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The Role of Military Expenditures in Pre-Revolutionary Iran's Economic Decline

Introduction

> I told the Shah that if the Army budget were increased we could do little if any thing for agriculture, education or public health. He said, "Very well, then; we'll have to postpone those things."

This incident occurred in 1943, a year after the Shah had succeeded his father and was recounted by A. C. Millspough,[1] then financial advisor to the Iranian government.

By the 1970s, however, the Iranian government was denying the relevance of the "guns versus butter" tradeoff for the country. The Shah posed the problem differently, "What is the use of having an advanced industry in a country which could be brought to its knees when faced with any small asinine event?" Asked on a subsequent occasion whether the desire for maximum national power implicit in such defense expenditure was compatible with the efforts to achieve maximum economic development, he replied, "It is not only

1 A. C. Millspugh, *Americans in Persia* (Washington: Brookings Institution, 1946), p. 77.

compatible but essential. The one is worthless without the other. There is no economic power without military power.[2]

On the other hand, defense expenditures in particular have been cited by several observers, such as Halliday,[3] as having had a detrimental impact on the country's economy, thus, in part contributing to internal tensions that ultimately resulted in the revolution.

The existing literature on this period in Iran's history is, unfortunately, largely anectdotal, with little or no attempt to determine empirically the links between military expenditure and various economic performance indices. Furthermore, from a theoretical point of view, a logical case could be made either way that the likely net impact of military expenditures was negative or positive.[4]

Classical economic theory, for example, would predict, on the basis of resource allocation, that defense will decrease investment or civilian consumption and thus reduce growth or welfare. The military burden would have to be justified on the basis of other social welfare gains such as an increase in collective security. Keynesian theory, on the other hand, could claim that in the presence of inadequate effective demand the operation of the multiplier would imply an increase in national product resulting from additional defense expenditure; thus there could be some economic justification for military spending. If the economy operates with substantial excess capacity, then additional demand and output would raise capacity utilization, thereby increasing the rate of profit and possibly accelerating investment. Whether in the short and long run the former or latter effect dominates will determine the final outcome of defense on the country's economic performance.[5] Clearly, the impacts of military expenditure will also vary from

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2 Shahram Chubin "Implications of the Military Buildup in Less Industrial States" in V. Ra'anan, ed., *Arms Transfers to the Third World: The Military Buildup in Less Developed Countries* (Boulder, Colorado: Westview Press, 1978), p. 268.

3 Cf. Fred Halliday, "Iran, the Economic Contradictions" *MERIP Reports* (July-August 1978), pp. 9-18; *Iran: Dictatorship and Development* (New York: Penguin Books, 1979); "Theses on the Iranian Revolution," *Race and Class*, (Summer, 1979), pp. 81- 90; "The Genesis of the Iranian Revolution," *Third World Quarterly* (October 1979), pp.1-16.

4 Cf. Steve Chan, "The Impact of Defence Spending on Economic Performance: A Survey of Evidence and Problems," *Orbis* (Summer, 1985), pp. 403-434.

5 Sadat Deger and Ron Smith, "Military Expenditure and Growth in Less Developed Countries," *Journal of Conflict Resolution* (1983), pp. 335-353.

sector to sector. The sections that follow attempt to throw some light on this interesting and controversial topic through quantifying the impact of Iran's defense expenditures on the main sectors of economic activity.

Economic and Social Impact of the Military in the Pre-Revolutionary Iran

In pre-revolutionary Iran, the military played an important economic and social role. The economic impact was manifested in at least five ways:[6]

1. Since the 1920s, the armed forces took a large part of government revenues. Under Reza Khan, the military budget constituted on average a third of all expenditures; despite the enormous rise in government revenues in the 1960s and 1970s, military expenditure continued to absorb a significant revenue portion.

   More precisely, between 1953 and 1970, defense expenditures rose from $67 million to $844 million, a more than twelve-fold increase; between 1970 and 1977, they rose by almost the same proportion again to $9,400 million. In 1974, the year in which oil price rises were reflected in a 141 percent increase in the previous years' total expenditures, defense spending was 32 percent of total budget allocation and, while this percentage declined somewhat after that, it was estimated that in the 1973-8 Plan defense would amount to 31 percent of total planned expenditures or over 9 percent of GDP.

2 Since the 1920s, the armed forces had been an important source of employment. In 1976, the 300,000 men under arms represented 3 percent of all those employed and 5 percent of those in non-agricultural employment.

   The oil boom, however, altered the relation of the military to the labor market; whereas previously it was a relatively privileged branch of employment, competition from the

6 Fred Halliday, *Iran : Dictatorship and Development*, pp. 71-71.

private sector for technicians altered the comparative advantages of each branch and put the armed forces at a disadvantage. Like the private sector, the armed forces experienced a growing lack of skilled pesonnel after 1974.

3. The Iranian military played an important role in production. By the 1970s, the country had a number of defense plants assembling transport vehicles and producing armor plating and ordinance.

4. The armed forces also had their own service units. The Bank Sepah was owned by the army and specialized in providing cheap loans to officers. The Cooperative Organization of the Forces of Order in 1941 provided cheap food, clothing and other goods: its imports were exempted from customs duties, the railways were bound by law to carry military goods free of charge and, since land reform in the early 1960s, the army had acquired direct control of the produce of some villages.

5. Finally, the armed forces played a direct role in the country's development programs. The Army had organized the Literacy and Health Corps. These units were sent out to serve in villages. The expansion in base facilities, especially in the southern part of the country in the 1960s and 1970s, also had pronounced economic effects: the population of Bandar Abbas, the Gulf port chosen as the new naval HQ, rose from 18,000 in 1960 to 200,000 in the early 1970s.

In sum, while military development had in large part determined the character of much current expenditure and the size of the multiplier impact on the civilian sector of the economy, the priority given to the military budget diverted resources from other projects and consituted a distortion of the country's overall development.

Iran, despite its oil revenues even after 1973, was still short of capital relative to its needs, and the funds spent on arms were thereby lost to forms of productive investment. The same applied to skilled labor and infrastructural growth.[7]

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7 *Ibid.*, p.73.

