although the initial focus of this literature was largely on East Asian economies, more recently, proponents of industrial policy have also investigated resource-abundant economies, particularly by looking at the challenges of Latin American nations in their new resource-based specialization (Ocampo et al. 2009). They agree that the onset of the Dutch disease in resource-rich economies leads to the appreciation of exchange rate which in turn causes industrial output to become less competitive internationally. They also concur on other negative impacts of the Dutch disease on the economy—observing that as production in resource-based activities is capital intensive with low demand for skilled labor, it often leads to polarization in income distribution and is prone to corruption. Meanwhile, limited technological learning and spillovers erode the overall economic benefits from natural resource exports (Cimoli et al. 2009: 556). Unlike the proponents of the Dutch disease approach, analysts such as Cimoli et al. (2009) and Salazar-Xirinachs et al. (2014) focus on the process of technological learning and capabilities accumulation and point out that as manufacturing lies at the core of technological learning, Dutch disease particularly compromises future learning prospects. "In fact, in order to avoid the resource curse, rents have to be purposefully distributed against comparative advantages, fostering diversification of production in knowledge-intensive activities (Cimoli et al.: 556)." However, in order to be successful, an incentive structure is needed that would promote "learning-based" rent-seeking as opposed to rent-seeking in general (Ibid.: 543).

Although there are a number of differences among the above bodies of literature, similarities also abound. They offer a rather rich toolbox to utilize in examining various trends in the Iranian manufacturing developments during the past three decades. In what follows, the patterns of industrial development in Iran are discussed in relation to the country's prevailing macroeconomic environment. In addition, the status of manufacturing in the Iranian economy, changes in the mix of industries, and trade policies are examined together with investment trends and targeting.

Economic Context for Industrial Developments in Iran: Challenges and Opportunities

Almost 40 years ago, Iran experienced a revolution and, subsequently, a devastating war with tumultuous impacts on several levels. Iran's interactions with the USA and, to a lesser degree, major European economies faced significant tension. As a result, Iran's relations with international markets were restricted to energy exports and trade of goods. Notwithstanding Iran's oil and gas (O&G) sector, multinational corporations (MNCs) were only interested in the sales of finished or semi-finished goods to Iran and not in making investment, transferring technology, or integrating the country within their value chains. The Iranian economy faced extreme difficulties during the Iran–Iraq war. Yet, there were other effects as well. The situation forced local industrialists, managers, and engineers to find ways to keep their facilities operational and engage in technological imitation, copying, reverse engineering, and minor innovation. This led to an enduring emphasis placed on "self-sufficiency," which has arguably prolonged the country's import substitution approach to industrialization. It also focused policy-makers and industrialists on "production" capacity (satisfying the domestic market) as opposed to "technological learning capabilities" (developing competitive products for export). Another early development with long-term impact on the manufacturing profile of the country was the confiscation of industrial firms after the revolution. Such takeovers took place as a number of factory owners left the country and as revolutionary courts transferred certain enterprise ownerships to the state. The result led to a bloated state ownership of industrial firms. In spite of several rounds of "privatization" over the past decades, state or quasi-state (public) entities still control the lion's share of Iran's key industries, including steel, petrochemicals, auto, cement, and others. Notwithstanding, as a result of the above developments in the early post-revolutionary and Iran–Iraq war period (1979–1989), Iran's gross domestic product (GDP) shrank by a significant factor.

Since the signing of the peace agreement between Iran and Iraq in 1988, the Iranian government has drafted and implemented several 5-year economic, social, and cultural development plans. Their objectives and actual performances are reviewed below—especially the economic outcomes at the macro level and their relationship to industrial policies. In doing so, we make a central argument that a developing economy, in order to achieve accelerated industrial development, must enjoy macro policies that provide an enabling environment for various types of learning. Such policies include (but are not limited to) economic stability through sustained growth, predictable foreign exchange rate, stable fiscal policies and public expenditure, controlled inflation, predictable trade policy, and a fair and equitably enforced taxation policy. It is such a combination of policies that encourage accumulation of capabilities at various levels. In what follows it is shown that successive Iranian administrations have not been able to provide such an environment. Thus, mismanagement of available oil revenues, abrupt liberalization followed by restrictive trade policies, and a highly unstable growth pattern have been accompanied by high inflation and sizable devaluation of local currency. At the same time, the Iranian

government has not succeeded in stabilizing demand and controlling output volatility because it has lacked proactive countercyclical fiscal and public procurement policies. Such missteps have led to, or have been accompanied by, significant financial difficulties faced by manufacturing enterprises and waves of bankruptcy that have destroyed accumulated capabilities.

During the last year of Iran–Iraq war (1988), the Iranian economy experienced a very difficult situation. Oil revenue income was less than $10 billion, the economy had contracted by −5.5%, while the inflation rate had risen to 25% (MEAF 2004). Faced with such dire conditions and under pressure to satisfy the pent-up demand and reconstruction needs, President Hashemi-Rafsanjani's administration embarked on the (post-revolutionary) First Development Plan (1989–1993). This was basically a crisis management and reconstruction plan that relied heavily on foreign loans in pursuit of two goals: first, toward importing consumer, intermediate, and capital goods and upgrading the infrastructure; second, toward investing in the revival of industrial capacities and establishing new activities. Foreign direct investment (FDI) would additionally be deployed for O&G and manufacturing capacity buildup. It was envisaged that, by exporting part of the products from existing capacities and attracting FDI to newly established export processing zones (EPZs), exports would rise to earn the required foreign exchange for debt servicing. To achieve these goals, the government adopted measures from the economic reform packages prevalent throughout the developing world during the 1980s—including trade liberalization and privatization as well as enforcing "real" prices and reducing public debt.

