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# Introduction. Military expenditures and Economic Growth (France, Morocco)

Jacques Fontanel

In

Military expenditures and Economic Growth (France, Morocco)

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Centre d'Etudes de Défense et de Sécurité Internationale,  
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Summary : In this econometric and simulation studies we try to verify the relation between military expenditures and other macroeconomic variables such as GDP, inflation or unemployment. There are some limitations of these methods, such as some circumstantial link between some variables, the quality of quantitative indexes and measures and the problem of multicollinearity. We try to solve these limitations in order to understand the reality of these relations given by our econometric equations and results.

Résumé ; Dans cette étude économétrique et de simulation, nous essayons de vérifier la relation entre les dépenses militaires et d'autres variables macroéconomiques telles que le PIB, l'inflation ou le chômage. Ces méthodes présentent certaines limites, comme le lien circonstanciel entre certaines variables, la qualité des indices et mesures quantitatives et le problème de la multicollinéarité. Nous essayons de résoudre ces limitations afin de comprendre la réalité de ces relations données par nos équations économétriques et nos résultats.

Military expenditure, GDP, inflation, unemployment. Growth, economic development

Dépenses militaires, PIB, inflation, chômage, croissance, développement économique

In our quantitative study, we proposed to make clear the relations existing between military expenditure and economic development in France and in Morocco. It is based on new methods for the quantitative analysis of economic relations and on general procedures for the validation of models. While this type of study and research has been developed in many branches of economic science, it seems practically never to be used for analysing relations between economic growth and national military efforts. Yet it is reasonable to suppose that military expenditure has an appreciable positive or negative influence on the principal aggregates of national economies. The weakness of the qualitative and quantitative studies conducted on this subject may be attributed to several causes:

- Economists have stopped regarding armed conflicts as economically caused phenomena. Without prejudging such a response, we believe that the rejection of any analysis of military expenditure in the economic sphere, is, to say the least, regrettable.
- The available statistical information on military matters is inadequate in three ways: the changing conceptualization of the military sector (annex 3), the falsification of quantitative data by reason of military defence secrecy, and the difficulty of clearly demonstrating the prices and costs of defence matériel.

Recent efforts by the United Nations to develop research on the relation between economic growth and military expenditure, which have been emphasized in a number of publications, have not yet elicited a very favourable response from economists, who have generally limited their studies to simple deductive analyses.

In our study we propose to base our theoretical discussion on a clear empirical foundation: econometric analysis and simulation procedures.

The method we use in this research is closely related to the general philosophy of procedures for the validation of theories and models. Annex 1 presents the major methodological lines available in economic analysis and indirectly explains the line that our study follows.

For our part, we shall try to maintain a 'heuristic' validation method: instead of concerning ourselves with the validation of an existing theory on the basis of a rationalistic analysis, using some existing fragments of theory, we shall endeavour to make clear the satisfactory empirical relations that can provide a coherent theoretical explanation. We are less interested in validating one theory than in testing several that might be validated. Our approach is thus basically iterative and quantitativistic. This does not mean that no other approach is desirable, but we believe that the results obtained constitute high-quality raw material for suggestions of coherent and applicable economic theories.

Scientists, following Karl Popper, believe that at least we can obtain confirmation of a theory or rejection of a law. So long as an analysis is

coherent and not refuted by the facts, there is no justification for rejecting it, even when there is no convincing explanation concerning its substance. We shall try to determine these theories, we shall endeavour to test them and from the information obtained we shall develop some theoretical analyses that will be unchallengeable in so far as facts and coherent reasoning are concerned.

We shall try to find empirically the most significant statistical patterns linking several interesting macroeconomic variables, making more or less direct references to the relation between military expenditure and economic development. The most significant of these statistical patterns will facilitate our intuition concerning the links between military efforts and economic growth. However, underlying all these statistical patterns that we investigate, there are a certain number of hypotheses relating to economic theories expressed in the past. For example, is the Baran-Sweezy thesis, that there is a positive link between gross national product and military expenditure, confirmed in France and in Morocco? Is the increase in military expenditure not related, instead, to population growth? Does growing military expenditure promote inflation? Does a reduction in military expenditure inevitably lead to higher unemployment? Does a low rate of military expenditure in a country (in comparison with other countries) favour or not favour growth in certain sectors of the economy? Does a reduction in national activities in the armaments industries have a favourable effect on the balance of payments, or does it not?