The Iranian military also played a marked social role, evident in at least four respects:[8]

1. The armed forces were a vehicle of social mobility. Since many of the Iranian officer corps came from relatively unprivileged backgrounds (lower civil servants, farmers), the rise of the officer corps as a force in Iranian society under the Pahlavi regime introduced a new component in the ruling class. This social composition may, among other factors, explain why the army supported land reform and did not protect the large landowners. Lower down in the ranks, conscription also acted as a means of social mobility.

2. The army had also been used as an instrument of national integration by the Shahs. In the 1920s and 1930s, Reza Khan used the army as a coercive instrument for crushing tribal resistance. Under the Shah, sons of tribal leaders were encouraged to become army officers, and the regime tried to promote the enlistment of men from the oppressed minorities.

3. Under the Shah, the armed forces acted as an instrument for diffusing the regime's ideology and, in particular, loyalty to the monarch.

4. Finally, the armed forces provided personnel for running other government activities. The officer corps, therefore, provided a reserve of personnel on which the regime could draw to administer wider sections of the economy.

General Considerations of the Defense/Growth Relationship

In general, proponents of military expenditures justify them not only on grounds of national security and stability, but also in economic terms. As Benoit[9] noted, expenditures may contribute to growth by:

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8 *Ibid.*, pp. 73-74

9 Emile Benoit "Growth and Change in Developing Countries," *Economic Development and Cultural Change* (1978), p. 277.

> (1) feeding, clothing and housing a number of people who would otherwise have to be fed, housed and colthed by the civilian economy... (2) providing education and medical care as well as vocational and technical training (3) engaging in a variety of public works--roads, dams, river improvements, airports, comm-unication networks, etc.--that may in part serve civilian uses, and... (4) engaging in scientific and technical specialties...which would otherwise have to be performed by civilian personnel.

In addition, the military sector is often the first to come in contact with modern technology and can train its personnel in handling sophisticated equipment. This experience can then be transmitted to other sectors of the economy.

The basic criticism against defense expenditures is that they represent a significant opportunity cost.[10] Chan[11] has summarized the four main negative effects. First is the modernization effect which was also noted by Benoit. The result may be an income shift (as civilian GDP is reduced), a productivity effect as government expenditures exhibit "negligible rates of measurable productivity increases,"[12] or a "crowding out" of civilian consumption and investment. Second, Chan suggests a balance of payment effect if growth is export-led: military expenditures could lead to a "chronic and serious displacement of capital and talent from the most dynamic sectors of civilian production to military production."[13] Third, Chan notes the use of R & D resources in defense may hurt the country's technological and productivity base. A final criticism is that defense expenditures are often import-intensive.[14] If imports are financed by external loans, the external debt rises. If imports are financed through export earnings, resources are absorbed which might have better alternative uses. Thus, one can readily see why no consistent relationship has emerged between growth and defense.

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10 W. Leontief and F. Duchin, *Military Spending: Facts and Figures Worldwide Implications and Future Outlook* (New York: Oxford University Press, 1983); and United Nations, *The Relationship Between Disarmament and Development* (New York,: United Nations, 1982).

11 Steve Chan *op. cit.* (1985), pp. 403-434.

12 E. Benoit, "Growth Effects of Defence in Developing Countries," *International Development Review* (Summer 1986), pp. 745-752.

13 Chan, *op. cit.*, p. 417.

14 R. Looney and P.C. Frederiksen, "Profiles of Current Latin American Arms Producers," *International Organization* (Summer 1986), pp. 745-752.

In short, a logical and convincing case can be made for defense expenditures either helping or hindering growth in the Third World. Clearly, whether defense expenditures impact positively, negatively or neutrally on economic growth in Third World countries is an issue only empirical research can resolve.

Empirical Studies

The impact of military expenditures on economic growth in developing countries has been empirically examined by a number of scholars.[15] Rothschild[16] rank correlated growth, exports and military spending for 14 OECD countries between 1956 and 1969 and concluded that increased defense spending tended to reduce exports and growth. Benoit[17] used 1950-65 data for 44 developing countries and estimated a model which included investment, defense and foreign aid. He concluded that "contrary to my opinion, countries with a heavy defense burden generally had the most rapid rate of growth, and those with the lowest defense burdens tended to show the lowest growth rates."[18]

Dabelko and McCormick[19] assessed the impact of defense spending on education and public health expenditures and grouped countries by form of the government: personalist, centrist, and polyarchic. They found significant opportunity costs existed for education and health in every country; the level of development had little impact on this cost; and personalist regimes tended to have the highest

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15 For an extensive review, see Chan, *op. cit.*, and A. Cappelen, *et. al.*, "Military Spending and Economic Growth in OECD Countries," *Journal of Peace Research* (1984), pp. 361-373.

16 Rotschild, Kurt, "Military Expenditures, Exports and Growth," *Kyklos* (1973), vol. 26, no. 4, pp. 804-813.

17 E. Benoit, *Defence and Growth in Developing Countries* (Lexington, Mass: Lexington Books, 1973), and E. Benoit, *"Growth and Change in Developing Countries," op. cit.*

18 E. Benoit, "Growth and Change in Developing Countries," *op. cit.*, p. 271. See Also N. Ball "Defence Expenditures and Economic Growth: A Comment" *Armed Forces and Society* (1985), pp. 298-301.

19 David Dalbelko and James McCormick "Opportunity Cost of Defence: Some Cross-National Evidence," *Journal of Peace Research* (1977) pp. 145-54.

opportunity costs (the measurement of the opportunity cost of defense is particularly controversial.)[20]

Lim[21] estimated a Harrod-Domar type model and concluded that "defense spending is detrimental to economic growth" in developing countries.[22] He estimated regression equations for different regions of the world and concluded:[23]

> Our results also show marked inter-regional differences in the relationship between defense and growth. Economic growth in the African and Western Hemisphere LDCs in the sample seemed to be adversely affected by defense spending. On the other hand, there is no relationship between defense and growth in the other two groups of LDCS (Asia and Middle East and Southern Europe).

No theoretical explanation was offered to explain why the hemisphere would affect the role of defense on growth. Frederiksen and Looney[24] assumed an identical model specification and tested for a relationship between defense and growth in the context of their resource constrained/unconstrained hypothesis. Once again, they found that the coefficient for defense spending was positive (and statistically significant) in the richer group but *insignificant* in the poorer group.

