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THE ECONOMIC EFFECTS OF INDIGENOUS ARMS PRODUCTION IN GREECE

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Abstract

This paper examines the economic effects of domestic arms production in Greece. It investigates for possible economic spin-offs through backward and forward linkages in five sectoral outputs of the Greek industry. Empirical results reported here indicate that positive economic spin-offs from indigenous arms production are so far negligible. (JEL L60, L6)

1. Introduction

The effects of military spending on growth and development is a controversial subject. Authors (Benoit 1973, 1978; Kennedy 1974) have claimed that defence expenditure can have a positive impact on the economy. On the other hand, other writers (Faini, Annez and Taylor 1980; Deger and Smith 1980) have shown that military spending has a net negative impact and hinders economic growth. However, many of the latter studies tend also to accept that such expenditure can have some positive economic spin-offs. Such spin-offs take essentially two forms: a) effective demand creation through domestic production of military inputs and b) increasing productivity through technological progress (creation of new skills and R & D stimulation). It has been argued (Mosley 1985) that defence spending can be used as a countercyclical stabilization policy. In a typical Keynesian fashion it can create effective demand and counter a recession. However, any such beneficial effects can not be expected to fall pervasively on the whole economy. Rather they will concentrate on specialised industries with which linkages are high, i.e. industries with intermediate and/or final products for military use.

This study examines the spin-offs of military spending on such industries in the case of Greece. In relative terms, Greece is the highest military spender in NATO and Europe, allocating yearly an average 6% of GDP to defence. Since the mid-70s she has been engaged in domestic arms production. If there are any substantial beneficial spin-off effects from military spending they should be evident in the Greek case.

2. Defence Considerations and Indigenous Arms Production

2.1. Motives for Domestic Arms Production

There are two main ways in which demand for weapons can be met. Arms can be either bought from abroad or produced domestically. Since the two options are not mutually exclusive a country can opt for a combination of both. At most, any given state has four alternatives for weapons acquisition: it may purchase weapons from one or several suppliers who can either be located at home or abroad. Clearly, whichever alternative or combination of alternatives a country opts for it must involve some costs and benefits of economic, political and military nature. It is the latter that are of particular importance for most countries with acute defence problems such as Greece.

In practice, most countries especially smaller - peripheral states rely almost exclusively on imports for their armaments. However, since the 1960's there has been a steady trend towards indigenous arms production by smaller countries. Ayres (1983) attributes this to the way weapons suppliers and especially the major powers often use arms supplies as instruments of national policy. They often use then as means of exerting pressure and influence over the recipient country especially in times of conflict. Broadly speaking there are three factors that determine the arms supply policies of the major arms exporters:

a) *The hegemonic factor,* which may influence the flow of arms from the supplier with the aim of achieving or maintaining a position of hegemony or domination over the recipient country or in the region.

b) *The industrial factor,* which refers to the economic advantages of arms sales which may result in large scale production runs of the particular weapon.

c) *The restrictive factor,* whereby the supplier may refuse to provide any arms or certain types of weapons if it is felt that this may turn to be against any of the interests of the supplying state.

It is the way that the restrictive factor has often been operated by the major suppliers of armaments (although not very successfully) that has prompted many countries to a) rely on.more than one external source of arms supply and b) to seek to develop a domestic arms industry which would at least offer a minimum level of self sufficiency in armaments.

Domestic production of arms and of course their maintenance may promote a nation's independence in pursuing its own policies or at least offer a degree of manoeuvre that would not have been available otherwise. Thus, the risk (and concomitant fear) of cutoffs, embargoes or slowdown in supply of arms and/or spare parts in periods of crises is to a certain extent reduced. Furthermore, the establishment of an arms industry, particularly in a small developing country, may have considerable domestic political significance as a source of national pride and as a sign of increased sovereignty and independence.

2.2. **The Greek** Case

Before the 1974 Turkish invasion of Cyprus, Greece relied for her armaments almost exclusively on imports. A large part of the weapons and the equipment used by her armed forces was either bought or provided as aid by the United States. Since then there has been a continuous effort to diversify the sources of arms supply. The share of U.S. weapons procured steadily declined mostly in favour of West European arms. U.S. weapons accounted for more than 80% of all weapons imported by Greece in the period 1965-74. Since then it steadily declined to reached 42% in the 80s remaining nevertheless the single biggest source for weapons supply. At the same time, it was felt that in case of an armed confrontation with Turkey, Greece may be faced with a slow down in the flow of arms and spare parts. She would have to rely on her own defence capabilities with minimum if any external assistance from her allies. The development of domestic arms production facilities was seen as an important step towards achieving a degree of minimum military self sufficiency. A number of industries were set up, mostly joint ventures between the Greek state and foreign companies. Most prominent between them are the Hellenic Aerospace Industry (EAB); the Hellenic Arms Industry (EBO); the Hellenic Industry of Vehicles (ELBO). Along side the main defence industries there exists a number of small to medium sized enterprises manufacturing mostly under licence small components, spare parts and light infantry weapons for the Greek Armed Forces and some for exporting. Fifteen years after the original ambitious plans the defence industry has achieved some degree of import substitution in weapons require-

