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The Cost of a Revolution

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Introduction

In this study, I have attempted to quantify the economic opportunity benefits/costs of the 1979 Iranian revolution and the subsequent policies and actions of the Islamic Republic for the average Iranian citizen. This question has often been raised in various contexts, but has not received a rigorous treatment yet. I have addressed this issue by focusing the study on the difference between the actual performance of the Iranian economy in 1979-2010 period against a set of scenario-generated counterfactual outcomes, to obtain a measure of economic opportunity cost. Some of these

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scenarios are based on the economic performance of the Iran in the pre-revolution years, and some are constructed from the performance of Iran's neighbors in the period ending in 2010. The goal of this study is to start a dialog, not to provide the definitive answer to this often asked question.

Based on the methodologies used in this study, the opportunity costs of the Iranian revolution range between US$ 59,559.57 to 732,704.80 for the average Iranian citizen in the 1979-2010 period. In other words, the average Iranian citizen experienced a loss of income ranging between US$ 59,559.57 to 732,704.80 in constant 2005 prices and adjusted for purchasing power parity in this period. While the range presented here is large, our findings indicate a consensus loss of income (based on purchasing power parity) of approximately US$ 80,000.00 between 1979 and 2010, or on average US$ 2,580 per year, per person. Thus, a family of four lost (or did not earn) over US$ 10,000.00 per year. Given that by 2010, Iranian citizens earned less than US$ 10,000.00 per year in real terms, the computed "cost" in this study translates into over 25% loss of income in purchasing power terms per year, per person. Since per capita income was significantly lower than US$ 10,000 for the period ending in 2010, this cost is much higher than 25% loss of purchasing power. For example, the computed loss amounts to over 50% of per capita income in 1989. Given that the Iranian economy has been in a severe recession since 2012, such costs have undoubtedly risen. Data scarcity, unfortunately, prevents us from quantifying these costs for post-2010 period.

While my findings are based on counterfactual scenarios, they are generally rooted in plausible assumptions and rigorous economic analysis. Where they are not based on reasonable foundations, I have clearly communicated such shortcomings. Thus, these results are useful for impartial assessment of economic stewardship of the Islamic Republic of Iran in comparison with both its neighbors in the Middle East and North Africa (MENA) region and with Iran's performance in the two decades prior to the revolution in 1978.

Counterfactual analysis is a common tool in economic analysis. Examples include Givens and Kubler and Schmedders, among many others.[2]

Choosing the concept of opportunity cost– the cost that we pay for making one decision instead of another – as the basis of this study is not incidental. This

[2]G.E. Givens, "Estimating Central Bank Preferences under Commitment and Discretion," *Journal of Money, Credit and Banking*, 44:6 (2012), 1033-1061. See also F. Kubler and K. Schmedders, "Non-parametric counterfactual analysis in dynamic general equilibrium," *Economic Theory*, 45:1 (2010), 181-200.

concept is at the heart of economic analysis. Policies implemented at the national level naturally entail opportunity costs and often have long lasting effects. As the science of choice, economics is intended to help individuals, entrepreneurs, and public and private decision makers make better decisions. Evaluation of success or failure of policies requires knowledge of their opportunity costs, to enable us make cost-benefit analysis.

The target audience of this study is the educated reader, though not necessarily the professional economist. Thus, I have avoided presenting mathematical and statistical details underpinning this study as much as possible. Furthermore, I have intentionally narrowed the focus of this study. I have not tried to match the breadth of surveys of the Iranian economic performance or history such as those by Salehi-Esfahani and Pesaran or Issawi[3]. A narrow focus is necessary. The fact is that between 1979 and 2010, the MENA region faced significant endogenous and exogenous shocks such as the breakup of the Soviet empire, the rise of Islamic fundamentalism, several significant wars and uprisings: the Iran-Iraq war of 1980-1988, terrorist attacks on the US in 1993 and 2001; the second Persian Gulf war and the war in Afghanistan; and the Arab Spring in 2010-2012. Adding to this list of mitigating factors would be the Global Financial Crisis, and oil shocks of 1980 and 1986. Disentangling the impact of these events and detecting the causal relationship between these events and the economic performance of Iran is a daunting task that requires sophisticated econometric analysis. Such a study, by nature, is both inaccessible to most readers and highly contingent on the methodology used.

The rest of this study is organized as follows. In Section 2, I present some background information that I consider informative about the attitudes of Iran's key decision makers regarding economic growth and development and the welfare of Iranian citizens. In Section 3, I describe the data used in my analysis and discuss some observed facts about Iran's per capita GDP as well as comparisons with other countries. Section 4 contains the description of methodologies used and discussion of their results. I present my conclusions in Section 5.

Iranian Decision Makers and Economic Growth

The opportunity costs computed in this study are outcomes of decades of policymaking by successive Islamic Republic administrations and decision makers. The Iranian decision

[3]H. Salehi-Esfahani and M.H. Pesaran, "Iranian Economy in the Twentieth Century," *Iranian Studies*, 42:2 (2009), 177-211; see also C. Issawi, *An Economic History of Iran, 1800-1914* (Chicago: University of Chicago Press, 1971).

makers, politicians, and pundits often brush off the costs that their decisions impose on the average citizen as the necessary price to pay for opposing hostile and meddlesome foreign powers. In addition, it is important to bear in mind that the Islamic Republic is not particularly concerned with economic development or elevating the living standards of its citizens.

The founder of the Islamic Republic and its first supreme leader, Ruhollah Khomeini, memorably claimed that "economics is for donkeys".[4] Ali Khamenei, the current supreme leader and Iran's most influential decision maker, is a harsh critic of modern economic growth and development, which he considers a ploy to maintain the Western hegemony. In the fall 2010, when he gave a speech on what he calls "the Islamic-Iranian Model of Progress," he stated that ". . . We intentionally do not use the word 'development', since 'development' has its own value system. We may not necessarily agree with or adopt that value system. We do not want to use a well-known international concept that conveys known perceptions, and injects its values into our system. We want to offer an alternative concept that conveys our values."[5] He then proceeds to spell out what he means by "progress". In his words, progress needs to happen, in order of importance, in realms of spirituality, Quranic thought, knowledge, and at the very last, in livelihood (a catch-all concept for a variety of issues from security to governance). Pointedly, he does not include economic development and improvement in living standards in his hierarchy of progress. He discusses economic concepts only in terms of distributive justice and he makes the claim that one should regard economics and wealth creation with a "non-materialistic" view.