Smith and Smith.[25] predicted that military expenditures may contribute to growth through the direct impact on resource mobilization of equipment and skills, the provision of necessary infrastructure, and an internal supply response to the military demand. Indirectly, they hypothesized that military spending might hurt the savings to output ratio. They found that military expenditures led to a decline in savings relative to income which

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20 See C. Lyttkens and C. Vedovato, "Opportunity Costs of Defence: A Comment on Dabelko and McCormick," *Journal of Peace Research* (1984), pp. 395-397.

21 David Lim, Another Look at Growth and Defence in Less Devloped Countries," *Economic Development and Cultural Change* (1983), 377-384.

22 *Ibid.*, p. 379.

23 *Ibid.*

24 P.C. Frederiksen and Robert Looney, "Another Look at the Defence Spending and Development Hypothesis," *Defence Analysis* (1985), pp. 205-210.

25 Dan Smith and Ron Smith, "Military Expenditures, Resources and Development, " Paper presented for the United Nations Group of Government Experts on the Relationship Between Disarmament and Development.

retarded growth. The effect on modernization and productivity was positive but weak, and they stressed the sensitivity of their results to model specification and estimation procedures. On the issue of causality, they recognized that military expenditures and savings could cause growth, but also that growth might prompt more defense and savings. They found that the small direct positive effect of defense was outweighed by the indirect effect of a lower savings rate.

In a similar study, Deger and Smith[26] examined the interaction of military expenditures, savings and growth and found that military expenditures had a small positive effect on growth through modernization but a larger negative effect on savings. Taylor, *et. al.*[27] estimated a regression equation which related the growth rate of output to changes in exports, population, the defense burden, capital inflows and capital stock. For all developing countries and for separate regional groupings, they found that increase in military expenditures had a significant negative impact on economic growth. Further, increases in the defense burden depressed the investment/GDP ratio which suggests that military expenditures are on balance competitive with investment.

The same general conclusion was reached by del Pando.[28] Focusing on just five South American countries, he found that if military expenditures were to be cut back, the reduction in demand could be more than compensated by spending the same resources in other sectors of the economy. The Faini study[29] indicated that the growth of military expenditures reduced the growth of investment and agricultural production. A one percent rise in the military's share of Gross Domestic Product (GDP) was associated with a 23 percent and 18 percent drop in the shares for investment and agriculture in GDP, respectively.

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26 Sadat Deger and Ron Smith, "Military Expenditures and Growth in Less Developed Countries," *Journal of Conflict Resolution* (1983), pp. 335-353.

27 Lance Taylor, R. Faini and P. Annez, "Defence Spending, Economic Structure and Growth: Evidence Among Countries Over Time." Paper prepared for the United Nations Groups of Government Experts on the Relationship Between Disarmament and Development.

28 José del Pando, "Declaration of Ayacucho: Analysis and Quantification of a Possible Agreement on Limitation of Military Expenditure in Latin America." Paper presented to the United Nations Group of Government Experts on the Relationship Between Disarmament and Development.

29 R.Faini, P. Annez and L.Taylor, "Defence Spending, Economic Structure and Growth: Evidence Among Countries and Over Time," *Economic Development and Cultural Change* (1984), pp. 487-498.

Relevance of Previous Studies of Iran

In terms of pre-revolutionary Iran, the results obtained by Frederiksen and Looney[30] are suggestive of the impact military expenditures may have had on the country's economic growth. Much of their cross-sectional work has entailed grouping developing countries on the basis of resource constraint, with their general results indicating that defense impacts negatively on countries experiencing relative shortages of savings-investment and foreign exchange. On the other hand, their results tend to show an overall net positive impact of defense expenditures on growth in those developing countries possessing relatively unconstrained economic conditions. On the basis of their several papers, Iran was classified as a relatively unconstrained country in the 1950s and 1960s, but became resource constrained in the 1970s.

This result may be counter-intuitive given the oil price increases in the 1970s experienced by Iran. However, most commentators[31] on the Iranian economy confirm the fact the Iranian governments's overly ambitious development plans in the wake of the dramatic increase in oil revenues after 1973 actually created increased resource scarcity in the country.

The expansion of domestic demand far beyond the country's output potential and the capacity to import goods and services inevitably resulted in a marked acceleration of the domestic rate of price inflation. The rate of increase in retail prices rose from 3.7 percent during the Fourth Plan period (1968-72) to 15.5 percent in 1974. In order to curb the price rises, instead of reducing public sector expenditure, the regime embarked on an anti-profiteering campaign. Owing to the suppressed inflationary pressures that existed in the system and to the government's failure to remove bottlenecks effectively, consumer prices started accelerating to 16.6 percent in 1978 and finally to 25.1 percent in 1977, while the growth rate of real investment in construction fell from 53.2 percent in 1975 to 22.9 percent in 1976 and to only 2.7 percent on 1977. While total gross domestic fixed capital formation at constant prices had grown by 64 percent in 1975 and 21 percent in 1976, in 1977 it grew by

30 P.C. Frederiksen and R.E. Looney, *op. cit.*
31 Cf. R.E. Looney, *The Economic Origins of the Iranian Revolution* (New York: Pergamon Press, 1983).

only 3.4 percent. In fact, for the first time since 1976 private sector real investment in machinery and equipment, as well as in agriculture, decreased by 6.8 percent in 1977.[32]

Firouz Vakil has noted that:[33]

> Oil revenues may well be a mixed blessing, depending on the size of the annual liquidity injections relative to the availability of complementary factors of production. Indeed, these revenues are, on the one hand, like the blood of the economy carrying badly needed investment resources to particular areas for purposes of expanding productive capacity; and on the other, they are capable of producing an excess liquidity situation, if capital resources become suddenly out of line with other complementary factors of production (such as skilled labor, technology, organizational skills, natural resources or general infrastructure services). This duality renders the planning task all the more difficult under conditions of financial surplus, since it requires a shift of emphasis in the planning circles from an allocation of resources according to the real scarcity factor, or a combination of them.