ments in such areas as: ammunition, portable weapons, trucks & jeeps, armoured personnel carriers and infantry fighting vehicles, airplane and helicopter maintenance. These however, represent only a small portion of the total requirements of any armed forces. The majority of armaments needed still have to be imported, including sophisticated advanced weapons systems such as: combat helicopters, fighter planes, modern naval units, electronic equipment; all of which are of paramount importance for the successful conduct of military operations.

3. The Economic Effects of Domestic Arms Production

3.1. Stages **of Production**

The ultimate objective of domestic arms production policies is to get as close as possible to self-sufficiency in weapons. Such goals have been expressed by a number of countries (e.g. India, Israel, Brazil, Argentina, Turkey) and Greece has not made secret of the fact that she aims for a similar target in certain key areas. However, autarky in weapons is impossible to achieve in the short to medium term. It requires massive investment and then, on the basis of international experience only with partial success despite the vast resources pushed into defence production.

To understand the difficulties involved we need only consider the stages required for the build-up of domestic arms production facilities. This process can be separated into seven major stages:

1) Arms are imported but are serviced and maintained domestically.

2) A licence to produce arms locally is acquired and production facilities are built which, however, require a lot of technical and personnel assistance from the supplier.

3) Production begins and to start with it involves local assembly of imported sub-assemblies.

4) The sub-assemblies are now assembled locally from imported components and some may be re-exported to the licensor.

5) Components are manufactured locally from imported raw materials.

6) Local production of raw materials.

7) Complete indigenous production including design, raw materials and manufacture.

Even countries that have been pursuing military self-sufficiency for many years (e.g. India, Israel) have not reached the last stage. The difficulties of creating an independent defence industry are also evident in the Greek case. Most of the weapons produced locally are overseas models made under licence. The implication being that given the complexity of modern weapons, it is extremely difficult for a small country to achieve a satisfactory level of autarky and independence of action in anything but the very basic weapons, maintenance and spare parts. Nevertheless, it is still interesting to consider the likely economic spin-offs of domestic defence production.

3.2. Economic Linkages and Spin-offs

Arms production is a branch of the manufacturing sector and we can expect some links between domestic production and the rest of the industrial sector. Once the arms industries have been set up, they will have backward and forward linkages creating inter-industrial demand and concomitant spin-off for the underlying industrial base. Of course, a relative well developed industrial base may be a necessary (but not sufficient) precondition for a given country to embark on the process of manufacturing arms. If the production of arms is to generate any linkages in the domestic economy then, the manufacturing sector must be able to supply the necessary inputs that will be required by the defence industry. Needless to say that not all the branches of the manufacturing sector are relevant to the production of arms. Only certain branches of manufacturing may be of use in terms of linkages to the arms industry. It is with these specific industries rather than the whole of the existing industrial structure that the arms industry will have to develop crucial technical linkages. Kennedy (1974) identifies and lists nineteen industries as being important for arms production. All of them are contained within seven major three-digit manufacturing sector categories (as grouped by ISIC). They are:

1. Iron and steel (29 sub-categories)
2. Non-ferrous metals (33 sub-categories)
3. Metal products (15 sub-categories)
4. Machinery (64 sub-categories)
5. Electrical machinery (32 sub-categories)
6. Ship-building and repairing (4 sub-categories)
7. Motor vehicles (10 sub-categories)

In his important work Kennedy (1974) refers to them as the Potential Defence Capacity (PDC) group of industries whereas others call them the Potential Arms Production Base (PAPB) (Wulf 1983). Whatever name is adopted, it is generally accepted that this group of industries is important in terms of arms production. The corresponding classification in Greek data sources is (i) basic metals, (ii) metal products, (iii) not electrical machinery, (iv) electrical machinery, (v) transport equipment.