In our econometric studies we try to answer these questions (and many others). What are the limitations of the method? They are of at least three kinds:

- The relation reveals only a circumstantial link resulting from chance; or
- The information used is not correct or is not sufficiently precise; or
- There are phenomena of multicollinearity (a statistical phenomenon frequent in macroeconomic analysis, which removes much of the interest in the demonstration of a relation between two or more variables).

The first limitation can be overcome at two levels.

- On the one hand, when conducting statistical research, the economist does not proceed casually or randomly; if he believes that a relation may or should exist between two or more variables, or if he wishes to prove the contrary, he carries out a statistical regression study; the empirical adjustment made depends initially, on a hypothesis that the researcher wants to test.
- On the other hand, the results obtained should be clearly stated and should have a confirmed theoretical character. If the connexion being tested cannot be logically interpreted, the relation demonstrated has no theoretical and practical scope. For this reason, we believe that it is fundamental, a priori, to present in a precise manner the hypotheses being tested, and if the signs obtained do not match the hypothesis, we must carefully investigate the reasons for these "deviations". Thus, it is entirely pertinent to reject the applicability of a theory on the basis of a statistical pattern that has little coherence or internal logic.

The second limitation is not the responsibility of the economist unless he himself makes an error of interpretation in the figures he prepares on the basis of various kinds of information. The quality of statistical information should make the researcher cautious, especially if the results obtained support the theories presented by those who supply the statistics; on the other hand, contrary results may lead to new economic analyses, the burden of proof resting with those who challenge the results. Even with mediocre information (annex 3), the economist has a duty to try to test his intuition in the processing of the statistics. He certainly should not fail to take an interest in the quality of the primary information, or the conceptualization of aggregates; he may make a useful contribution by demonstrating the inadequacies of the available information, by suggesting new measurements, by calling for the establishment of standard deviations for each item of information furnished. But he cannot be accused at the same time of neglecting the facts and of using the only statistical information available.

The third limitation relates to multicollinearity, whose empirical treatment is presented briefly in annex 2. Multicollinearity is a frequent phenomenon in macroeconomic analysis. However, as soon as the relation can be correctly explained by theory, statistical analysis permits a simple confirmation, even if the coefficients obtained are not particularly significant.

Our economic analysis therefore proposes to correlate the statistical information concerning several significant variables of the relation between military expenditure and economic development. If, for example, we find no significant relation between military expenditure and economic growth, we shall be able to say that, in the light of the available information and of the relation being tested, there are no evident links between these two variables, and all the hypotheses stated, in the case of France, are not supported by our empirical analysis.

We shall try to avoid the errors commonly encountered in this field. The results should be handled with prudence; they are merely supports for intuition, instruments which are necessary but undoubtedly insufficient for validation. Economic and social phenomena are so complex that they hide fundamental relations from man's sight. There are no absolute proofs of the accuracy of an economic law, but it is possible to obtain better quantitative connexions between economic aggregates and greater efficiency in forecasting and in the preparation of economic decisions. The discovery of empirical relations does not imply the existence of an exact relation, but the absence of an empirical relation inevitably leads to rejection of the hypothesis. Annex 1 explains the general philosophy underlying this method.

We shall test many economic relations, taking account of time. Indeed, besides having to test the relation between the military expenditure for one year and the national product for the same year, we must also show whether or not there is a time lag between an increased military expenditure at time  $t$  and an increase in the national product at time  $t + 1$ . These studies are relatively complex, but we shall try to demonstrate a number of significant time lags.

view, to include such costs as a part of military expenditure, but they should be accounted for under a broader concept, that of military potential.

- "Mothballed armaments factories" represent a reserve of military production capacity that can be used at any time. Their maintenance should be accounted for under military expenditure, and their total cost should be included in the calculation of the military potential expressed in terms of monetary expenditure.
- Military aid generally constitutes a particular kind of military expenditure, since it is hoped that the debtor country will provide assistance in case of conflict. Military aid always strengthens the donor country.

These different substitutes show the inadequacy of a military-expenditure analysis that disregards a State's military potentialities. Some countries have a production structure that facilitates very rapid rearmament.

The activities of the military sector in the strict sense include the following:

- The use of personnel;
- The purchase of matériel;
- The cost of operation and maintenance;
- The construction of military installations;
- Research and development.