In a similar vein, Razavi and Vakil stated:[34]

> In a sense, the Shah dismissed the views of his technocrats and called for a Big Push (in the investment area) interspersed by a few key targets. Some of these were production of 15 million metric tons of steel, electrification of the railway system, the setting up of several nuclear power plants, building oil refineries and petrochemical plants, construction of six-lane superhighways connecting the Gulf ports to the capital, rapid development of the country's ports and, last but not least, *the development of an*

32 Thomas Walton, "Economic Development and Revolutionary Upheavals in Iran," *Cambridge Journal of Economics* (September 1980), pp. 271-292.
33 Firouz Vakil, *Determining Iran's Financial Surplus 1352-1371: Some Management Concepts* (Tehran: Institute of International Political and Economic Studies, 1975), p. 6.
34 Hussein Razavi and Firous Vakil, *The Political Environment of Economic Planning in Iran, 1971-83* (Boulder, Colorado: Westview Press, 1984), p. 74.

> *impregnable defense infrastructure...* the question of feasibility almost did not enter the equation. (emphasis added)

In fact, Razavi and Vakil[35] attribute the Iranian Revolution to the fact, after 1973:

1. The development patterns and strategies that were chosen and implemented by the Shah's regime moved the economic system out of its sectoral, regional and social balances;

2. The management system of the country was rigidly top-down with the Shah making the major economic decisions himself and with no provision or tolerance for the feedback of corrective signals, and

3. The injection of vast oil revenues into the economy intensified the incapacities of the sytem and led to explosive trends.

Razavi and Vakil[36] point out that these conclusions should not, of course, be taken to imply that economic forces were the only (or most important) factors behind the collapse of the regime. The merely suggest that the economic system itself had developed an internal mechanism that intensified the further deterioration of the political-economic situation.

Iran's shift in the early 1970s from a resource unconstrained to a resource constrained economy would, according to Frederiksen and Looney, imply an alteration in the impact of military expenditures on growth from positive to negative. The implication being that the Shah's military build-up directly led to the economic deterioration preceding and perhaps precipitating the overthrow of the regime.

Before we use cross section results of the type cited above to see if, in part at least, the post-1973 deterioration in the Iranian economy can be attributed to increased military expenditures, it should be pointed out that a recent paper by Joerding[37] has cast some doubt on the validity of previous cross-sectional analyses.

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35 *Ibid.*, p. 102.
36 *Ibid.*
37 Wayne Joerding, "Economic Growth and Defense Spending: Granger Causality," *Journal of Development Economics* (April 1986), pp. 35-40.

In larger part, previous cross-sectional studies have used ordinary least squares (OLS) to estimate:

$$\text{Growth} = X + MILX$$

Where growth is the economic growth rate, X is a vector of explanatory variables and MILX is a measure of military spending. As Joerding correctly points out, this formulation is only appropriate if MILX is econometrically exogenous, otherwise the parameter estimates are biased and inconsistent. So the reliability of these studies depends on the implicit assumption that military spending is an econometrically exogenous variable.

Clearly, as Joerding[38] points out, it is likely that military spending is at least partially dependent on the overall performance of the domestic economy, if for no other reason than that domestic production imposes a kind of budgetary constraint on expenditures. During periods of low growth, military spending must share the financial constraint with other government programs, but it is unlikely to be completely immune. This reasoning and other arguments[39] imply that military spending is an endogenous variable. At least the possibility bears scrutiny.

Using a sample of 57 countries and both ACDA and SIPRI data, Joerding,[40] using the Granger causality test, found that economic growth caused military spending caused economic growth:

> Since Granger non-causality is necessary for strong or weak economic exogeneity in state models, we must conclude that military spending potentially is an endogenous variable. Consequently, studies using OLS to estimate equations like (1) are seriously flawed, all the parameter estimates being biased and inconsistent.

Joerding[41] goes on to conclude that:

> Since Granger causality is a necessary but not sufficient condition for strong exogeneity, we cannot conclude economic growth is an endogenous variable

38 *Ibid.*, p. 39.
39 Cf. Deger and Smith, *op. cit.*
40 Joerding, *op. cit.*, p. 39.
41 *Ibid.*, p. 39.

> with respect to military spending to economic growth. Thus, the evidence on this question is ambiguous.

In Iran's case, the use of GDP in the growth equation may invalidate the conditions for exogeneity (since oil revenues are a large component in GDP), and it is very apparent that during this period military expenditures preceded increases in oil revenues.

To overcome this methodological difficulty, the next section examines the impact of military expenditures on the Iranian economy through the use of time series analysis of the non-oil components of the economy.

Time Series Analysis

Given the limitations of cross-sectional analysis in assessing (during different time periods) the impact of military expenditures on various facets of the Iranian economy, a more direct approach is needed to determine: (1) the nature and time phasing of the impacts on the economy produced by the military expenditures, and (2) any possible changes over time in the parameters of this relationship.

It is hypothesized that over time military expenditures may have contributed to the Iran economy directly, through Keynesian demand contributions to GDP, or indirectly, through carry-over effects stemming from increases in such areas as the nation's stock of human capital. More specifically, the indirect contribution to growth embraces Hirshman type linkages and can broadly be considered as a sequence of multiplier accelerator mechanisms. Theoretically, indirect contributions (or spread effects) can continue to occur long after specific military expenditures have occurred.[42]

The overall impact of military expenditures on the Iranian economy is assumed to have had many determinants, including technonolgy, the extent to which investment opportunities generated were taken advantage of by domestic entrepreneurs, the ability to attract foreign factors, and the contribution to human capital.

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42 Robert Looney, "Impact of Oil Revenues on the Pre-Revolutionary Iranian Economy," *Middle Eastern Studies* (January 1985), pp. 61-71.

Obviously, neither the time pattern exhibited nor the relative sizes of dirrect or indirect military contributions to growth needs to be fixed and could conceivably have varied between subperiods. Provided that investment and demand opportunities generated by the growth of military expenditures are exploited and bottlenecks are not a constraint on growth, the model predicts that Iranian economic growth could be positively stimulated by military expenditures.

To determine the impacts of military expenditures on the pre-revolutionary Iranian economy, both non-oil gross domestic product and non-oil GDP by sector for the period 1959-77 were regressed on military expenditure.