In practice, whereas Iran was able to raise $23 billion in short-term foreign loans, it did not attract any meaningful FDI—even less so to EPZs for producing exportable products (Razavi et al. 2018). From a discouragingly low base (at the end of the war), however, the Iranian economy grew by a respectable average of 7.3% per annum during the First Development Plan (see Table 1). Imports, improved capacity utilization rates, and investment in new capacities for construction materials and in

Table 1 Key indicators of economic performance during Iran's 5-year development plans

Five-year development plans (FYDP)	Annual average oil revenues ($ billion)	Annual average GDP growth (%)	Annual average manufacturing growth (%)	Average inflation rate (%)	Annual average growth of manufacturing exports (%)
First FYDP (1989–1993)	14.7	7.3	9.3	21.7	4
Second FYDP (1995–1999)	14.1	2.6	7.4	25.5	4
Third FYDP (2000–2004)	26.2	5.8	10.6	14.2	21
Fourth FYDP (2005–2009)	73.2	4.4	6.3	14.8	27
Fifth FYDP (2011–2015)	65.9	−0.5	2.1	22.8	−2

Source: Reproduced from Shafie and Mobasser (2018)

badly needed infrastructure, as well as demand improvement, contributed to economic recovery. However, the meager 4% annual growth rate of manufacturing exports limited earning the badly needed foreign exchange. Injection of short-term external finance into an economy geared toward self-sufficiency and import substitution industrialization (ISI), and in particular into projects with long gestation periods, invited trouble. This together with a drop in oil prices led to a debt crisis and growth collapse in the last year of the plan in 1993—which further aggravated inflationary pressure and obliged devaluation.

Due to the instabilities at the end of the First Development Plan, the authorities decided to postpone the launching of the Second Development Plan. During the hiatus of 1994, economic growth turned negative, inflation surpassed 35%, imports—at $12 billion—decreased to half of the previous year, and foreign exchange rate appreciated by 59% (MEAF 2004). In order to cope with such imbalances, the Second Development Plan (1995–1999) was drafted with two key objectives: (1) controlling inflation and exchange rate appreciation in the short term and (2) continuing economic liberalization and privatization initiatives as well as relying on domestic sources of capital for investment and imports together with export promotion. However, low levels of oil export income, a debt crisis, restrictions placed on the country during the foreign loan renegotiations, and high rates of inflation imposed severe limitations on achieving the Plan's goals. The average annual rate of economic growth dropped to 2.6% during the Second Development Plan, average rate of inflation rose to 25.5%, and the growth of manufacturing exports averaged at the slow pace of 4% per annum (Table 1). Yet, toward the end of the Plan, the government's stabilization measures gradually lowered inflationary pressures and eased foreign exchange shortages. The election of Mr. Mohammad Khatami to the office of president in 1997 and his conciliatory approach to foreign policy led to improved cooperation with European and Asian countries and MNCs. There were few noticeable changes in the direction of economic policies during President Khatami's administration. Nonetheless, experiences gained during the previous two plans led economic planners to take into account certain factors that had adversely affected the Iranian economy: (1) the adverse effect of oil income fluctuations on economic growth and their magnification in association with a weak financial system and (2) distortions due to lack of economic transparency in such areas as (a) foreign exchange allocation under a system of multiple rates, (b) proliferation of taxes and duties on businesses, and (c) extent of trade limitations and nontariff barriers.

The Third Development Plan (2000–2004) was influenced by the above observations to call for continued economic reforms toward "developing a competitive economy." Its related objectives included liberalizing trade and financial markets, addressing monopolies, limiting government's role in the economy through privatization and improved private sector participation, and significantly increasing exports (Majles 2017). Several important changes in the existing laws and institutions were carried out during the Plan. In the financial sector, these included the establishment of a foreign exchange reserve fund and the passage of Foreign Investment Protection and Promotion Act (FIPPA), placing limits on the

government's ability to dole out loans through the commercial banking system, allowing the establishment of private banks, and unifying the multiple foreign exchange rate system. Additional policy initiatives targeted the improvement of business climate by reducing permit requirements, reducing tariffs (as well as tariffication of nontariff barriers), streamlining import duties, reducing price controls, and decreasing energy subsidies. These, coupled with rising oil revenues, improved economic indicators and made the Third Development Plan the most successful after the revolution. During the Plan, GDP grew by an average of 5.8% per annum, inflation dropped to an annual average of 14%, and manufacturing exports grew by an annual average of 21% (Table 1). Valuation of privatized state-owned enterprises grew by a factor of 15 in comparison with the previous plan, while private sector investment rose considerably (Iranian Privatization Organization 2015).

By 2004, the last year of the Third Development Plan, the economy had stabilized, oil revenues had risen to $36 billion, trade balance had witnessed a surplus of $5 billion, and the foreign exchange reserve fund had accumulated more than $10 billion (CBI 2005). It was in this environment that the Fourth Development Plan was drafted with the following objectives: (1) to continue economic reforms of previous plans, (2) to expand linkages to the global economy, and (3) to make the transition from a resource-based to a knowledge-based economy. Assuming a stable environment, the Plan emphasized undisrupted high economic growth and diversification of production structure by promoting knowledge-based technologies as well as controlling inflation, promoting exports, and reducing poverty (Majles 2017). However, the Iranian economy soon faced a very different milieu from the one presumed during the conception of the Fourth Development Plan. Four new developments are worth mentioning:

1. The Plan was passed during the last year of Khatami's government whereas the new administration of President Ahmadinejad that took office in 2005 had a different populist agenda.
2. Within a year, oil prices increased to an unprecedented level of more than $100 a barrel, opening the door for an intoxicated government to spend without restraints and dole out various types of low-interest loans—leading to the resurgence of inflationary pressures. To control inflation, the government resorted to record level imports (which almost doubled from $35 billion in 2004 to $65 billion in 2010), setting the conditions for Dutch disease and financial difficulties for many manufacturing firms (Nili 2017, vol 1: 429).
3. A major public housing scheme (*maskan-e mehr*) was initiated and built by the government. The scheme financed the construction of more than one million housing units for low-income families through the Central Bank of Iran. By providing demand for construction material at such a high level, this initiative was able to postpone the negative impact of abovementioned policies for a couple of year.