Some specific problems may then arise: Should military pensions be included in the calculations? Is it possible to make a proper accounting for the work done by the military sector for the private sector? The answers to these questions are relatively unimportant, provided that all countries accept the same accounting system.

Two additional elements of uncertainty should be raised:

- In order to reduce the impact of an excessive pressure of military expenditure on public opinion, the information furnished by States is deliberately kept below actual expenditure levels; many research projects are attributed to civilian accounts even though their only applications lie in the military field.
- "Publicity effects" play a major role in military matters, and therefore governmental leaders must use such information prudently.

The United Nations has published the different conceptualizations provided by SIPRI, NATO and the United States Department of Defense <sup>1/</sup> and has developed a draft international accounting system based on three principles:

- (1) The only information to ask for is the information that States can actually present for statistical purposes; some countries do not have the information needed, while others do not wish to disclose certain kinds of military information.
- (2) The information requested should not go into detail, even though the general structure of military expenditure should be correctly defined.
- (3) The information furnished should be verifiable. On this point there is still some disagreement, but it seems useless, in the framework of disarmament, to call for a reduction in the military expenditure of other countries without providing for monitoring of the action of each country in this matter.

For our part, we consider it interesting to distinguish four aggregate concepts:

- Military expenditure should include the employment of personnel (at its real, rather than apparent, cost), the purchase of matériel, the cost of operation and maintenance, the construction of military installations and the research and development produced directly by the military sector.

National defence production, which includes military expenditure, paramilitary forces (at their real cost), civil defence, mothballed armaments factories, military aid and the stockpiling of strategic products directly adapted to the military effort.

- The national military potential, which includes national-defence production, the increase in military production that can be arranged within a short time in case of conflict (undoubtedly less than one month in the case of nuclear war), specific possibilities of mobilization, and military resources (matériel and training). To be sure, the last concept seems difficult to measure, but we feel that the determination of a good rate of conversion to present value is capable of producing a correct estimate of military resources. Thus, the military expenditure of the past 20 years, both at the level of matériel and at the level of training, could serve as a basis for the determination of this calculation, adding an estimate of the structural possibilities of rapid reconversion of certain industries.

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<sup>1/</sup> United Nations document: Reduction of military budgets: International measurement and publication of military expenditure (1977). United Nations document: Reduction of the military budgets of States Permanent Members of the Security Council by 10 per cent and utilization of part of the funds thus saved to provide assistance to developing countries. Report of the Secretary-General (1975).

- The total national-defence potential, which includes the national military potential, the education and health costs for the population (technological level and physiological condition of the citizens) for the past 20 years (with the associated rate of conversion) and national civilian resources (determined by the national product for the past 30 years).

It is particularly useful, in our view, to calculate these different concepts, since they take account of different notions of military effort. Military expenditure shows the annual effort made by a State, national-defence production shows the totality of annual costs motivated by a country's desire for security, national military potential indicates the potential power of the military sector, and total national-defence potential constitutes an indicator of State power.

(b) Empirical analysis

Quite concretely, economists are somewhat disarmed by the inadequacy of available information. First of all, the search for such information is hampered by many difficulties; in some countries the budgets voted for national defence are easy to find, but information on actual expenditure requires more intensive research, most important, however, numerous kinds of contradictory information coexist under the same name, which inevitably makes the analysis difficult; it is possible to determine behind the concepts the information actually given, but concretely, such "precise information" is seldom supplied. For France, for example, the most diverse figures are given to express military exports (see annex 4). Between the figures supplied by USACDA and by the French Rapports Parlementaires, there is a ratio of 1:3, which shows the difficulty of using these figures. The economist is often forced to make use of concepts formulated by statisticians, but he generally bears a large share of the responsibility because he does not devote sufficient effort to the harsh discipline of conceptualization.

A further problem is that developing countries do not have a satisfactory statistical apparatus. Thus, it is extremely difficult to know the annual military expenditure, since the public-budget mechanisms prevailing in the Western democracies do not operate. For example, it is very difficult to know Morocco's budget, either because it is not very well known by the information services or because it is classified as a "military secret". Research must therefore be limited to the information provided by international organizations.