In addition, to test for structural changes associated with the 1973-74 oil price increases and subsequent stepped up level of defence expenditures, two dummy variables[43] DUMAX and DUMBX, were added to the regression equations, DUMAX was formed by multiplying real military expenditures by 0, 1959-1973, and 1, 1974-77. DUMBX was formed by multiplying real military expenditures by 0, 1959-74, 1, 1975-77. Clearly *a priori* it is not possible to speculate whether increased oil revenues had an immediate impact (DUMAX) or a lagged (DUMBX) impact on the military expenditure non-oil income relationship, hence both variables were independently introduced into the regression equations.

As noted above, one of the main limitations of cross section analysis is its inability to identify the timing of impacts. In particular, the empirical economic development literature[44] has shown that many impacts of government expenditures demonstrated a distributed lag relationship,i.e., the impact of specific expenditures on income tends to decline over time in some type of decay scheme with the first year's impact the greatest, declining in subsequent years. Operationally,[45] estimates utilizing Koyck distributed lag schemes of the form:

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43 A similar approach was used in R. Mallakh and M. Kadhim, "Absorptive Capacity, Surplus Funds and Regional Capital Mobility in the Middle East," *Reviste Internazionale de Scienze Economiche e Commerciali*, (April 1977), pp. 308-325.

44 Cf. L.M. Koyck, *Distributed Lags and Investment Analysis* (Amsterdam, North Holland, 1954).

45 Cf. P. Rao and R. Miller, *Applied Econometrics* (Belmont, CA: Wadsworth Publishing Company, 1971), pp. 88-92.

$$Y(t) = a + bx + cy(t-1)$$

are used to measure both the indirect and distributed impacts of certain expenditures (x) on output (y).

To improve the regression specifications (by avoiding spurious correlations) and at the same time test the robustness of the results, several control variables were also individually added to the regression equations. These variables included:

1. Total gross capital formation,
2. The labor force,
3. Total private sector investment, and
4. Investment and construction.

The results (Table 1) show several striking patterns:

1. In general, military expenditures had a positive impact on non-oil output in Iran, but this relationship turned negative after 1973-74 (as indicated by the positive sign for military expenditure and the negative sign for the dummy variables, DUMAX and DUMBX).
2. This result holds after controlling for other sources of sectoral output such labor and investment.
3. The result holds not only for non-oil output, in general, but also for the main producing sectors.
4. The results are extremely robust in terms of the sign and size of the coefficients for military expenditures.

To summarize, the regression results were highly significant and confirmed the net positive impact of military expenditures on non-oil income growth during this period. The impact of military expenditure was spread over time with the impact declining in future years.

However, the high statistical significance of the dummy variables (DUMBX) and its negative sign indicate that the nature of this impact began to change begining in 1973-1974. In short, marginal increases in defense expenditure began to negatively impact on

Iranian growth after 1973. Apparently, a number of negative impacts associated with defense expenditures began to manifest themselves by the mid-1970s, reducing considerably the contribution to growth previously associated with the country's defense allocations.

The manner in which military expenditures in Iran shifted after 1973-74 from making a positive contribution to non-oil output to a negative marginal contribution cannot be inferred from the results in Table 1. Clearly, increased resource constraints leading to higher opportunity costs associated with increased military expenditures, as the cross sections indicate, may have played a role in this regard.

One way of identifying the general source of these resource constraints is to examine any particular public sector budgetary shifts occurring after the oil boom in such a way as to alter the pattern between government revenues and expenditures.

To examine the relationship between government expenditures and oil revenues, distributed lag equations of the type estimated above were undertaken. Government expenditures were broken into three main categories:

1. Military expenditures,
2. Total public sector allocations, and
3. Government consumption.

The dummy variables were created by multiplying each type of expenditure by 0, 1959-73, 1, 1974-77 (DUMAX), or 1, 1959-74 (DUMBX).

As expected, the results (Table 2) indicate a strong link between each public sector expenditure and government revenues.

Several notable differences by type of expenditure do exist, however:

1. While both total government and public sector consumption expenditures show a strong distributed lag relationship, military expenditures exhibit a close direct link with government revenues.

2. While both total government expenditures and public consumption exhibited relative declines vis à vis government revenues after 1973-74, military expenditures maintained their pre-1973-74 relationship to revenues (DUMAX and DUMBX being statistically insignificant).

One might conclude from these results that for political reasons military expenditures increased proportionately to oil revenues after 1973-74 and, furthermore, the authorities may have diverted potentially productive resources away from other types of public sector activities to facilitate the post-1973 build-up. This relative shortage of productive resources may have contributed to the conditions experienced after 1973-74.

Finally, it might be argued that due to increased resource constraint after 1973-74, all government expenditures declined in their ability to contribute to non-oil output and that military expenditures were not unique in this regard and thus should not be singled out as contributing to the country's economic decline.

To examine this aspect of post-1973-74 Iranian fiscal policy, regression similar to those presented in Table 1 were performed. Instead of military expenditures, however, various types of government investment were used in place of military expenditures:

1. Government investment in construction;

2. Government investment in machinery;

3. Total government investment, and

4. Total construction (public plus private).

To improve these estimates, a control variable, the labor force, was included in all the regression equations.

The results (Table 3) indicate that, in general, government expenditures contributed to non-oil output (the main exception being manufacturing) for the period as a whole. Furthermore, in contrast to military expenditures, the marginal impact after 1973-74 was positive for all sectors.

These results clearly indicate that military expenditures were unique in their marginal negative impact on private sector output after the 1973-74 oil revenue boom.

Conclusions

In his book, *Economic Origins of the Iranian Revolution*, Looney suggested that a number of latent tensions inevitably resulted from the development process itself so that the authorities had no advance notice of the mass alienation developing in the country. In the *Rise and Fall of the Shah*, on the otherhand, A. Saikal[47] put forth the idea that the Shah pursued two objectives that were inherently contradictory: preserving a strong monarchy while transforming Iran into a modern state, based upon the model of Western capitalism. According to Saikal, these twin objectives required policies that necessarily conflicted, creating a fundamental dilemma.