Since 2012, his focus has been a concept which he calls "resistance economics," which echoes ideas from war-time economic management. The Rouhani administration formally adopted "resistance economics" as the blueprint and guideline for economic policymaking in the summer of 2014.[6]

This attitude is not limited to supreme leaders. Many Islamist ideologues, prominent among them Mohammad Taghi Mesbah Yazdi and the late Morteza Avini, have objected to economic growth and development as goals worthy of pursuit. In the summer of 2014, Mesbah Yazdi went as far as saying that "if the main objective was the economy, we would be better off without the (1979) revolution".[7]

[4]V, Nasr, *The Shia Revival: How Conflicts within Islam Will Shape the Future* (New York: W.W. Norton, 2006), 134.
[5]Mr. Khamenei's website: http://farsi.khamenei.ir/speech-content?id=10664/.
[6]Michel Makinsky, "Iran Special: Real Story Behind Supreme Leader's 'Resistance Economy', EA World View, 5 March 2014, at http://eaworldview.com/2014/03/iran-full-story-behind-supreme-leaders-resistance-economy/.
[7]Refer to http://www.radiofarda.mobi/a/f9-mesbahyazdi-critics-rouhani-religion-alamolhoda/25426317.html/.

There is no reason to doubt the sincerity of such statements. The ideologues and decision makers in the highest echelons of power do not consider economic growth, and by extension, the welfare of Iranian citizens to be important. Thus, it is not entirely surprising that Iran lags behind more successful neighbors. This divergence will become more pronounced over time and impoverish the country, since even small differences in the long-term growth rate of economies lead to dramatic disparities over time.

Ignoring fundamental differences between the Islamic Republic's core economic objectives and the globally dominant paradigm of desirability of rising living standards for the average citizen may lead to miscalculations and policy failure. Emergence of a large, prosperous and politically assertive middle class may not be a desirable outcome for the Islamic Republic. In fact, several studies including, but not limited to Alfoneh, Thaler, et al., and Alamdari point to the increasingly clientelist nature of the Iranian state and economy under Khamenei's leadership.[8] In such an environment, economic growth does not necessarily lead to gradual liberalization or democratization of the political system. In addition, the decision makers in a clientelist system can implement policies with impunity that are too politically costly to be palatable in a liberal democracy. In the Iranian context, continuation of the Iraq-Iran war after 1982 and the nuclear program since mid-1990s come to mind.
Description of the Data and Preliminary Comparisons

The main vehicle in my analysis is purchasing power parity (PPP) adjusted real per capita GDP in US Dollars, and based on 2005 fixed prices. I use this measure to overcome the following in-built problems of comparisons across countries: a) differences in tax regimes, government transfers, and subsidies; b) differences in inflation and exchange rate regimes; c) differences in the size and growth rates of population. I use the data from Penn World Tables data bank, maintained by the University of Pennsylvania, to extract per capita real GDP series for Iran and a select number of countries in the MENA region.[9]

Cross-country comparisons based on PPP-adjusted per capita income are common in economic development literature. Realistically, we do not have a better measure of

[8]A. Alfoneh, "All Ahmadinejad's Men," *The Middle East Quarterly* (2011), 79-84; D.E. Thaler et al, "Mullahs, Guards, and Bonyads," *An Exploration of Iranian Leadership Dynamics*, (Santa Monica, CA: RAND Corporation Monograph Series, 2010); K. Alamdari, "The Power Structure of the Islamic Republic of Iran: Transition from Populism to Clientelism, and the Militarization of Government," *Third World Quarterly*, 26:8 (2005), 1285-1301.

[9]I use Penn World Tables version 7.1. This data bank contains data ending in 2010. The latest version (V8.1) extends the data to 2011.

welfare at the individual level. Alternative measures are built on GDP foundations, with cosmetic alterations. For example, the widely discussed human development index (HDI) published by United Nations Development Program is 1/3 PPP-adjusted per capita GDP, and 2/3 life expectancy and educational attainment. Since life expectancy and educational attainment changes are relatively slower than GDP growth, and since both measures are highly correlated with GDP, economic growth is the main driver of changes in HDI. In general, the higher the value of per capita GDP, the better off a country is. According to studies by Barro and Rueschemeyer, et al., per capita GDP is highly correlated with health, wealth, longevity, and democracy.[10]

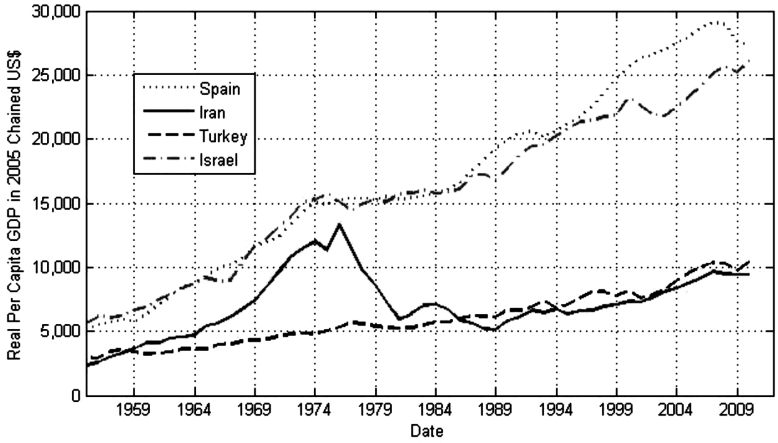
A brief overview of the trajectory of the Iranian per capita income in the period under investigation is useful to better understand the subsequent discussions. Penn World Tables record data on Iran's real per capita GDP starting in 1955. In that year, with an income of US$ 2,328.12, Iran had a per capita GDP less than 80% of Turkey (US$ 2,933.80), and less than 45% of Spain (US$ 5,164.829) and Israel (US$ 5,621.36).

Between 1955 and 1978, Iran enjoyed one of the highest rates of real economic growth, per capita, in the world. At 6.57% per year, this growth outpaced that of countries mentioned above, such that by 1976, at US$ 13,329.78, Iran's per capita GDP was 2.5 times larger than that of Turkey, 88% of Israel's, and 87% of Spain's. In other words, in 1976 Iran was posed to break into the ranks of the rich countries' club. This picture, however, quickly changed with the revolution in 1978. By 1986, Iran's per capita GDP was less than Turkey's and equal to US$ 5,866.89, a drop of almost 66% in comparison with the 1976 level. Since 1986, Iran has remained poorer than Turkey. In comparison with Spain and Israel, in 2010 Iran per capita GDP was about one third of per capita GDP in either country. These patterns are easily detected in

In Table 1, I report the breakdown of real GDP levels by sampling period. Figure 2 provides a visual demonstration for Iranian real per capita GDP. Between 1955 and 2010, Iran's per capita GDP grew at 2.94% per year – a modest rate by developing countries' standard. The fastest growth happened in 1975-76, when growth topped 17.72%. Similarly, the largest contraction happened in 1979-1980, when per capita income shrank by -17.31%.

[10]R. Barro, "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, 106:2 (1991), 407-444; D. Rueschemeyer, E, Huber-Stephens and J.D. Stephens, *Capitalist Development and Democracy* (Chicago: University of Chicago Press, 1992).