4. Increasing tensions with world powers over the nuclear dossier began to exert its impact on the economy, gradually limiting access to foreign investment, technologies, and markets.

Economic indicators in the first year of the Fourth Development Plan were sound, and oil revenues during the Plan were quite high. However, mismanagement of foreign exchange and unprecedented levels of imports paved the way for the onset of Dutch disease, again leading to growth collapse. During the Fourth Development Plan, the average annual economic growth rate was 4.4% but only around 1% in its last 2 years. Although inflation averaged around 15%, it jumped to 25% in 2008, the penultimate year of the Plan (CBI 2010). Yet, the foreign exchange rate was kept unchanged. Furthermore, resorting to patronage schemes, the government started several initiatives: (1) a large number of employees were hired by the state, (2) job creation loan schemes were launched, and (3) part of the rising oil income was transferred to all Iranian nationals through fixed monthly payments. On the positive side, earlier investments in industrial capacities, especially in intermediate goods such as petrochemicals, refinery products, metals, and nonmetallic minerals reached fruition and pushed the annual average growth rate of manufacturing exports to 27% (Table 1).

The Fifth Development Plan (2011–2015) was drafted during 2010—coinciding with another burst in economic growth driven by high oil revenues that topped $90 billion in that year. Yet, a number of drastic internal and external shocks overturned the entire economic scene. First, a long-awaited policy of reducing subsidies on energy and some other essential goods was implemented under a government act (aimed to make the subsidies targeted). Such a radical economic surgery coincided with the arrival of a second shock due to the onset of UN-sponsored sanctions. Finally, if one adds these shocks to the cumulative impact of populist policies of Mr. Ahmadinejad's administration, they account for the reasons why the Iranian economy plunged into another growth collapse during 2011–2012. This growth collapse was accompanied by several unpleasant developments. To begin with, the mismanagement of foreign exchange rate led to shortages and caused a two-thirds devaluation of the rial. In response to currency shortages, the government reintroduced foreign currency rationing and returned to multiple exchange rates. In effect, trade policies were made subservient to foreign exchange policies. Furthermore, the onset of sanctions directly impacted many areas of activity—banking, oil and gas, autos, shipping, and aviation. Indirectly, sanctions caused severe restrictions on the import of raw materials and intermediate and capital goods that were essential for the operation of manufacturing activities. Inflation soared again—reaching 35% in 2013—and manufacturing export experienced negative growth rates (Table 1). In 2012, the Iranian economy witnessed its worst performance in almost three decades as it contracted by 5.8% (CBI 2015). The situation improved after 2013, when Mr. Hassan Rouhani was elected into office as president—promising negotiations with world powers and relief from international sanctions. In anticipation, the economy began to gradually recover so that the growth rate reached

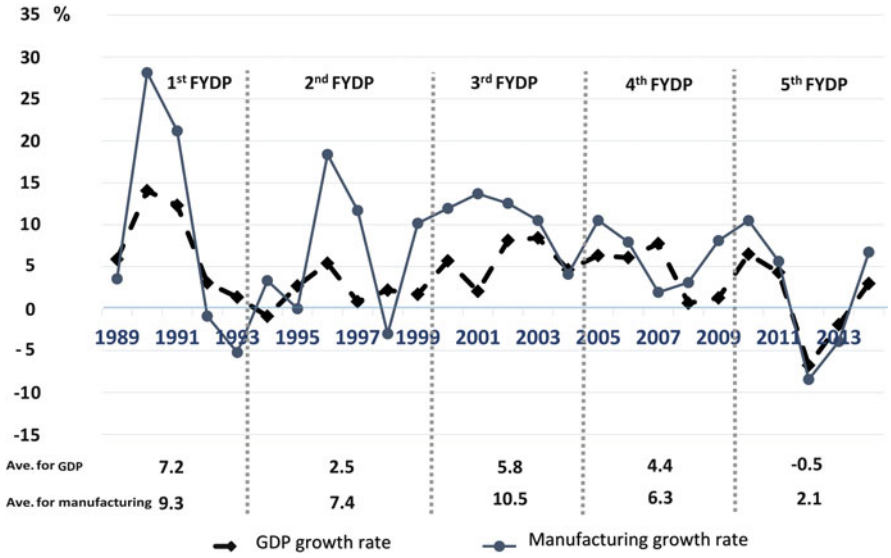

Fig. 1 GDP and manufacturing growth rates in Iran during 5-year development plans (FYDP) (1989–2015) [Source: CBI (1989–2016), Economic Report and Balance Sheet]

3.2% in 2014 and 4.6% in 2015 (CBI 2016). A year later, the inflation rate was also brought down to 10% (Ibid.).

Iran's experiences since the end of the war with Iraq may thus be summarized as follows: erratic economic growth (growth spurts followed by growth collapse), high rates of inflation, pro-cyclical fiscal policy, exchange rate mismanagement leading to prolonged periods of domestic currency overvaluation followed by sudden devaluation, and trade liberalization punctuated by periods of trade restrictions. More specifically:

1. Between the end of Iran–Iraq war in 1989 and 2014, the average annual growth rate of the Iranian economy was 3.9%, which was below the corresponding figure for developing countries as a whole. At the same time, economic growth rates in Iran exhibited significant fluctuations. That is, a growth surge would be followed by a growth collapse (Fig. 1). This pattern would be accompanied by foreign currency shortages, strong inflationary pressures, widening trade gap, and diminishing competitiveness of non-resource-based manufacturing activities—leading to high bankruptcy rates in a large number of firms, especially small and medium enterprises (SMEs). Such outcomes have been predicted in the structuralist and resource curse literature that mismanagement of oil revenues and foreign exchange rate together with pro-cyclical fiscal and monetary policies and sudden trade liberalization would result in missed opportunities for turning periods of high oil revenues into stable and prolonged growth patterns.