Lastly, it is always possible as a first analysis, to use only the available information, but the economist quickly finds it necessary to obtain more significant information, either by co-operating with the official statisticians or by making cross-checks. For our study, we shall use the available information, the source of which is indicated each time we define the variables under study. We are aware that this procedure is inadequate, but we believe that at present it is the only plausible one in view of the considerable difficulties involved in present-day econometric research. In any event, we do not need any high degree of precision; all we require is an order of magnitude. Even if present concepts cannot satisfy scrupulous economists, they are the only ones available and must serve as support for the discussion; however, emphasis must be placed on the "reduction" of the analysis to which they lead.



## II. The operational mode

Our study involves three major stages: conceptualization and demonstration of the connexions, computerization of the model, and study of the results. <sup>2/</sup> These stages are not of equal importance, and it seems simpler to us to use the following operational mode:

### (1) First stage: Demonstration of the relation

To begin with, the problem must be correctly defined. Three types of objectives are directly or indirectly indicated: the answer to a question (how can we explain the behaviour of an economic system?); the test of a hypothesis (does a policy of full employment lead to inflation?); or, lastly, the estimation of an effect (if the Government modifies its military policy, what will be the effect of this change on economic activity?). We shall use these three possibilities for various purposes. The economist must then correctly define the variables and parameters he wishes to test, determine the measures of efficiency, and select the desirable approximations.

As a second step, the gathering of data is an essential procedure which leads to a demonstration of working hypotheses, a modification of the tests that can be envisaged, or a reformulation of the problem. We must look into the quality of the information; in our study, we have used the best-known types of information, being unable to judge how well they estimated the phenomenon represented. For France we have used the data provided by INSEE, and for Morocco we have worked with information furnished by the United Nations. We have given a number of critiques of the concept of military expenditure, and we could do the same for the fundamental macroeconomic variables associated with the military sector.

As the third step, we must prepare credible hypotheses. Does military expenditure have a positive or negative effect on the economic growth of France and Morocco? Does it have a greater influence on the development of industry or on the growth of communications? If military expenditure serves to absorb a surplus, can other types of public expenditure play a more effective role? Thanks to the combined use of regression techniques and computers, we can then test for the different hypotheses, depending on the criteria of validity which are defined in annex 1. Statistical analysis then tells us the limits of validity of the hypothesis (annex 2).

As our fourth step, we compare the results obtained for a developed country and for a developing country, for an arms-exporting country and for an arms-importing country. This analysis should make clear the links existing between the fundamental macroeconomic variables and military expenditure as a function of the level of development.

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<sup>2/</sup> J. Fontanel, Les techniques de simulation informatique dans l'analyse macroéconomique (Nanterre thesis, 1974). Simulation macroéconomique appliquée (Université Sciences Sociales Grenoble, Diffusion PUG, 1977).

(2) Second stage: Demonstration of the interrelations

On the basis of the results obtained in the first stage, we must adopt the best equations, the best theoretical and statistical relations, in order to construct a simulation model that can demonstrate the dynamic interdependences between the different variables. It is possible, for example, that an exogenous economic variable will bring about a nominal increase in the gross domestic product but will have such an effect on prices that its over-all effect on the country's long-term growth in terms of constant currency will be negative. 3/

Several questions then have to be answered:

- How many variables have been included in the model?
- How should the endogenous and exogenous variables be chosen?
- Is the model recursive (meaning that the method of least squares is applicable?) or does it involve simultaneous equations (so that, for example, the method of double least squares must be used)?

Next, we must evaluate the model at the theoretical level and therefore verify the logic of the formalized system, judge the possibility of hypotheses and the deterministic or stochastic nature of the model, and analyse the resolution structure of the system.

Once this study has been carried out, it becomes possible to proceed to the computerized calculation. 4/ If all the procedures have been correctly developed, the way is open for theoretical experimentation.

Our objective remains basically to measure the impact of the representative variables of the military sector on the representative macroeconomic variables of the national economies of Morocco and France. We shall consider these economies exclusively from the standpoint of their relations to military expenditure, which is obviously inadequate in absolute terms. For example, the test of an equation connecting gross national product with military expenditure for a given period does not indicate that in actuality only military expenditure influences growth. We are testing only the hypothesis that there is a connexion between these two variables - trying to determine whether, on the one hand, military expenditure constitutes a governmental exogenous variable or whether, on the other hand, it constitutes the resultant of all the interactions affecting gross domestic product. In fact, equation by equation, we study the link between these two variables in the unlikely case that one of them is found to be the only variable explaining the other. If the econometric relation results in satisfactory tests and if the model