Figure 1: Per Capita Real GDP, comparison with Israel, Spain, and Turkey



I report summary statistics for growth by decade, and also important sampling periods. The fastest growth took place between 1955 and 1978. Per capita income grew six-fold in this period and, as mentioned above, Iran enjoyed one of the fastest growth rates in the world. This period is not of immediate interest to us, however, a detailed discussion on the sources of this rapid growth is available.[11]

In the post-revolution period, the average real growth is an anemic 0.20% per year. As is clear from Figure 2 and Table 1, the onset of the Revolution of 1978-79 and the war with Iraq between 1980 and 1988, had a profound impact on the Iranian economy. Real per capita declined from US$ 9,644 in 1978, to US$ 5,898.04 in 1981 and further fell to US$ 5,156.06 by 1989.

The first stage of this loss is explained by the economic policies pursued by the revolutionary government, which included confiscation and nationalization of industries and businesses, confiscation of the property of entrepreneurs, and persecution of those deemed close to the recently toppled Monarchy. These policies led to significant flight of capital and brain drain, and were naturally followed by a significant output drop.

PC GDP stands for per capita GDP in the corresponding period, and ΔGDP represents logarithmic growth rate (year-to-year) of per capita GDP for the corresponding period. “Average” refers to sample mean for the period, while “Min”

[11]Selahi-Esfahani and Pesaran, 2009.

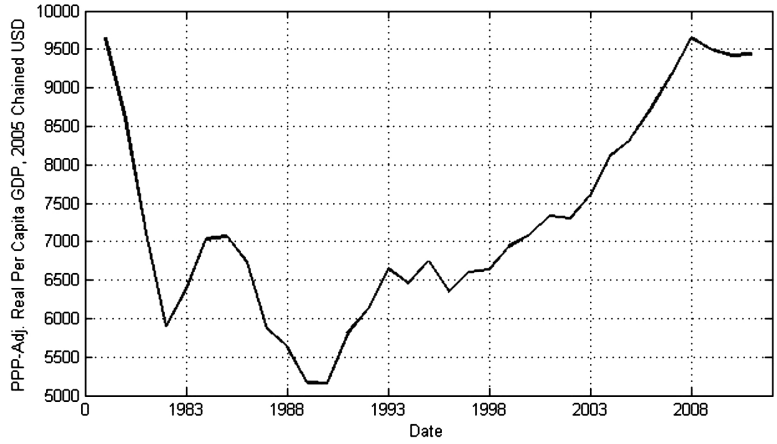
and "Max" refer to the lowest and highest values and the year they were were attained, respectively.

Table 1: Level and Growth Rates of PPP-Adjusted Per Capita Real GDP of Iran
(2005 USD Constant Prices)

	Average		Min				Max			
Years	PC GDP	ΔGDP	PC GDP	Year	ΔGDP	Year	PC GDP	Year	ΔGDP	Year
1955-2010	7085.82	2.94	2328.12	1955	-17.31	1980	13329.78	1976	17.72	1976
1955-1978	7125.80	6.57	2328.12	1955	-15.84	1978	13329.78	1976	17.72	1976
1979-2010	7205.76	0.20	5156.06	1989	-17.31	1980	9645.97	2007	12.67	1990
1960-1969	5319.36	7.38	4091.94	1961	-0.01	1961	7327.97	1969	15.25	1965
1970-1979	10546.83	4.29	8480.23	1970	-15.84	1978	13329.78	1976	17.72	1976
1980-1989	6203.54	-4.56	5156.06	1989	-17.31	1980	7114.11	1980	10.29	1983
1990-1999	6539.44	3.36	5809.50	1990	-5.82	1995	7092.79	1999	12.67	1990
2000-2010	8511.93	2.92	7300.56	2001	-1.62	2008	9645.97	2007	6.65	2003

Between September 1980 and August 1988, Iran and Iraq were at war. In the context of this study, the cost of mobilization for war and the 1986 oil price crash dealt devastating blows to the Iranian production abilities and hence, adversely affected the per capita GDP. In June 1982, Iran's then supreme leader, Ayatollah Khomeini, rejected a ceasefire offer, leading to Iran's international isolation. This decision almost certainly led to increased supply of crude oil by Saudi Arabia. This crude oil glut,

Figure 2: PPP Adjusted Per Capita Real GDP of Iran in 2005 constant price USD



coupled with technological innovations leading to lower oil-intensive production in industrialized countries, resulted in the oil market crash of 1986. Between 1986 and the ceasefire in August 1988, Iranian economy fared very poorly.

Another detrimental factor affecting income growth in this period was a population boom that started in late 1960s, averaged 3.75% between 1976 and 1990, and reached the maximum of 4.29% per year in 1981. A stagnant or contracting economy along with rapidly rising population naturally led to further decline in income per person. The row labeled 1980-1989 on Table 2 shows that between 1980 and 1989, Iranian per capita GDP contracted by 4.56% per year.

As (Mojaver, 2009) documents, early 1990s were characterized by massive investments in physical and human capital.[12] Furthermore, between 2003 and 2012, Iran enjoyed an unprecedented oil revenue windfall, primarily fueled by emergence of China and India as important global economic powers. The size of this windfall is conservatively estimated to be over half a trillion US Dollars. Yet, oil revenues and the contribution of early 1990s investments, coupled with the astonishing successful population control policy that saw population growth slowdown from over 4% a year in late 1980s to about 1.26% a year for 1990-2010, did not result in significant income growth.[13] The rows labeled 1990-1999 and 2000-2010 in Table 1 show that the average growth rate during these periods were 3.36% and 2.92% per year, respectively. Typically, an investment boom leads to periods of rapid income growth. However, Egypt (3.30%), Turkey (2.54%), or Lebanon (5.46%) which did not experience a reconstruction boom or an oil windfall, post similar or better growth results in the same time span.

Salehi-Esfahani and Pesaran discuss the causes of short-lived impact of the "reconstruction" policies undertaken by president Hashemi Rafsanjani's administration.[14] In short, balance of payment problems and difficulties in management of partially liberalized markets following the decline in oil prices after 1993 led to interventions in foreign exchange markets in particular, and international trade in general, leading to a sharp slowdown in growth. This trend is clearly visible in Figure 3.

As recently as 2009, Mojaver detected evidence in favor of significant decrease in total factor productivity (TFP, or simply "productivity") after the revolution.[15] He

[12]Mojaver, 2009.

[13]Data on Iranian population growth rates are from Penn World Tables.

[14]Pesaran, 2000; Salehi-Esfahani and Pesaran, 2009.

[15]Mojaver, 2009.

concludes that Iranian productivity in manufacturing did not recover to pre-revolution levels. If this observation also holds true for other sectors, especially services - the largest in the Iranian economy – then along with other factors such as government policies, we may have a culprit for the slow rate of income growth in post 1990s period. While it requires further research, one can speculate that the legal system, uncertainty at domestic and international levels, as well as massive government-induced distortions in the market may be responsible for this slowdown.