R.K. Ramazani[48] stated that the way in which the vast oil reserves were used magnified every weakness in the Iranian economy. According to him, the grandiose plans for developing the economy and atomic energy, the massive imports of food and consumer goods, the rapidly rising rate of inflation, the spreading corruption, the shortage of electricity, the infrastructural bottlenecks, the decline of agricultural productivity, and the maldistribution of wealth all contributed to the demise of the Shah.

S. Akhavi[49] suggested in *Religon and Politics in Contemporary Iran* that the secularization policies pursued by the Shah and his father seriously undermined the clergy's power and interests, leading to wide-spread resentment toward the dynasty among the ulama. Eventually, this provoked active opposition when the increasing bureaucratization of power was perceived as threatening the independence that they and their religious instituions had traditionally possessed.

Taheri[50] pointed to other factors in the Tehran daily newspaper, *Kayhan International*, saying that the public uprising against the

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47 A. Saikal, *The Rise and Fall of the Shah* (Princeton: Princeton University Press, (1980).
48 R.K. Ramazani, "Who Lost America? The Case of Iran," *Middle East Journal* (1982).
49 S. Akhavi, *Religion and Politics in Contemporary Iran: Clergy-State Relations in the Pahlavi Period* (New York: State University of New York Press, 1980).
50 Amir Taheri, "Public Discontents," *Kayhan International* (July 13, 1978).

Shah was due to an accumulation of discontent with tight control, overcentralization, lack of sufficient debate, and a general feeling that corruption, inefficiency, and arrogance had struck the bureaucracy. And James Bill[51] in "Iran and the Crisis of 78," described the Iranian revolution as a multi-class phenomenon in which the people of Iran rose en masse against a hated decrepit system.

The results presented above are consistent with all of these interpretations. They tend to indicate more precisely, however, the great economic costs associated with military build-up that took place after 1973-74. How much economic growth would have improved if military expenditures were held at their pre-1973 levels is hard to estimate precisely. The fact remains, however, that the economy would have been healthier, perhaps sufficiently so to defuse the tensions that ultimately resulted in the overthrow of the regime.

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51 J.A. Bill, "Iran and the Crisis of '78," *Foreign Affairs*, (1978).

Table 1

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables								Statistics			
	Lagged Dependent Variable	Military Expend-iture	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Invest-ment	Investment in Const-ruction	RHO	r^2	F	DW
(1) Total Non Oil GDP	0.91 (13.99)	1.70 (4.38)		-0.72 (-4.07)					(-0.59) (-3.03)	0.988	3429.59	1.98
(2)	0.76 (8.20)	2.04 (5.33)		-1.08 (-4.75)	0.24 (2.28)				-0.70 (-4.05)	0.999	4112.11	1.49
(3)	0.86 (9.48)	0.59 (2.64)				0.08 (3.02)			-0.52 (-2.50)	0.998	2326.87	2.31
(4)	0.89 (11.06)	1.61 (2.94)		-0.66 (-2.07)		0.01 (0.25)			-0.58 (-2.99)	0.998	2565.97	2.03
(5)	0.92 (15.11)	1.39 (3.69)		-0.78 (-4.57)			0.54 (1.74)		-0.75 (-4.65)	0.999	3732.56	1.68

Table 1 (continued)

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables: Lagged Dependent Variable	Military Expenditure	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Investment	Investment in Construction	Statistics: RHO	r^2	F	DW
(6)	0.69	2.50		-1.27				1.10	-0.72			
	(7.06)	(5.73)		(-5.28)				(2.95)	(-4.31)	0.999	5039.04	1.45
Agriculture												
(7)	0.94	0.61		-0.06					-0.52			
	(10.41)	(2.55)		(-2.17)					(-2.52)	0.998	1801.16	2.44
(8)	-0.04	0.35	-0.25			0.02			-0.52			
	(-0.18)	(3.54)	(-3.83)			(2.35)			(-2.85)	0.918	135.56	2.29
Manufacturing												
(9)	0.86	0.01				0.06			-0.60			
	(9.450	2.99				(2.55)			(-3.14)	0.988	2455.50	2.61
(10)	0.86	0.08	-0.01			0.010			-0.61			
	(9.13)	1.14)	(-0.27)			(2.00)			(-3.21)	0.998	1868.61	2.61

Table 1 (continued)

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables: Lagged Dependent Variable	Military Expenditure	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Investment	Investment in Construction	Statistics: RHO	r^2	F	DW
(11)	0.93 (10.41)	0.16 (2.55)		-0.07 (-2.17)					-0.52 (-2.52)	0.998	1801.16	2.44
Construction												
(12)	0.21 (1.41)	0.14 (2.65)	-0.11 (-4.35)		0.02 (2.64)				-0.66 (-3.19)	0.980	148.70	2.27
(13)	-0.03 (-0.12)	0.08 (1.90)		-0.08 (-2.47)	0.44 (2.47)				-0.14 (-0.62)	0.939	46.09	2.14
(14)	0.15 (0.97)	0.18 (5.49)	-0.12 (-4.99)				0.10 (3.08)		(-3.84)	0.982	172.21	2.11
(15)	-0.10 (-0.50)	0.13 (3.16)		-0.09 (-2.61)			0.15 (2.36)		0.01 (0.05)	0.921	34.86	2.02
(16)	0.18 (1.18)	0.14 (4.04)	-0.11 (-4.39)					0.06 (2.71)	-0.64 (-3.46)	0.980	149.38	2.19

Table 1 (continued)

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables: Lagged Dependent Variable	Military Expenditure	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Investment	Investment in Construction	Statistics: RHO	r^2	F	DW
(17)	-0.07	0.08		-0.08				0.10	-0.09			
	(-0.27)	(2.04)		(-2.51)				(2.51)	(-0.38)	0.934	42.70	2.10
Water-Power Electricity												
(18)	0.21	0.04				0.005			-0.40			
	(1.20)	(3.40)				(4.49)			(-1.75)	0.995	1740.37	2.08
(19)	0.23	0.09		-0.03		0.003			-0.77			
	(1.44)	(4.13)		(-2.32)		(1.77)			(-5.02)	0.997	1098.15	2.31
(20)	0.39	0.10		-0.04					-0.77			
	(2.60)	(5.48)		(-5.58)					(-4.93)	0.997	1154.13	2.39
Ownership of Dwellings												
(21)	0.70	0.08		-0.04					-0.54			
	(3.25)	(2.05)		(-2.10)					(-2.66)	0.989	365.46	2.30