2. In the period 1989–2014, the average annual growth rate of manufacturing was 7.1%—nearly double the economic growth rate. However, fluctuations were even more pronounced in the sector's growth pattern (Fig. 1). Between 1999 and 2014, the directions of economic and manufacturing growth rates were alike except for the years 2001 and 2007. The similarity of the two patterns reflect their association with oil price volatility—although further studies are required to establish a definite relationship in terms of lead-lag and direction of causality. What is of concern is the fact that after several years of above average growth since 1998, industrial growth rates have been quite unstable, and the annual average growth rates have decreased from 10.5% during the Third Development Plan to 6.3% and then to 2.1% during the Fourth and Fifth Development Plans. This pattern has had severe impacts on employment, development of networks of learning and technological upgrading, and generation of organizational capabilities.
3. According to a study on the relationship between economic and industrial growth in Iran (Nili 2017, vol 1: 36) over the past 20 years, drivers of growth have been oil revenues, domestic demand, services, and industry. The latter two sectors have accounted for 85% of economic growth in that period. What is not clear is the importance of industrial growth in recent economic growth recovery.

Critical Issues in Iran's Industrial Development

The previous section presented a rather brief overview of the Iranian economic and industrial performance over the last 25 years. In order to examine the performance of the manufacturing sector more closely, several key issues are probed—which have loomed large in recent debates in Iran and can provide a more nuanced and detailed understanding of the forces that have shaped the manufacturing sector in the country. These include the changing share of manufacturing sector in the economy, structural transformation, directions in trade policy, investment patterns, and industrial policy and targeting.

Manufacturing in the Iranian Economy

The share of manufacturing in GDP has been rising steadily when looked at in terms of real prices. As exhibited in Fig. 2, this share increased from 8.2 to 16.6% between 1989 and 2014. This trend demonstrates that the process of industrialization has been continuous and progressive (except for a few years in early 1990s as well as in 2007 and 2013). It also shows that external shocks and growth fluctuations have not had major impacts on the relative status of manufacturing. However, when one considers the GDP share of manufacturing in current prices, a different picture emerges. At its highest, the share of manufacturing in GDP was 17.5% in 1997 and 2001 but declined to 11.8% in 2014. The period exhibits a rising secular trend of the

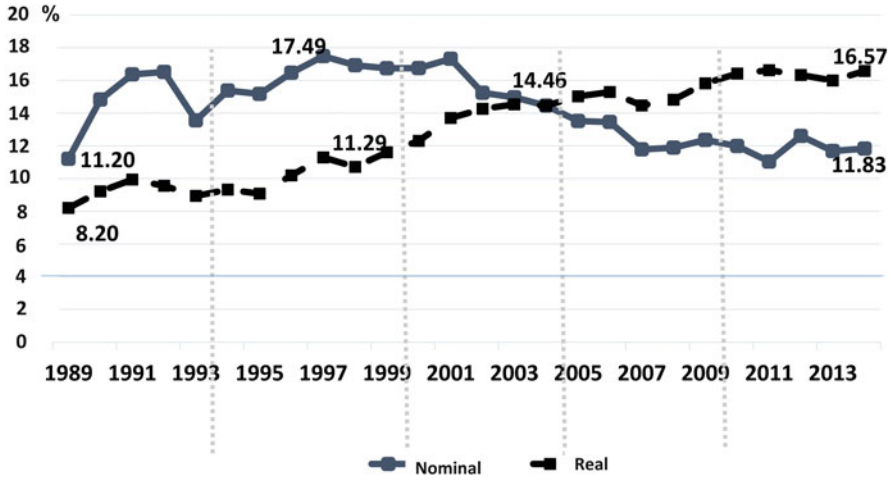

Fig. 2 Share of manufacturing in GDP—nominal and in constant 2004 prices [Source: Reproduced from Tashkini (2016)]

share of manufacturing in the economy up until 2001, followed by a declining secular trend over the next decade and a half. This demonstrates that since 2001 the market value of manufacturing production has been declining relative to other sectors. There are several reasons for this. First, trade liberalization and high levels of imports in this period have put pressure on the price of tradables, whereas prices of non-tradables have increased substantially. Second, terms of trade between the manufacturing sector and the other sectors—agriculture, services, and especially construction—have worsened. Government intervention in controlling the prices of final and intermediate goods such as dairy products and cement, iron, and petrochemicals contributed to the worsening terms of trade between manufacturing and other sectors. The declining share of manufacturing in terms of market value is attributable to the workings of the Dutch disease. In addition, this decline shows that due to the Iranian government's inability to adopt the necessary industrial and technological policies, the economy has failed to generate new competitive industries and high value-added ones or to promote developmental blocs around new technologies.

Changes in the Industrial Mix

The next issue is the extent of change in the mix of key manufacturing industries in Iran. This is of interest from two perspectives. The first has to do with the question of whether the changes are a sign of structural transformation, that is, the extent to which the changes in industry mix have been a reflection of high-productivity industries replacing low-productivity ones and generating new employment and contributing to value added and exports in the process. However, changes in the industry mix in a resource-abundant economy can also be looked at through the

prism of deindustrialization—to what extent they are accompanied by loss of jobs, technological capabilities, and learning networks in industries that are employment-generating and engineering-intensive. Table 2 exhibits changes in shares of key variables such as employment and production value that have taken place in major manufacturing activities during the period 1994–2015. It compares these shares over three periods: the year 1994 and the average shares for the Third and Fifth Development Plans. Three significant trends can be observed:

1. Consumer goods industries that include "food and beverage" as well as "textile and apparel" industries have continuously lost share by more than one-half—from 45.6 to 22.1% in total production value of manufacturing and from almost 38 to 16.4% in total manufacturing value added. Textile and apparel have taken the main brunt of this decline, whereas the impact on food and beverage industries has been moderate.
2. In contrast, there has been an extraordinary rise in the share of intermediate goods (commodities) including petrochemicals, refinery products, basic metals, and nonmetallic minerals. During the three periods shown in Table 2, the share of intermediate goods has more than doubled, increasing from 24 to 53% of production value, from 30 to 60% of value added, and from 55 to 89% of exports. However, since intermediate goods are capital-intensive process industries, increases in their share of employment have been quite moderate, from 27.6 to 32.8%.
3. The final observation is related to motor vehicle and machinery industries. Although these industries do not produce competitive products and therefore have a negligible export capacity, relatively speaking, they are high-productivity, engineering-intensive industries. The two industries together increased their share in all indices (except for exports) when data for 1994 are compared to averages for the Third Development Plan. However, as a result of economic reforms that went into full swing during that Plan, the engineering-intensive industries lost share in almost all indices between the Third and the Fifth Development Plans.

Transformations in manufacturing activities have thus resulted in a twofold outcome: first, there has been an unmistakable change in favor of intermediate goods that produce exportable resource-based commodities. Second, consumer goods industries have been hit relatively hard, while engineering-intensive industries have lost ground as well. High levels of imports and absence of industrial and technology policies have contributed to this process. Both consumer goods and engineering-intensive industries have been entirely focused on the domestic market—except for the food industry that has been able to make inroads into regional markets.

Table 2 Changes in the mix of key manufacturing activities—1994 and averages for 3rd and 5th 5-year development plans (FYDP) (percentages show share of the type of industry in the relevant variable)

	Production value			Value added			Employment			Export		
Type of manufactured goods	1994	3rd FYDP	5th FYDP	1994	3rd FYDP	5th FYDP	1994	3rd FYDP	5th FYDP	1994	3rd FYDP	5th FYDP
Consumer (food, beverages, textiles, and apparel)	45.6	27.6	22.1	37.9	15.7	16.4	30.9	24.5	21.4	6	6.7	6.5
Intermediate (chemicals, refinery products, basic metals, and nonmetallic minerals)	24.4	31.2	52.7	29.8	41.2	60.2	27.6	29	32.8	55	63.1	88.8
Motor vehicles (assembly)	3.3	15.5	8.3	3.3	11.2	5.5	3.6	6.6	4.1	ng.	ng.	1
Machinery (electrical and mechanical)	7.2	8.2	5	8.2	8.6	4.9	15	10.6	11.3	ng.	ng.	1.5
Total (for above industries)	80.5	82.5	88.1	79.2	76.7	87	77.1	70.7	69.6	61	69.8	97.8

Note: ng. stands for negligible

Source: Author's calculations based on SCI (1994–2015), Census of large industrial establishments

Trade Policy and Exports

Despite the stated export promotion intentions, Iran primarily followed an import substitution policy until the Third Development Plan. Experiences with the war and sanctions contributed to a commitment to self-sufficiency. However, starting from the Third Development Plan, trade liberalization was promoted as part of economic reforms. In practice, this policy resulted in a substantial increase in imports but also of exports. During periods of soaring oil revenues, the policy of fixing the foreign exchange rate in an inflationary environment worked in favor of imports and against exports of manufactured products. But exports of resource-based commodities grew considerably, leading to a new pattern of export specialization completely dominated by commodities (Table 2). Overall, macroeconomic uncertainties associated with high growth followed by growth collapse have made it quite difficult for firms to accumulate technological capabilities and produce non-resource-based manufacturing goods for export markets.

The following observations have been offered on the relationship between exports and growth (Hausmann et al. 2007): (1) countries that have higher rates of growth specialize in the export of high-technology products; (2) economies that export goods with intermediate as well as low technologies have lower growth rates; (3) however, the lowest growth rates are experienced by economies that export natural resources and commodities. These outcomes may not be obvious in the short run when commodity prices increase substantially. In the long run, however, export of products incorporating high and/or low technologies tend to be more stable and have a more positive influence on growth compared to exports of natural resources and commodities that have volatile prices and transmit external shocks to the domestic economy.

Table 2 records the highly uneven pattern of Iran's industrial exports. During the decade spanning the First and Second Development Plans, industrial exports grew at a low annual average rate of 4%. However, in the next two plans, with major investments in steel, petrochemicals, cement, refinery products, and nonmetallic minerals coming to fruition, the growth rate of exports jumped to 21 and 27%, respectively. Yet, restrictions associated with sanctions imposed on the Iranian economy, such as market access and banking limitations, reduced the average annual growth rate of manufacturing exports to −2% during the Fifth Development Plan. This means that except for the decade of Third and Fourth Development Plans, manufacturing export growth was not sustained. Furthermore, exports tended to rely heavily on investment toward the production of commodities (Table 2 showed that export growth was associated with intermediate goods or commodities). Iran's export structure thus fell in the category of low rates of growth and least contribution to economic growth. Yet, imports grew at an average annual rate in excess of 30% between 1999, at the outset of the Third Development Plan initiating trade liberalization, and 2010, just before the height of international sanctions imposed on the Iranian economy. They multiplied almost five times from $13 billion to $65 billion over that period. Growth of imports at such a rate had an undesirable impact on the

production of consumer and labor- and engineering-intensive goods, as well as their related networks of learning and technological capabilities.