Moreover, Salehi-Esfahani and colleagues, in their study of oil exports, show that inflation has a significant negative effect on long-run real output.[16] Since inflation has been stubbornly in double digits for almost the entire post-revolutionary period, its negative impact has neutralized some of the positive factors such as the oil windfall of the period 2003-2008.[17]

Finally, a discussion of the Iranian economy in early 21st century must include the impact of the country's nuclear program. This program has been extremely costly, controversial, financially wasteful, and shrouded in secrecy. It has led to diplomatic tension, economic sanctions, and uncertainty at least since 2002. In terms of economic costs, estimates range between 100 billion USD (Vaez & Sajjadpour, 2013) to 500 billion USD (Rosen, 2015). Costing roughly 11 billion USD, the Bushehr nuclear plant is the most expensive facility in the world, both in absolute and per unit of output terms. Even Mehdi Araghchi, Iran's chief nuclear negotiator in P5+1 negotiations leading to the Joint Comprehensive Plan of Action (JCPOA) agreement in July 2015, admits that "measured in economic terms alone, our nuclear program is a catastrophic loss . . . . But we are willing to bear such costs to maintain our dignity, independence, and progress. We (pay these costs) in order to resist others' belligerence."[18]

Accurate estimates of economic damages sustained by Iran during the Iraq-Iran war are not available. (Hiro, 1991) reports a conservative estimate of 627 billion USD.

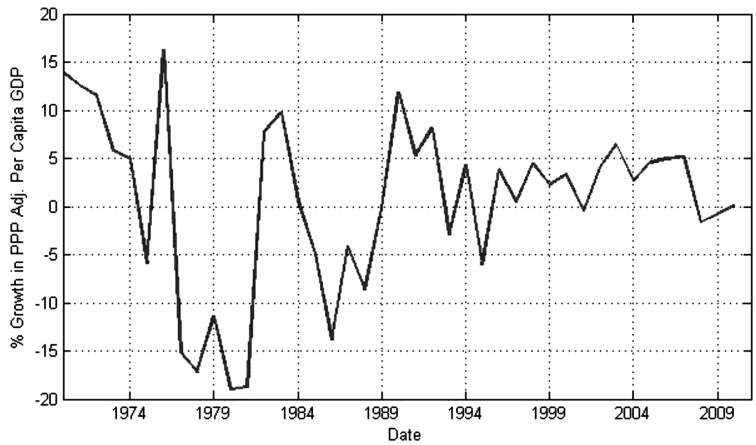
[16]H. Saleh-Esfahani, K. Mohaddes, and M.H. Pesaran, "Oil Exports and the Iranian Economy," *Quarterly Review of Economics and Finance*, 53:3 (2013), 221-237.

[17]Among many others, I have shown elsewhere that persistent double-digit inflation and poor macroeconomic stewardship are among the main problems facing the Iranian economy. Briefly, both problems stem from failed attempts of the government to influence the real cost of capital, leading to massive arbitrage opportunities and corruption. This crucial issue is unfortunately beyond the scope of the current study. See M. Jahan-Parvar, *The Practice of Central Banking in the I. R. of Iran: Is There Room for Reform?* (London: Legatum Institute, 2013). for a discussion of the topic.

[18]See https://goo.gl/Djdwcl. His speech was first reported by Fars news agency. This report was later removed following Araghchi's objection to publication of his off-the-record remarks.

Based on (Rosen, 2015) reported value of roughly 500 billion USD, the cost of Iran's nuclear program is close to the damages sustained during the war with Iraq. In other words, the Islamic Republic policy makers have imposed the equivalent two wars on a middle-income country in thirty years.

Figure 3: Growth Rates of PPP Adjusted Per Capita Real GDP of Iran in 2005 constant price USD

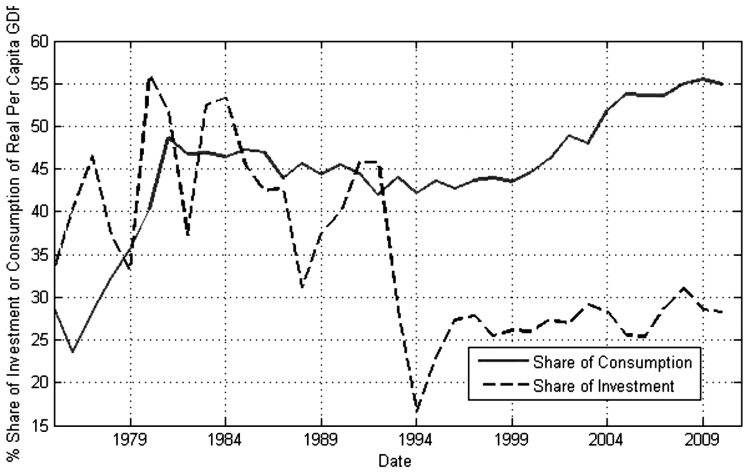


Empirical economic growth studies establish a significant positive relationship between accumulation of capital and the growth rate of investment in an economy and its future growth potential. In general, investment, after paying for depreciation of the existing capital stock, turns into new capital and adds to the capital endowment of an economy. Developing economies devote a larger percentage of their income to investment than rich countries. In part, this is due to high marginal rate of return on capital in developing economies (which are typically abundant in labor, but not in capital).[19] We observe in Figure 4 that this empirical regularity does not hold for Iran. Since 1992, the share of investment as a percentage of per capita real GDP has fallen and stayed low, while especially since 2000, share of consumption in per capita GDP has increased. This observation implies low future growth in output. Identifying the factors that cause this observation is an interesting topic for future research.

Finally, I discuss data from other MENA countries used in this study. The sample includes countries that during the 1978-2010 period had cordial relations with the West,

[19]See R.J. Barro and X. Sala-i-Martin, "Convergence," *Journal of Political Economy*, 100:2 (2003), 223-251 for further information.

Figure 4: Shares of investment and consumption outlays as a percentage of PPP adj. real per capita GDP, in 2005 constant price, US$.



did not engage in wars of aggression or state-sponsored terrorism, and had taken steps to liberalize their economies. I also limit my sample to countries in the Middle East. Thus, I do not include Cyprus, a European Union member, North African countries (except Egypt which has strong economic and cultural ties to the Middle East), and non-sovereign territories such as Palestinian Authority in the West Bank and Gaza.

The sample includes Bahrain, Egypt, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Turkey, the United Arab Emirates, and Yemen. To be clear, I do not claim that other countries in the MENA region are examples of good economic stewardship. Many of them face significant policy challenges, such as high youth unemployment, low productivity growth, low levels of innovation, and anemic entrepreneurial activity (with the exception of Israel and Turkey). But my results show, and they are corroborated by findings of other studies, that Iran has an unflattering record even in comparison with its neighbors.[20]

As I explain in Section 4, I use per capita GDP growth data from the sample countries to construct counterfactual paths for Iran's economy. This strategy is meaningful if there is reasonable correlation between income levels among the countries represented in the sample, and between income levels of the sample countries and Iran.