It should be mentioned here that the prior existence of the PDC group of industries and particularly their relative importance within a country's economy may affect a) the cost of establishing an arms industry and b) the volume of arms manufacture and c) the size of the spin-offs. It has been suggested (Deger 1986) that having a pre-existing developed industrial base and specific capital endowments is quite helpful in setting up and maintaining an arms production industrial complex. However, countries with special security problems (e.g. Israel) may engage into weapons manufacture which, with purely economic criteria, can barely afford. Thus, as a general rule, countries which have a smaller potential capacity for defence production compared to actual arms production may have, a disproportionately high burden of defence industrialization since the manufacturing and human capital base is inadequate to support the military-industrial superstructure. Furthermore, if the existing capacity can not provide many of the necessary inputs to arms production these will have to be imported. In practical terms this means that one form of dependency will be replaced by another. In such a case any potential spin-offs will probably be very weak.

3.3. Empirical Results

It is natural to expect that any spin-offs from domestic arms production should be mostly evident in the PDC sectors of the economy, because of the direct linkages that exist between this group of industries and defence production.

Such economic spin-offs from arms production will, according to Deger and Sen (1983), take essentially two forms: a) creation of effective demand for underemployed industrial capital (or unutilized capacity) and b) technological progress through a sift in the production function. The latter is aschieved through the formation of new skills in the relevant industries, the creation and/or improvement of managerial and organizational expertise, research and development and so forth.

We intend to test the hypothesis as to whether there are spin-offs from domestic arms production in Greece in the period 1974-1990. On the basis of our forgone discussion our investigation will concentrate on the PDC group of industries where any spin-offs would be more evident: a) basic metals, b) metal products, c) non-electrical machinery, d) electrical machinery and e) transport equipment. Let xi be the index of output of the ith industry. The following OLS equations are estimated:

$$X_{it} = a_{0i} + a_{1i}ME_t + a_{2i}MAN_t + u_{it} \quad (1)$$

where Xi is the index of output in the ith industry, MAN is the index of total output in manufacturing, ME is military spending in real terms, the i subscript is for the ith industry, ui is the error term. To take account of lagged effects whereby past military spending affects current output a lagged version of the equation is also estimated:

$$X_{it} = a_{0i} + a_{1i}ME_{t-1} + a_{2i}MAN_t + u_{1t} \quad (2)$$

The specifications of the equations are of course quite general and very basic. However, even with this basic form any substantial spin-offs from domestic arms production that might exist should be evident. The results of the regression analysis are reported in tables 1 and 2. Due to strong serial correlation in all but one of the equations (basic metals, BM) a first order autoregressive correction was used. The results are reported in Tables 3 and 4.

In general the estimated equations give interesting results. Given the generality of the specifications they are satisfactorily defined in terms of standard error of regression and goodness of fit (R-squared) with the exception of basic metals (BM). Any relevant additional variables would probably improve the fit. The coefficient of manufacturing is significant and positive except in the case of machinery (MAC) and transport equipment (TRP) and these results are doubtful and need further analysis. Let us however concentrate on the coefficients of military spending. In all but one case (machinery, MAC) they enter the equations with a negative sign. This is the reverse of what would be expected if there were any appreciable spin-offs. The situation is slightly improved when this variable is lagged (Table 4) without however altering the overall picture. In three out of five cases the ME coefficients have a positive sign but their effect on the indices of output is insignificant perhaps only with the exception of electrical machinery (EMAC).

In general the results indicate that in the case of Greece spin-off effects are

not strong at all. The industries chosen have the best chance of receiving any beneficial effects. Apparently, such effects may be occasionally positive but they are extremely weak and negligible. Indeed, the negative signs in some of the cases may be pointing to the adverse effects of military spending in line with the findings of other studies mentioned earlier.

4. Conclusion

Domestic arms production by smaller countries such as Greece is primarily influenced by strategic considerations and motivated by the desire to achieve greater independence in that field. At the same time it is also hoped that it can have beneficial economic effects such as aggregate and inter-industrial demand creation through backward and forward linkages. We tested the hypothesis using Greek data and a set of industries which are specially susceptible to defence linkages, the potential capacity for defence in Kennedy's (1974) terms. Our estimations showed that domestic arms production has an insignificant effect on these sectoral outputs. We have found scant evidence of any such stimulus and it would appear that optimistic expectations of appreciable spin-offs remain so far unfulfilled. It is possible that this can be attributed to the industrial base of the country which may not be strong enough to sustain a fully developed defence industry and provide the necessary inputs.