Table 1 (continued)

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables: Lagged Dependent Variable	Military Expenditure	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Investment	Investment in Construction	Statistics: RHO	r^2	F	DW
(22)	0.58	0.09		-0.05			0.01		-0.48	0.988	260.37	2.39
	(2.03)	(2.25)		(-2.18)			(0.65)		(-2.24)	0.988	260.37	2.39
(23) •	0.34	0.11		-0.03	0.02				-0.37			
	(2.08)	(6.84)		(-3.39)	(2.02)				(-1.65)	0.997	940.91	1.86
(24)	0.60	0.07				0.002			-0.85			
	(6.42)	(5.30)				(1.72)			(-2.77)	0.996	972.19	2.30
(25)	0.62	0.11		-0.02					-0.60			
	(7.85)	(7.17)		(-2.84)					(-3.10)	0.997	1329.92	2.31
(26)	0.43	0.11		-0.35			0.04		-0.44			
	(4.37)	(1.84)		(-4.05)			(2.66)		(-2.05)	0.997	1271.79	1.92
(27)	0.13	0.12		-0.38				0.05	-0.23			
	(0.65)	(7.53)		-3.69				(2.63)	(-0.98)	0.996	822.10	1.85

Table 1 (continued)

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables: Lagged Dependent Variable	Military Expenditure	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Investment	Investment in Construction	Statistics: RHO	r^2	F	DW
Banking												
(28)	0.57	0.10				0.007			0.20			
	(5.71)	(4.25)				(2.81)			(0.86)	0.993	596.34	2.17
(29)	0.64	0.17		-0.05		0.010			0.05			
	(7.03)	(4.13)		(-2.04)		(0.30)			(0.22)	0.996	191.07	1.94
(30)	0.68	0.10							0.39			
	(6.14)	(3.99)							(1.72)	0.984	437.67	2.11
(31)	0.65	0.18		-0.06					0.02			
	(8.28)	(7.28)		(-4.18)					(0.76)	0.996	1119.36	1.95
Trade												
(32)	0.50	0.04				0.01			0.45			
	(2.82)	(2.61)				(2.73)			(-2.10)	0.988	248.31	2.18

Table 1 (continued)

IRAN DISTRIBUTED LAG IMPACT OF MILITARY EXPENDITURES ON PRIVATE SECTOR OUTPUT, 1959-1977

Equation Activity	Independent Variables: Lagged Dependent Variable	Military Expenditure	Dumax	Dumbx	Total Gross Capital Formation	Labor Force	Total Private Investment	Investment in Construction	Statistics: RHO	r^2	F	DW
(33)	0.50	0.15	-0.07			0.004			-0.66			
	(3.38)	(2.87)	(-2.21)			(1.32)			(-3.72)	0.993	453.76	2.46
(34) •	0.62	0.19	-0.10						-0.68			
	(3.08)	(4.08)	(-3.53)						(-3.84)	0.992	535.32	2.58

Notes: See text for definition of symbols; Economic Data from Bank Markazi Iran, *National Income of Iran 1338-50 (1959-72)*, Tehran: Bank Markazi Iran Bureau of National Accounts, 1975); Bank Markazi Iran, *Annual Report*, various issues; Nominal Military Expenditures data from Stockholm International Peace Research Institute, *World Armaments and Disarmament SIPRI Yearbook*, various issues (Philadelphia: Taylor and Finances); Construct Price Military Expenditures derived by deflating with the Iranian current price index (1975 = 1.00); regressions estimated with Cochrane-Orcutt iterative estimation technique to correct for serial correlation; r^2 = correlation coefficient; F = F statistic; ( ) = t statistic; DW = Durbin-Watson Statistic.

Table 2

IRAN: IMPACT OF GOVERNMENT REVENUES AND STRUCTURAL CHANGE ON PUBLIC SECTOR EXPENDITURES

		Independent Variables				Statistics			
Equation	Public Sector Expenditure Category	Lagged Dependent Variable	Government Revenue	Dumax	Dumbx	RHO	r^2	F	DW
(1)	Military Expenditures	0.10	23.63			-0.57			
		(0.82)	(8.98)			(-2.88)	0.991	807.97	2.10
(2)		0.07	27.65	-3.03		-0.66			
		(0.63)	(5.76)	(-0.98)		(-3.66)	0.993	549.04	2.37
(3)		0.10	26.76		-3.06	-0.59			
		(0.96)	(7.56)		(-1.28)	(-2.99)	0.992	528.95	2.23
(4)	Total Government Expenditures	0.51	46.71			-0.08			
		(5.59)	(7.15)			(-0.32)	0.992	924.85	1.89
(5)		0.46	70.16	-16.80		-0.66			
		(6.30)	(7.00)	(-2.74)		(-2.67)	0.998	1615.47	2.45
(6)		0.49	64.59		-14.17	-0.64			
		(7.82)	(9.34)		(-3.43)	(-3.41)	0.998	1913.02	2.32

Notes: See text for definition of symbols; Economic Data from Bank Markazi Iran, *National Income of Iran 1338-50 (1959-72)*, Tehran: Bank Markazi Iran Bureau of National Accounts, 1975); Bank Markazi Iran, *Annual Report*, various issues; Nominal Military Expenditures data from Stockholm International Peace Research Institute, *World Armaments and Disarmament SIPRI Yearbook*, various issues (Philadelphia: Taylor and Finances); Construct Price Military Expenditures derived by deflating with the Iranian current price index (1975 = 1.00); regressions estimated with Cochrane-Orcutt iterative estimation technique to correct for serial correlation; r^2 = correlation coefficient; F = F statistic; ( ) = t statistic; DW = Durbin-Watson Statistic.