Table 2 shows that there is high positive correlation between income levels in the plurality of the countries in this sample, and between Iran and income levels in sam-

[20]Salah-Esfahani et al., 2013.

ple countries. Panel B of this table shows that in addition to correlation in levels, growth rates of income are also non-trivially correlated. I interpret these results to be encouraging for the approach adopted in the next Section.

Table 2: Correlations between Levels and Growth Rates of PPP-based Per Capita GDP among MENA Economies

	Egypt	Israel	Jordan	Lebanon	Oman	Turkey	UAE	Kuwait	Qatar	Saudi	Iran
Panel A: Levels of Income											
Bahrain	-0.17	-0.09	0.33	-0.06	-0.15	-0.03	0.56	0.79	0.83	0.88	0.96
Egypt		0.99	0.27	0.77	0.95	0.96	0.52	0.72	0.89	0.83	0.97
Israel			0.28	0.76	0.93	0.97	0.54	0.76	0.85	0.84	0.94
Jordan				0.42	0.41	0.36	0.44	0.61	0.83	0.64	0.83
Lebanon					0.82	0.78	0.37	0.60	0.79	0.67	0.81
Oman						0.94	0.50	0.71	0.93	0.83	0.95
Turkey							0.65	0.77	0.89	0.88	0.97
UAE								0.39	0.49	0.56	0.63
Kuwait									0.53	0.80	0.76
Qatar										0.77	0.88
Saudi											0.88
Panel B: Growth Rates of Income											
Bahrain	0.16	0.07	0.02	0.03	-0.23	0.13	-0.08	0.33	0.31	0.45	0.11
Egypt		0.10	-0.33	0.16	-0.07	0.03	-0.20	0.07	-0.11	-0.07	-0.12
Israel			0.13	0.29	0.00	0.31	0.27	-0.01	0.04	0.25	0.03
Jordan				0.06	0.05	0.01	-0.17	-0.06	0.14	0.10	0.31
Lebanon					0.08	0.17	0.02	-0.18	-0.16	0.13	0.2
Oman						0.10	0.04	0.17	0.53	0.50	0.19
Turkey							0.37	0.04	0.22	0.28	0.05
UAE								-0.28	0.12	-0.01	-0.03
Kuwait									-0.22	0.22	-0.09
Qatar										0.15	0.51
Saudi											0.07

Methodology and Numerical Results

In this section, I present a comprehensive discussion of the underlying computations that generate the numerical results. They are readily divided in two categories:

"naïve or own country" and "regional" scenarios. "Naïve or own country" scenarios use Iranian growth data from 1950s to 1978 to construct counterfactual experiments and results. "Regional" scenarios are based on contemporaneous data (1978 to 2010) from the MENA region sample discussed in Section 3.

The following equation is the measure used to make comparisons. I call it "cumulative cost" if this value is negative or "cumulative benefit" if it is positive:

$$CCB_{t\rightarrow T} = \sum_{t=1979}^{2010}\left(Y_t^{Sce} - Y_t\right), \quad (1)$$

where Yt^{Sce} is the real per capita GDP in 2005 US dollars generated by one of the scenarios discussed below, Yt is the actual realization of Iranian per capita real GDP in year t. We compute the difference between scenario based and actual real per capita GDP for each year in sample, t, and then sum up these differences for the entire sample or a sub-sample.

If the resulting value for our measure, denoted as $CCBt\rightarrow_T$, is less than zero, then the value of per capita income based on that particular scenario for the duration of (sub-) sample is greater than what was actually achieved by the Iranian economy. We view such an outcome as a cost imposed on the average Iranian citizen, and as a proxy for opportunity costs. It simply says that if the Iranian economy had followed the path assumed by a particular scenario instead of what it actually did follow, the average Iranian citizen would be better off by the number of dollars that appear in $CCBt\rightarrow_T$.

Alternatively, if $CCBt\rightarrow_T$ is greater than zero, we interpret this outcome as Iranian economy outperforming what could be achieved under that particular scenario. Hence, we call $CCBt\rightarrow_T < 0$ "cumulative cost" and $CCBt\rightarrow_T > 0$ as "cumulative benefit".

Naïve Scenarios

As discussed earlier, Iran enjoyed high growth in real per capita personal income between 1955 and 1978. The average growth rate in this period was 5.75% per annum. The scenarios discussed in this section are all related to that growth trajectory or levels of per capita income for 1955 to 1978.

Also known as "projections," these scenarios are familiar staple of the popular media. The most well-known of such projections was the assertion that Soviet Union's Gross National Product (GNP) would surpass that of the United States in 1984.[21]

[21]This is based on the projections printed on the inside jacket of the 1961 edition of Paul Samuelson's widely read textbook, *Economics: An Introductory Analysis* (New York, McGraw-Hill).

Another example was the widely held belief in 1980s that Japan would surpass the United States in early 1990s as the largest (and the dominant) economy in the world. Projections are fraught with problems, as the US-USSR and US-Japan examples amply demonstrate.

Table 3: Computed CCBt→T Values for All Scenarios

"Scenario" refers to different projections and counterfactual experiments detailed in Section 4. CCBt→T refers to cumulative cost or benefit introduced in Equation (1). If this number is less than zero, it implies a cumulative cost to the average citizen for studied period, and if it is greater than zero, it signifies gains. "SPC GDP 2010" stands for scenario-generated real per capita income in 2010, as opposed to what is actually realized in the data. "Min" and "Max" refer to the smallest and largest values of real per capita GDP generated by each scenario.

Scenario	CCBt→T	SPC GDP 2010	Min	Max
Panel A: Naïve Scenarios (Projections)				
Frozen in '78	-78,031.70	9,644.25	9,644.25	9,644.25
High growth	-732,704.80	65,710.62	10,240.26	65,710.62
Middle income trap	-207,454.23	14,714.77	10,240.26	14,714.77
Panel B: Regional Scenarios (1979-2010)				
Regional: Average	-83,608.05	9,918.66	8,852.31	10,425.17
Regional: High	-107,569.18	10,048.64	9,822.70	11,838.67
Regional: Low	-59,559.57	9,413.69	6,593.20	9,781.22
Panel C: Regional Scenarios (1989-2010)				
Regional: Average	-20,353.25	9,918.66	8,995.51	10,425.17
Regional: High	-34,758.80	10,048.64	9,988.75	11,838.67
Regional: Low	10,758.50	9,413.69	6,793.10	9,781.22
Panel D: Monte Carlo Simulation-Based Scenarios				
Monte Carlo Simulation	-79,613.78		5,523.02	19,223.10
1989-2010 sub-sample	-14,713.64		5,156.60	10,742.93

I refer to the first scenario studied as "Frozen in '78". This scenario computes the value of $CCBt\rightarrow_T$, had we kept Iranian per capita real GDP constant at its 1978 level (US$ 9,699.28 per person in 2005 prices) for 30 years.