Arms production projects are inherently costly, sophisticated in terms of technology and usually entail a long and unreliable gestation period of expensive R and D. Even advanced and economically strong countries can rarely afford to develop and produce independently the full range of weapons required. It is not surprising therefore to observe a sharp rise in the number of joint international arms production programmes. The small accomplishments of the Greek defence industry so far, were achieved largely with imported technology and know-how. Collaboration and participation in international projects seems to be the only viable way forward for the Greek arms industry if the existence of indigenous arms production capacity is considered to be strategically important. Existing and future European collaboration in joint defence projects (e.g. the European Fighter Aircraft) offers substantial opportunities for participation by the greek defence industry for under-licence production of components and sub-units of weapons systems. This, should eventually result in appreciable spin-offs and trickle down effects to the rest of the economy.

Appendix

TABLE 1

The Effect of Current Military Spending on Output

	BM	MP	MAC	EMAC	TRP
Constant	50.037 (3.77)	22.941 (0.95)	278.676 (8.82)	8.050 (0.33)	118.525 (4.68)
ME	-0.0096 (1.94)	0.0105 (1.17)	0.0169 (1.44)	-0.0031 (0.34)	-0.0109 (1.16)
MAN	0.679 (0.66)	0.429 (0.63)	-2.196 (-3.5)	0.932 (1.75)	-0.047 (-1.67)
R^2	0.484	0.402	0.682	0.449	0.177
s.e.	5.083	9.209	12.116	9.282	9.704
DW	2.08	0.85	1.11	0.76	0.64
F-stat	6.569	4.713	15.029	5.706	1.512

TABLE 2

The Effect of Lagged Military Spending on Output

	BM	MP	MAC	EMAC	TRP
Constant	39.811	48.325	296.207	23.098	90.571
	(2.34)	(1.77)	(7.51)	(0.81)	(3.19)
ME(-1)	-0.0071	0.0166	0.0122	0.0091	-0.018
	(1.21)	(1.77)	(0.90)	(0.94)	(1.87)
MAN	0.718	0.017	-2.252	0.467	0.420
	(2.52)	(0.03)	(3.41)	(0.98)	(0.88)
R^2	0.407	0.464	0.654	0.477	0.278
s.e.	5.449	8.718	12.627	9.040	9.087
DW	2.15	0.72	1.09	0.77	0.62
F-stat	4.807	6.071	13.284	6.395	2.708

Key for tables 1 and 2:

BM : index of output in basic metals
MP : index of output in metal products
MAC : index of output in non-electrical machinery
EMAC : index of output in electrical machinery
TRP : index of output in transport equipment

In parentheses are the t-values and s.e. is the standard error of regression.

TABLE 3

The Effect of Current Military Spending on Output

	BM	MP	MAC	EMAC	TRP
Constant	50.333	-60.026	271.757	-32.994	127.782
	(3,83)	(0.70)	(5.06)	(0.42)	(2.28)
ME	-0.0095	-0.0028	0.0105	-0.0092	-0.0062
	(1.91)	(0.43)	(0.86)	(1.20)	(0.82)
MAN	0.674	1.417	-1.949	1.470	-0,257
	(3.50)	(2.21)	(3.29)	(1.93)	(0.45)
AR(1)	-0.048	0.901	0.441	0.693	0.695
	(0.17)	(4.58)	(1.97)	(2.66)	(3.48)
R^2	0.485	0.659	0.750	0.668	0.571
s.e.	5.269	7.216	11.136	7.468	7.272
DW	2.02	2.22	1.83	1.27	1.41
F-stat	4.086	8.384	13.051	8.753	5.770

TABLE 4

The Effect of Lagged Military Spending on Output

	BM	MP	MAC	EMAC	TRP
Constant	39.827	-35.443	288.443	-16.942	102.740
	(2.44)	(0.47)	(5.03)	(0.19)	(1.93)
ME(-1)	-0.0078	0.0075	0.0077	0.0128	-0.0124
	(1.29)	(1.05)	(0.54)	(1.63)	(1.73)
MAN	0.736	0.987	-2.042	0.755	0.151
	(2.56)	(1.39)	(2.68)	(0.82)	(0.25)
AR(1)	-0.113	0.843	0.448	0.616	0.707
	(0.38)	(4.23)	(1.88)	(2.14)	(3.59)
R^2	0.413	0.680	0.743	0.698	0.633
s.e.	5.624	6.993	11.298	7.124	6.726
DW	1.98	2.31	1.81	1.27	1.52
F-stat	3.056	9.209	12.556	10.046	7.479

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