In terms of diversification of export products and markets, a number of issues should be further highlighted. As shown in Table 2, close to 89% of the country's exports in recent years have been concentrated in intermediate commodities—mostly petrochemicals, refinery products, and metals. To diversify beyond such export items, Iranian policy-makers have encountered two major challenges. First, moving along the value chain of commodities into downstream products with higher value added has proven to be quite difficult—facing major delays. The second hurdle has been faced in diversifying into new export-oriented manufacturing areas. As discussed in the literature (Hidalgo et al. 2007), resource-based economies are likely to face significant difficulties in diversifying their production and export structure due to the position of commodities in non-dense "product spaces." In addition to the challenges regarding the types of products, Iran has encountered major obstacles in diversifying its export markets. Furthermore, as discussed by Sadeq Z. Bigdeli in another chapter of this volume, the number of export markets has actually decreased, mostly due to sanctions. That is, Iranian export diversification has encountered many challenges in terms of products and markets.

In summary, despite increases in both imports and exports subsequent to economic reforms, an unsustainable pattern has set in. Import hikes have resulted in the contraction of labor- and engineering-intensive industries that, respectively, generated employment and shaped a network of learning and technological capabilities. Yet, a pattern of export specialization has emerged that depends on natural resources and commodities—which are capital intensive and have limited employment and domestic value added. Diversifying out of such products has posed major policy challenges for several reasons. First, both natural resources and resource-based commodities are positioned in non-dense "product spaces," which limit learning opportunities and technological spillovers from existing capabilities. Second, commodities tend to require low levels of local research and development (R&D) and have few interactions with domestic sources of knowledge and technology. Furthermore, diversifying into technology-intensive, export-oriented manufacturing has faced difficulties in accessing technologies and markets. The existing trade structure has led to periodic trade deficits and shortages of foreign exchange. Since price fluctuations in most items of Iranian commodity exports resemble fluctuations in oil prices, they have not been able to have a countercyclical effect to prevent or slow down incidents of growth collapse.

Industrial Investment and the Issue of Targeting

In this subsection, we take a closer look at investments in industrial capacities in Iran—including their priorities, sources of finance, and fluctuations. A key debate in the industrial policy literature has been over horizontal versus vertical policies. Vertical policies or selective targeting have been criticized for "choosing winners"

and allocating resources not on the basis of efficiency and market mechanism but according to bureaucratic decisions that are highly prone to corruption and rent-seeking (Krueger 1974). However, as proponents of industrial policy argue, effective horizontal policies like encouraging technological upgrading or improving the business environment are few, quite costly, and usually take a long time to implement. At the same time, a look at the wide spectrum of such policies as allocating finance and foreign exchange, developing infrastructure, and investing in education or skill formation shows that governments are "doomed to choose" (Hausmann and Rodrik 2006). If governments necessarily choose or target, then two questions arise: first, should these choices strictly follow "comparative advantages" or can new technologies be targeted in order to develop "good path dependencies" that lead to "competitive advantages" (Lin 2012; Cimoli et al. 2009: 545). The second question is whether governments can develop the institutional mechanisms to direct "rents" toward innovative activities and the development of technological and organizational capabilities.

Let us look at the choices that have been made by successive administrations in Iran on industrial investment projects. Coming out of a devastating war with Iraq, the government of President Hashemi-Rafsanjani was preoccupied with satisfying the pent-up demand for consumer goods as well as reconstruction of war-damaged areas and infrastructure. As Table 3 shows, there arose a certain division of labor between the government and the private sector, in which the former concentrated on developing capacities in capital-intensive intermediate goods and commodities, while the latter invested in the production of consumer goods and construction materials. Before going into further detail, it must be pointed out that during Iran's five post-revolutionary development plans, the share of government in fixed capital formation in industrial and mining activities averaged around 30%—fluctuating between 32% in the Second Development Plan and 25% during the Fifth Plan (CBI 1989–2015). As indicated by Table 3, average annual growth rate of fixed capital formation in the sector surpassed 28% during the First Development Plan as the economy came out of the war, redirected its financial resources, and received a high amount of short-term loans from outside. After this initial recovery, the best performance was recorded for the Third Development Plan, whereas in the Second and Fourth Development Plans, the corresponding growth rates were around 5%. The Fifth Development Plan was associated with a disappointing growth rate of −6% (of which more later). Table 3 also highlights the top three "priority" industries in terms of actual investment by the government and the private sector. Metal, petrochemical, and chemical industries were among the top three priorities for government investment during the first three development plans. The logic behind such choices was adherence to "comparative advantages" in terms of mineral deposits such as iron ore, copper, and ethane gas and derivatives. In addition, Iran has been ranked second globally in terms of combined oil and gas reserves. Therefore, investing in energy-intensive industries such as steel, glass, cement, and the like appeared quite rational. With a time lag of 2–4 years, investments in such large-scale, capital- and energy-intensive industries generated the capacities that led to an export leap during the Third and Fourth Development Plans. Since the Third Development Plan and with the transfer of ownership in such

Table 3 Investment growth rates in Iranian manufacturing and actual investment shares in priority sectors during the 5-year development plans (FYDP)

FYDPs	Annual growth of fixed capital formation (%)	Declared priority industries	Government or private sector	Top three priority industries based on actual share of in fixed capital formation		
				Priority #1 (%)	Priority #2 (%)	Priority #3 (%)
First	28.5	Metals, food, textiles	Gov.	Basic metals (43)	Chemicals (13)	Mechanical (4)
			Priv.	NMM (17)	Textiles (16)	Food and beverage (12)
Second	5.4	Minerals, agricultural processing industries	Gov.	Basic metals (20)	Autos –	Chemicals –
			Priv.	Oil-based products (20)	NMM (19)	Food and beverage (19)
Third	9.6	Petrochemicals, electronics, biotech industries	Gov.	Petrochemicals and chemicals –	Basic metals –	Autos –
			Priv.	NMM (17)	Food and beverage (17)	Basic metals (13)
Fourth	5.6	Knowledge-intensive industries	Gov.	–	–	–
			Priv.	Chemicals (19)	NMM (18)	Basic metals (16)
Fifth	−6.0	Downstream of petrochemicals and minerals	Gov.	–	–	–
			Priv.	Fabricated metals (17)	Chemicals (13)	Basic metals (13)

Notes: NMM stands for nonmetallic minerals, such as cement, glass, tile, and plaster, which are mostly used in the construction industry. Numbers in parentheses are percentages and represent share of named industry in government or private sectors' average fixed capital formation during the respective FYDP. Missing government priorities and investment shares are due to changes in the reporting categories of the Central Bank since the Third Development Plan
Source: Author's calculations based on CBI (1989–2016), Economic Report and Balance Sheet

industries to the "private" sector (in reality to "semipublic" entities), basic metals and petrochemical/chemical industries have continued to attract investment. Yet, this time, these industries have become priorities of the "private" sector. During the first three development plans, top investment priorities for the private sector included food and beverages as well as textiles and nonmetallic minerals—mostly construction materials (Table 3).