Table 3

IRAN: IMPACT OF GOVERNMENT EXPENDITURES ON NON-OIL OUTPUT BY SECTOR, 1959-1977

		Independent Variables								Statistics			
Equation	Sector Output	Lagged Dependent Variable	Labor	Dumax	Dumbx	Govt. Investment in Construction	Govt. Investment in Machinery	Total Govt. Investment	Total Construction Investment	RHO	r^2	F	DW
(1)	*Non-Oil Income*	1.00	0.06	0.009						-0.91			
		(17.39)	(2.76)	(2.25)						(-9.17)	0.999	3561.7	2.45
(2)		1.03	0.06		0.005					-0.84			
		(11.40)	(1.83)		(0.83)					(-6.40)	0.998	2483.62	2.21
(3)		0.27	0.27			1.49				0.34			
		(1.42)	(4.01)			(3.60)				(1.51)	0.991	453.87	2.17
(4)		0.58	0.20	0.71		0.02				0.998			
		(3.53)	(4.02)	(2.71)		(0.06)				(2142.61)	0.999	2142.61	1.93
(5)		0.31	0.28	2.53			0.62			0.04			
		(1.63)	(4.63)	(3.22)			(0.51)			(0.17)	0.996	845.21	2.07
(6)		-0.03	0.43					1.32		0.71			
		(-0.17)	(3.95)					(4.73)		(4.24)	0.977	169.88	2.13
(7)		-0.005	0.38	0.52				0.01		0.45			
		(-0.03)	(5.65)	(2.33)				(2.34)		(2.13)	0.993	439.58	2.41

Table 3 (continued)

IRAN: IMPACT OF GOVERNMENT EXPENDITURES ON NON-OIL OUTPUT BY SECTOR, 1959-1977

Equation	Sector Output	Independent Variables: Lagged Dependent Variable	Labor	Dumax	Dumbx	Govt. Investment in Construction	Govt. Investment in Machinery	Total Govt. Investment	Total Construction Investment	Statistics: RHO	r^2	F	DW
(8)		0.13	0.35						1.04	0.53			
		(0.67)	(4.08)						(3.78)	(2.57)	0.985	265.82	2.67
(9)		0.15	0.33	0.57					0.39	0.13			
		(0.67)	(4.08)	(2.65)					(1.28)	(0.58)	0.996	787.38	2.34
(10)	*Manufacturing*	0.91	0.01	0.001						-0.65			
		(10.97)	(3.01)	(2.26)						(-3.58)	0.998	2402.13	2.62
(11)		0.77	0.02			-0.003			0.05	-0.50			
		(4.31)	(2.69)			(-0.06)			(1.50)	(-2.39)	0.998	1417.70	2.42
(12)		0.90	0.01	0.15			-0.13			-0.67			
		(7.04)	(2.87)	(1.97)			(-0.96)			(-3.75)	0.998	1813.87	2.61
(13)		0.97	0.01		0.05			-0.05		-0.68			
		(6.25)	(2.67)		(1.69)			(-0.95)		(-3.85)	0.998	1775.06	2.64
(14)	*Water Power Electricity*	-0.38	0.01			0.04				0.69			
		(-1.23)	(3.76)			(2.29)				(3.97)	0.910	40.68	1.65

Table 3 (continued)

IRAN: IMPACT OF GOVERNMENT EXPENDITURES ON NON-OIL OUTPUT BY SECTOR, 1959-1977

		Independent Variables								Statistics			
Equation	Sector Output	Lagged Dependent Variable	Labor	Dumax	Dumbx	Govt. Investment in Construction	Govt. Investment in Machinery	Total Govt. Investment	Total Construction Investment	RHO	r^2	F	DW
(15)		-0.85	0.02	0.04		0.01				0.57			
		(-2.71)	(5.73)	(3.06)		(0.66)				(2.88)	0.967	89.77	1.99
(16)	*Transportation*	-0.34	0.01			0.14				0.78			
		(-1.94)	(2.38)			(5.58)				(5.11)	0.934	57.38	1.95
(17)		-0.47	0.02	0.62		0.08				0.80			
		(-4.75)	(4.38)	(5.51)		(4.72)				(5.44)	0.980	148.15	2.34
(18)		0.47	0.009	0.18			-0.73			-0.39			
		(1.25)	(4.00)	(3.09)			(-0.65)			(-1.75)	0.992	371.67	2.35
(19)		-0.78	0.02	0.05				0.08		0.84			
		(-5.20)	(3.60)	(4.39)				(4.35)		(6.51)	0.960	73.46	2.07
(20)		-0.65	0.02					0.12		0.84	0.897	34.90	1.96
(21)		-0.55	0.02	0.04					0.05	0.78			
		(-5.37)	(4.73)	(6.28)					(5.05)	(5.19)	0.981	161.27	2.18
(22)		-0.38	0.02						0.09	0.77			
		(-1.91)	(2.44)						(4.94)	(4.97)	0.925	49.72	1.80

Table 3 (continued)

IRAN: IMPACT OF GOVERNMENT EXPENDITURES ON NON-OIL OUTPUT BY SECTOR, 1959-1977

		Independent Variables								Statistics			
Equation	Sector Output	Lagged Dependent Variable	Labor	Dumax	Dumbx	Govt. Investment in Construction	Govt. Investment in Machinery	Total Govt. Investment	Total Construction Investment	RHO	r^2	F	DW
(23) •		0.60 (2.54)	0.02 (4.46)	0.10 (4.19)		-0.09 (-1.65)				0.47 (2.16)	0.989	257.27	1.78
(24)		0.60 (3.42)	0.01 (4.49)	0.25 (3.48)			-0.21 (-1.93)			0.34 (1.49)	0.989	282.90	1.94
(25)		0.63 (2.62)	0.02 (4.77)	0.07 (4.09)				-0.07 (-1.72)		0.40 (1.79)	0.989	296.40	1.84

Notes: See text for definition of symbols; Economic Data from Bank Markazi Iran, *National Income of Iran 1338-50 (1959-72)*, Tehran: Bank Markazi Iran Bureau of National Accounts, 1975); Bank Markazi Iran, *Annual Report*, various issues; Nominal Military Expenditures data from Stockholm International Peace Research Institute, *World Armaments and Disarmament SIPRI Yearbook*, various issues (Philadelphia: Taylor and Finances); Construct Price Military Expenditures derived by deflating with the Iranian current price index (1975 = 1.00); regressions estimated with Cochrane-Orcutt iterative estimation technique to correct for serial correlation; r^2 = correlation coefficient; F = F statistic; ( ) = t statistic; DW = Durbin-Watson Statistic.