The outcome of this scenario is reported in the first row of Panel A of Table 3. This scenario implies that real per capita GDP is invariant between 1979 and 2010, leading to a cumulative cost equal to US$ 78,031.70 per person. As we will see later,

this estimate is indeed close to what we find using more sophisticated techniques.[22] This value for opportunity costs in terms of lost income translates into a cost equal to approximately US$ 2,517.12 per person, per year.

The second scenario is called the "high growth scenario". It is the most implausible scenario in this study, and assumes that the real output growth rate of 5.75% could be sustained for the next three decades. Almost no economy, developed or developing, has been able to sustain such high growth rate in per capita real GDP for half a century. It implies that all factors of production (labor, capital, and technology as well as exploitation of natural resources) enjoyed gains in productivity and growth at a rate faster than that of all industrialized countries, which typically have productivity growth rates between 1.5 to 3% during economic expansion periods.[23] Even fast-growing Asian economies such as Korea, Taiwan, Singapore, China and Malaysia sustained above 5% growth in per capita real income and in the case of the latter, for 27 years.[24]

Given that per capita real GDP in post-revolutionary Iran did not reach 1978 level until 2006, this scenario presents a massive opportunity cost for the average Iranian citizen. However, this number should be treated cautiously as it is based on difficult-to-justify assumptions. The results of running the projection are available on the second row of Panel B in Table 3. This scenario implies a cumulative cost for the average person equal to US$ 732,704.80, or US$ 23,635.64 per year. Notice that this scenario also implies a real per capita GDP equal to US$ 65,710.62 for 2010, which is over two times higher than real per capita GDP in Spain (US$ 27,331) or Israel (US$ 26,034). One should view this projection's outcomes skeptically.

In the last two decades development economists have devoted considerable energy to the study of "middle income trap" phenomenon. In short, this problem means that many developing economies cannot sustain uninterrupted growth in per capita real GDP that allows them to transition from middle income or low-middle

[22]This is not surprising. Per capita real GDP exceeds US$ 9,644 only once in 1979-2010 period, in 2007. Thus, the computed cumulative cost in this scenario is similar to those in computations that yield end-of-period simulated per capita incomes around US$ 10,000.

[23]For example, the U.S. economy enjoyed approximately 1% multifactor productivity growth between 1987 and 2011. Notice that this time period includes the high productivity dotcom boom of 1990s. Economic theory implies that in the long run, per capita output can only grow as fast as gains in productivity, which enables an economy to produce more efficiently, and net accumulation of resources of production (labor and capital). Source: U.S. Bureau of Labor Statistics.

[24]J. Felipe, A. Abdon and U. Kumar, *Tracking the Middle Income Trap: What is it, Who is in it, and Why?* (s.1.: Levy Economics Institute, 2012).

income to high-income status.[25] Thus, after an initial period of fast growth due to exploitation of previously untapped natural resources or copying new production technologies, output growth in many developing economies stagnates.[26]

According to this literature, if not matched by gains in innovation and productivity, rising labor costs and the subsequent loss of international competitiveness leads to declining per capita output growth. Only 13 countries considered low or low-middle income in 1960 could join high-middle or high-income economies by late 2000s. A number of such countries are Iran's neighbors: Israel, United Arab Emirates, Qatar, and Kuwait. However, Oman, Jordan, Lebanon, and Turkey are currently in or have been in the middle-income trap for extended periods.

To explore what could have been the impact of the middle-income trap on Iran's economy, I impose a scenario that implies a declining growth rate after reaching the middle-income level. In particular, I allow growth rate of per capita GDP to decline from 5.75% to about 1.00 % in 15 years, and then decline to about 0.45% per year for the rest of the sample. The projection results from running this scenario are available on the third row of Panel B in Table 4. This scenario points to a cumulative cost equal to US$ 207,454.23 per person for 1979 to 2010, or US$ 6,692.07 per person, per year. It also delivers a per capita real GDP for 2010 equal to US$ 14,714.77.

For a more rigorous study of opportunity costs, we have to appeal to economic methodology. This is what I demonstrate in the next two sections.

Regional Scenarios

As pointed out earlier, the MENA region has encountered significant economic and political volatility in the last three decades. Such volatility would definitely impact the growth trajectory of the region's economies. The naïve scenarios studied in the previous section ignore such exogenous influences, which is why I consider them to be naïve. For example, it is implausible to assume that the oil price bust of 1986 or the financial crisis of 2007-2009 could not affect Iran's real income growth. But this is precisely what the "high growth scenario" in the previous section assumes. In this section, I address this important shortcoming.

[25]Official cut-off points for income levels in 1999 constant US dollars of per capita real GDP, based on Felipe et al., 2012, are: 1) low income: less than US$ 2,000, 2) lower middle income: more than US$ 2,000 but less than US$ 7,250, 3) upper middle income: more than US$ 7,250 but less than US$ 11,750, and finally 4) high income: more than US$ 11,750.

[26]Felipe et al., 2012.

The scenarios investigated in this section are based on a simple observation: Iran's economy and its neighbors, by and large, follow the same business cycle fluctuations. The channels of transmission are obvious enough. Two of Iran's major trading partners are United Arab Emirates and Turkey.[27] Hydrocarbon export revenues account for over 80% of Iran's exports and are its main source of hard currency. Similarly, revenues from oil and gas trade are the main driving force for Persian Gulf oil and gas exporting economies. In addition, output growth is correlated in these economies – see Table 2. Thus, it is reasonable to assume that barring nonmarket events such as war or political problems, Iran should follow a growth path similar to its neighbors.

However, pinning down what this growth path would have been with certainty is impossible. Yet, there is a simple solution. Assuming that absent non-economic impediments, Iran should have the same business cycle as its neighbors, then its GDP growth rate would have been similar to its neighbors in each year in our sample. This means that such a growth rate would be a stochastic variable and subject to a distribution law.

This assumption allows us to consider three counterfactual scenarios. In the first scenario, which I call "average growth rate scenario," per capita GDP growth in Iran follows the average per capita GDP growth rate among the MENA countries in the sample. The second scenario, which I call "high growth rate scenario," implies that Iranian per capita real GDP follows the average growth rate of the best performers in the sample. The third scenario assumes that Iran's per capita GDP grows at a rate comparable to the slower performers in the sample. Thus, I refer to this scenario as the "low growth rate scenario".