Before discussing the changes in actual industrial investment, a number of observations are in order:

1. State and private actors have both made decisions about industrial and mineral investments according to natural resource endowments and market demand.
2. There appears to be a rudimentary division of labor, with the state investing in capital-, scale-, and energy-intensive industries and the private sector focusing on consumer goods industries and products with high domestic demand like construction materials.
3. Several of the development plans set new priorities aiming to develop high-tech industries. For example, the Third Development Plan focused on the electronics and biotechnology industries, while the Fourth Development Plan considered knowledge-based industries as a priority area. However, the state has not made any sustained and meaningful investment in these industries. Nor has it been able to develop the hard and soft infrastructure to promote and facilitate private sector investments in high-tech industries. Therefore, aside from the commodity sector, no new competitive developmental blocs have emerged in the Iranian industrial sector.
4. It was toward the end of the Third Development Plan that a new foreign investment law (FIPPA) was adopted. However, except for a brief period in early 2000s, the government has not been able to attract significant Foreign Direct Investment (FDI) aside from the oil, gas, and telecom sectors.
5. Across the globe, FDI is looked upon not only as a source of finance but also as the wellspring of managerial know-how and organizational capabilities, technological knowledge, and information about global markets. However, Iranian managers and policy-makers have focused on its financial aspect only. Instead of resolving the difficulties of attracting FDI and negotiating with MNCs, they have found it easier to take out loans on international markets. This has led to the prevalence of a problematic formula according to which "Iranian management + foreign finance" can move important national projects forward. However, such a formula has led to long project delays, low productivity, limited technological learning, and major gaps in the formation of organizational capabilities.

An important study by Nili (2017), President Rouhani's economic advisor, provides a particular account of investment decisions and the resulting structural changes in Iranian industries. It reports that in 2007 the government lowered the interest rate below the inflation rate, while the average annual growth rate of real wages was kept above inflation. Such government decisions encouraged industrial firms to take out low-interest loans and replace labor with capital. This account highlights relative prices as the main reason behind the rapid growth of capital-

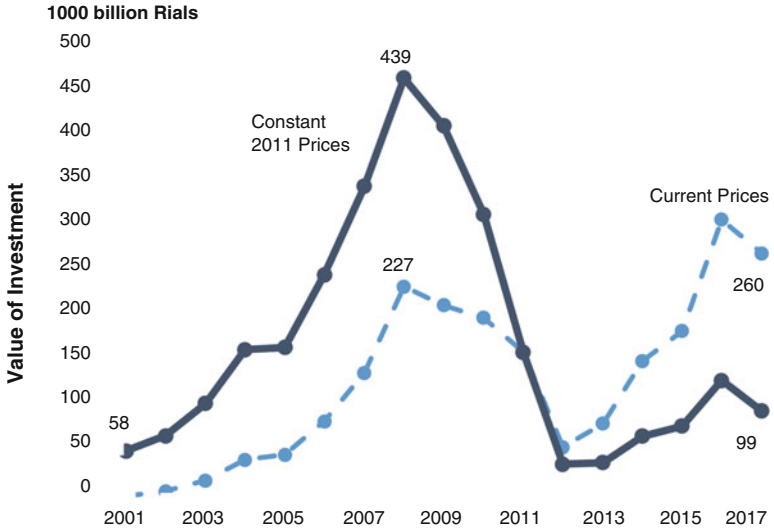

Fig. 3 Value of industrial investment according to utilization permits, 2001–2017 [Source: MIMT (2001–2017), Annual performance report (utilization permit data)]

intensive industries. In addition, the study suggests that excessive imports adversely affected production of consumer goods and forced firms to exit these industries, which led to a major loss of jobs—especially among SMEs (Ibid.: 434). In order to better analyze manufacturing investment and reexamine the above argument, its trends over the past decade and a half are probed here through Fig. 3. Because of the inflationary environment, trends are presented in both current and constant 2011 prices. Three periods may be distinguished.

First, 2001–2008 was a sustained period of relatively high growth in industrial investment. There is a lag of 2–4 years between the time an investment decision is made and when the "utilization permit" is issued after a plant become operational. It can be argued that the bulk of projects that received such permits in 2007–2008 were conceived during or after the last years of Mr. Khatami's presidency that ended in mid-2005. These projects were mostly based on public and private sector priorities discussed earlier. In the second period, there was a sharp decline (collapse is a better description) in investment between 2008 and 2012. This does not support the argument by Nili (2017) that government's lowering of interest rates in 2007 led to major industrial investments that substituted capital for labor and accelerated the growth of capital-intensive industries. Thus, not only there was no investment increase during that period, but manufacturing actually experienced an investment collapse—for which the reasons must be found beyond such arguments and time frames. Withholding industrial investment was a precursor to the overall industrial and economic collapse that occurred 3 years later in 2011 (Fig. 1). The investment collapse that began in 2008 was a reaction by industrialists to macroeconomic mismanagement, tensions with global powers, and signs of emerging sanctions

but, more directly, to trade liberalization and an unprecedented import boom. Starting in 1999, when the Third Development Plan's trade liberalization initiatives began, until 2010 just before the height of sanctions, imports soared at an average annual rate in excess of 30%. By the end of the investment collapse in 2012, the value of investment in real terms would not match that of 2001, a decade earlier, and even in current prices, it was lower than the corresponding 2006 value. As for the third period, there has been a slow recovery since 2013, the year Rouhani was elected. The recovery has been at a snail's pace and, in constant prices after 5 years of gradual increase, 2017 values barely resemble 2003 figures.

To conclude this section on targeting and investment, the following points should be highlighted:

1. Various administrations in Iran have chosen to give priority to the development of manufacturing capacity on the basis of "comparative advantages." At the same time, they have encouraged the private sector to manufacture products that would satisfy the domestic demand. During the first four Development Plans, no long-term strategy or industrial policy was conceived and implemented. The only serious attempt was made toward the end of President Khatami's administration when an industrial development strategy was formulated. However, this document was not presented for approval to the cabinet or the parliament. It was soon shelved as President Ahmadinejad took office, and his supporters criticized the document for having a neoliberal orientation.
2. Very few sustained and targeted investment projects have been formulated and launched by the government or the private sector to develop new competitive technology-intensive manufacturing. As such, Iranian industrial activities have remained limited to two broad sectors: first, a competitive natural resource-based commodity sector that exports more than half of its production and second, a non-competitive consumer goods and engineering-intensive sector that caters to the domestic market only. The reasons for lack of development of an export-oriented technology-based manufacturing industry should be sought in (a) the failure to formulate and ratify an industrial policy that would target promising sectors, (b) the lack of commitment to allocate resources in a sustained way; and (c) the inability to develop institutional mechanisms that would direct resources toward innovative activities and technological learning and away from "rent-seeking."
3. It is true that in the past industrial investment in Iran has been driven by oil revenues. Yet, developments over the past decade raise new issues. As oil prices reached new heights in the mid-2000s and the government reduced the interest rates below inflation, a boom in industrial investment was expected. But there was an investment collapse in 2008 which points to the importance of other factors such as macroeconomic instability, external tensions, and soaring imports that influence investment decisions by the private entrepreneurs and state/quasi-public enterprises. Once an erosion of investment confidence occurs, it is difficult to restore it in a short period of time as the very slow recovery of industrial investment since 2013 demonstrates.

Conclusion

This chapter set out to examine the role that industrial development has played in the Iranian economy from the time reconstruction efforts were launched in the aftermath of the Iran–Iraq war in 1989. Since then and in broad terms, the Iranian economy has experienced economic reforms, a populist government, gradual tightening of sanctions, and regional instability. A number of key factors that have influenced developments in the manufacturing sector were probed. These factors included the role of the state (its direction, clarity of plans, and continuity of support), macroeconomic stability, changes in the specialization patterns of both production and exports, role of trade policy and imports, and industrial investment trends.

An investigation of the growth trends in the Iranian economy and industry demonstrated the predominance of an erratic pattern of high growth followed by growth collapse. The intensity of such fluctuations has been even more pronounced for the case of industrial growth. Despite several attempts from the time of the Third Development Plan onward, successive administrations and the parliament have failed to create appropriate legal and institutional buffers for the management of oil revenues in ways that would withstand populist and distributional pressures. With the periodic episodes of rise and fall in oil prices, a pattern is observable whereby injection of oil revenues into the economy results in inflationary pressures, overvaluation of domestic currency, soaring imports, price controls, and pro-cyclical fiscal policy—gradually leading to foreign exchange shortages, sudden devaluation, and growth collapse. Relating this experience to that of Latin American economies, one is struck by the divide and especially the lack of cohesion between macroeconomic measures and policies supporting the production structure in Iran. It appears that overreliance on macro policies without an integrated industrial and trade policy component has been a contributing factor to repeated spurs in growth and their collapse in the Iranian economy.

In probing the role of industrial activities in the economy, it was shown that the share of industry in GDP has been gradually rising in real terms (constant prices). However, in an economy that has not been able to control and manage the impact of external shocks (especially oil price fluctuations), that share exhibits a decreasing trend when calculated in current prices. First, in a relatively high-inflation economy, the surge in the imports of tradables and control of prices of domestically produced goods keep their value in check. Second, prices of non-tradable goods and services have increased. Due to the impact of both developments, terms of trade between manufacturing and other sectors have worsened—thus, industrial activities have lost GDP share throughout the period under study.

Another important development has been transformation in the mix of industries. It was shown that most consumer goods and labor-intensive industries have lost their share in production value, value added, and other relevant indicators by almost 50%. In contrast, resource-based, capital- and energy-intensive industries have approximately doubled their share in terms of the same indicators. Thus there has been a clear shift in the production specialization of the country. Overall, consumer goods,

especially the labor- and engineering-intensive industries, have lost share to a rapidly rising commodity sector. This has been reflected in the Iranian trade as well. Although the value of both imports and exports has risen since the implementation of economic reforms, the specialization pattern that has emerged in exports has not been in line with the diversification goals of the economy—as close to 90% of manufacturing exports are either directly derived from oil and gas or are highly energy-intensive.

Investment priorities for industrial development have been based on "comparative advantages," while major delays and policy challenges have emerged in moving along the value chains into downstream industries and/or diversifying into new, more knowledge- and technology-intensive industries. Overall, the Iranian economy has suffered from the distortions predicted by the Dutch disease model. Manufacturing activities have been highly affected by such distortions, and specialization patterns have moved in a direction that requires limited technological learning, R&D, and interactions with local networks of knowledge. Given these circumstances, economic planning in Iran must pay serious attention to productive sector development policies directing macroeconomic measures. Specifically, Iran needs an industrial policy to expedite the accumulation of technological and organizational capabilities that would stabilize economic performance and achieve accelerated industrial development. In order to support such an endeavor, appropriate macro policies are further required to provide an enabling environment for various types of learning and and improving competitiveness.

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