I assume that growth rates are normally distributed for the cross-section of economies in the sample for any given year. This assumption means that growth rates have a familiar bell-shaped distribution, a common assumption in the economic growth literature.[28]

[27]CIA Fact Book, 2012. UAE is Iran's number one source of imports and accounts for 30.6% of Iran's total imports. Turkey accounts for 8.7% of Iran's exports (the 4th export market) and 4.2% of imports (also the fourth imports partner).

[28]Examples include R. Barro, "Determinants of Democracy," *Journal of Political Economy*, 107:6 (1999), 158-183; R. Barro et al., " Convergence Across States and Regions," *Brookings Papers on Economic Activity*, 1 (1991); Barro & Sala-i-Martin, 1992; D. Canning et al., "Scaling the volatility of GDP growth rates," *Economics Letters*, 60 (1998); Barro & Sala-i-Martin, *Economic Growth* (Cambridge, MA: MIT Press, 2003).

In the first scenario, I compute the average growth rate and the variation of growth rates for the countries in our sample in each year. Iranian data is naturally excluded to avoid contaminating the computations. We also compute upper and lower bounds on growth rates that encompass about 70% of possible values for real per capita GDP growth.

These three measures, average, upper bound, and lower bound growth rates for real per capita GDP growth for the region, allow me to study what would have happened if Iranian policy makers had followed liberalization policies (as the UAE, Israel, and Turkey did in 1990s and 2000s); or had implemented more competent monetary policies to avoid the perennial double-digit inflation; or had followed a less confrontational foreign policy.

Computing cumulative opportunity costs based on the average regional growth rate scenario yields results reported in the first row of Panel B in Table 3. The cumulative opportunity cost for this scenario is equal to US$ 83,608.05, or US$2,697.03 per person, per year. Based on this scenario, per capita real GDP in 2010 should have been US$ 9,918.66, instead of US$ 9,432.06, and high and low values of per capita GDP would be US$ 8,852.31 and US$ 10,425.17 instead of US$ 5,156.06 and US$ 9,645.97 respectively.

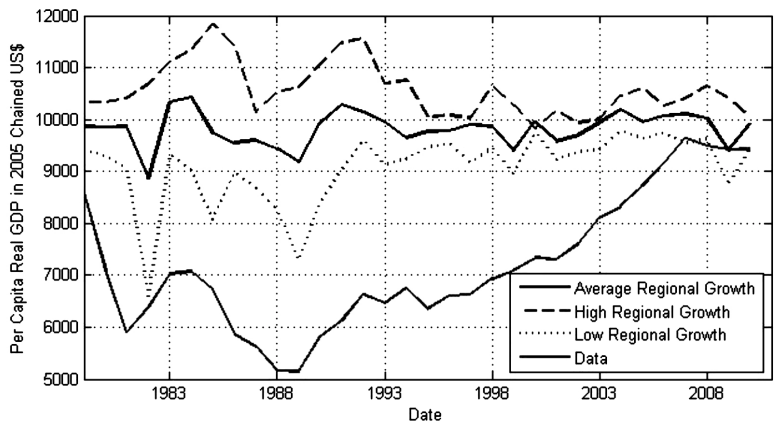
High regional growth rate scenario implies growth rates for the real per capita Iranian GDP that are one standard deviation larger than the average growth rate for the ten MENA economies in the sample. These results are reported in the second row of Panel B, Table 3. This scenario implies that the value of opportunity costs amounts to US$ 107,569.18, or US$ 3,469.97 per person, per year. This scenario implies that 2010 per capita real GDP equal to 10,048.64, an upper limit equal to US$ 11,838.67, and a lower limit equal to US$ 9,822.70.

Low regional growth rate scenario puts the CCB cost value at US$ 59,559.57. It also sets the 2010 per capita income at US$ 9,413.69. The upper and lower income limits are US$ 9,781.22 and US$ 6,593.20, respectively.

Figure 5 shows that the counterfactual scenarios generate real income paths that are above what the Iranian economy actual attainment in 1979-2010 period, even under the low growth assumption. In summary, this exercise shows that the cost of economic mismanagement and political decisions made since 1979 have contributed to significant loss of income and purchasing power. Following what even the slow performers in the region achieved could still put Iran in a better position in terms of the welfare of its citizens.

Figure 5: Regional Scenarios

This figure plots the results for running the three scenarios based on the growth rates of per capita real GDP of 11 MENA countries in sample. The first scenario, 'Average Growth', assume that the Iranian per capita GDP grows at the average rate of its MENA neighbors for each year in sample. The second scenario, 'High Growth', assumes that the Iranian per capita GDP grows at a rate one standard deviation above the average growth of Iran's neighbors for each year in sample. The last scenario, 'Low Growth', assumes that Iranian real per capita GDP grows one standard error lower than the average of its neighbors for any given year.



Monte Carlo Simulation-Based Growth Rate Scenario

While the scenarios discussed in the previous section address many shortcomings inherent in projection methods, they still suffer from an important statistical shortcoming. Statistical inference methodology yields accurate results when applied to sufficiently large samples of the population under investigation. Using a sample of only ten observations per year is decidedly not large enough. There is a solution available though. We appeal to a concept called the central limit theorem, which in practice enables us to design repeated samplings from a (potentially) unknown distribution.[29] This is tantamount of generating numerous samples, and then averaging the results. Implementation of simple Monte Carlo simulations of the form I describe here are widespread in engineering, physics, finance, and economics.[30]

[29]The central limit theorem implies that under mild requirements, most empirical distributions converge to a limiting Normal distribution.

[30]D. Creal, "A Survey of Sequential Monte Carlo Methods for Economics and Finance," Econometric Reviews, 31:3 (2012), 245-296 for a comprehensive review of these methods.

I proceed to implement this method as follows: First, I assume that for each year in the sample, growth rates are distributed with mean equal to the average growth rate of the cross-section of economies in my sample and variance equal to the sample variance of the same cross-section. Second, I form a path where initial income of 1978 grows following a random drawing of the distributions specified in the previous step for years 1979 to 2010. This forms one growth path for the Iranian per capita real GDP. Third, I subtract the actual data for 1979-2010 period, element by element, from the scenario-based real per capita GDP generated in step 2. Fourth, I sum the resulting differences to generate one realization of $CCBt\rightarrow_T$. I repeat this exercise 100,000 times, save the generated $CCBt\rightarrow_T$ in each run. Finally, I compute the average value of $CCBt\rightarrow_T$ for the whole Monte Carlo simulation. This number is the Monte Carlo generated $CCBt\rightarrow_T$, which does not suffer from small sample shortcomings, since it is based on a large number of resamplings.

The outcomes from executing this scenario are available in the first row in Panel D of Table 4. Based on Monte Carlo simulations, the value of opportunity cost in 1979-2010 period is equal to US$ 79,613.78 in 2005 constant prices, per person. Alternatively, this cost is equal to US$ 2,568.19 per person, per year. Monte Carlo simulations generate an upper bound for Iran's per capita real GDP equal to US$ 19,223.10 and a lower bound equal to US$ 5,523.02.

Figure 6: Monte Carlo Simulation-Based Scenario

This figure plots 100 paths of Monte Carlo simulations for Iranian PPP-adjusted real per capita GDP. The solid red line on the bottom reflects the actual data for the period1979-2010.

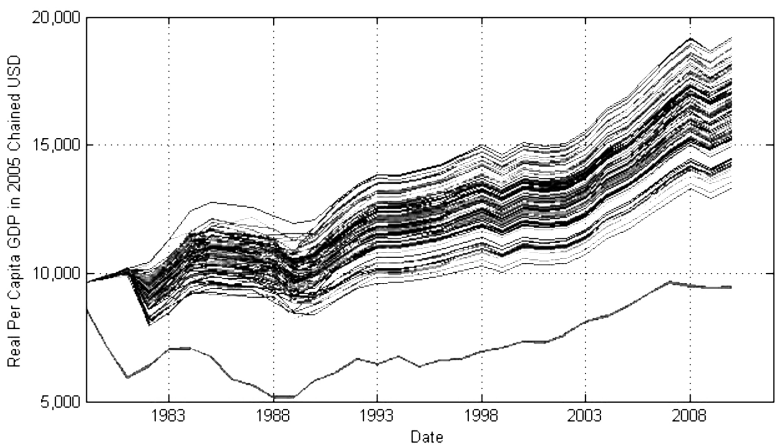


Figure 6 provides a visual representation of this method based on 100 simulated paths plotted along with the actual data. As it is clear from this figure, my Monte Carlo simulation results reconfirm what was found in the previous section: avoiding the actions taken by the Islamic Republic, both economic and political, and just following what Iran's neighbors did for the last three decades, would allow the average Iranian citizen to enjoy a significantly higher living standards. As it is clear from this figure and the results reported on Table 3, Monte Carlo simulated paths are strictly above the actual data. Notice that if Iranian policy makers could implement winning pro-growth policies along the lines of Israel, South Korea, Chile, or Taiwan, the end result for the average Iranian citizen could be even higher living standards. But few countries have replicated the stunning success of Taiwan or South Korea, so one can only hope that Iranian policy makers reverse course and follow their more successful neighbors.

Economic Performance since Iraq-Iran War:

The impact of direct military conflict on any economy is not negligible, and Iran is not an exception. A good part of cumulative opportunity cost discussed in the previous sections can be attributed to uncertainty and policies following the victory of the revolution in 1979 and the impact of war in 1980-1988. Table 1 presents results for 1990-1990 and 2000-2010 periods. Both periods witnessed modest growth, however Iran has not been able to return to pre-revolution growth rates. How successful was the system to recover from both revolution and war? In other words, is the system viable enough to generate high enough growth; at least comparable to other countries in the MENA region?

To answer this question, we look at Panel C and the second line on Panel D of Table 4. The values reported on Panel C, reflect the cumulative loss or gain for 1989-2010 period based on regional scenarios. These values are all significantly smaller than what is reported on Panel B of the same table, validating the assertion that the bulk of lost income is due to the revolution, the war with Iraq, and population policies of 1980s.

However, we observe a small cumulative "gain" only in case of the low growth scenario. The same conclusion is true for the second line on Panel D of Table 4. Once I limit Monte Carlo results to 1989-2010 period, the size of cumulative opportunity cost drops, but it does not turn positive. We recall that 1990s were a period for increased investment. Population growth slowed down significantly between 1990 and 2010. In addition, between 2003 and 2012, Iran earned a unique and unprecedented oil revenue windfall totaling over half a trillion dollars.

In other words, Iran's economic performance is at best better than the lagging economies in our sample. This result indicates that the system is not capable of generating a pro-growth environment. In case of an escalation of confrontation with the international community, this characteristic of the Islamic republic bodes ill for the ability of Iran to recover from losses due to a military engagement and/or extended and comprehensive economic sanctions in a reasonable time period.

Conclusion

The decisions of Islamic Republic's leaders and policy makers in their four decades in power have generally escaped rigorous scrutiny. Many people within and outside the system have questioned the rationale for some of the decisions made. In general, these criticisms are not rigorous, and have not focused on the potential opportunity costs. In this study, I have provided a preliminary measurement of the costs that the average Iranian pays for the policies of his/her government. I have intentionally set a low bar for my results: matching the behavior of other countries in the MENA region. With even such a low bar, Iran's performance is unflattering.

The opportunity costs for the average Iranian citizen are quite high. For a middle income country with per capita real GDP of less than US$ 10,000 for the sample period, an annual opportunity cost equal to US$ 2,500 is high. To better understand this issue, think about roads not built, research and development not carried out, health care improvements not realized, houses not built, and pension and retirement savings not funded. In other words, the average Iranian is significantly poorer than his/her neighbors or in comparison with what (s)he could have earned due to policies and actions taken by the Iranian state. Notice that massive investments in physical and human capital were undertaken, particularly after the Iran-Iraq war, and the oil revenues since 2003 are significantly larger than what Iran earned prior to the revolution. Thus, this underachievement cannot be attributed to lack of investment or oil income shortfalls. Continuation of such policies impoverishes future generations.

A cornerstone of the Islamic Republic's propaganda regarding U.S., Western, and international sanctions has been the claim that "sanctions and isolation have had absolutely no impact on our nation and economy" or "isolation and economic sanctions have led us down the path of self-sufficiency and progress". These claims turned out to be false, as both the outcome of 2013 presidential election and the July 2015 JCPOA agreement amply demonstrated. The severity of the 2012-2014 recession, a direct result of the imposition of sharp international sanctions, focused the public's interest on many fragilities of Iran's economy. However, the majority

of debates and commentaries are focused on recent economic performance of Iran, and the impact imposing or lifting of sanctions. The costs imposed by international sanctions are undeniably real. However, they are only an addition to opportunity costs borne by Iranian citizens – as the price paid for their country's policies, both domestic and international – since 1979.

Given the expressed indifference of key Iranian decision makers to the welfare or living standards of ordinary citizens, the opportunity costs computed in this study may be completely justified. If key Iranian policy makers operate under a different set of rules, arguing that Iranian citizens deserve better may not change their views. They pursue goals that may be incompatible with welfare maximization, and have different measures for success. However, many Iranian economic decision makers at least nominally express interest in growth and prosperity for their country. In this study, I highlight the discrepancies between the stated objectives of these officials and the outcomes of the implemented policies.

Iranian politicians often try to wrap the debate about their policies and actions in a nationalistic garb, accusing their critics of not having Iranian citizens' best interest in mind. The goal of this study is to recast the debate about the merit of policies pursued in the last four decades in concrete, economic terms. Once the costs of decisions are measured in terms of numbers rather than (nationalistic or religious) sentiments, informed dialog becomes more attainable and fruitful.