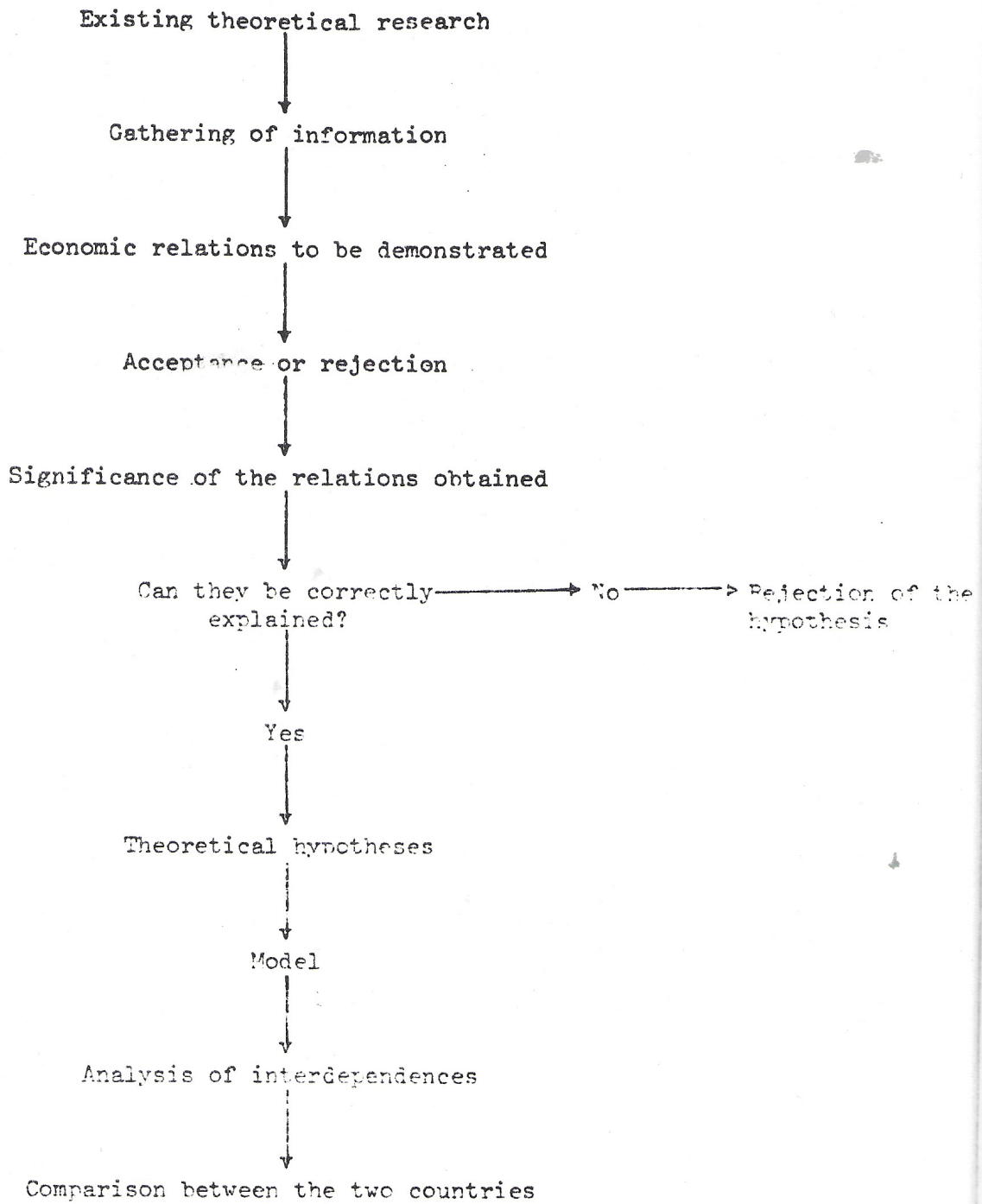
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3/ J. Fontanel, L'Anti-Publicité (Université des Sciences Sociales de Grenoble, Diffusion PUG, 1976).

4/ J. Fontanel, "Le couple informatique-recherche économique: un bilan provisoire" (Revue Economie Politique, to be published).

is coherent, the theory developed in this way cannot be invalidated even if this type of analysis reflects the influence of the explanatory variable. Our method offers, on the one hand, a pedagogical presentation of all the ins and outs of the variations of an explanatory variable (military expenditure) and, on the other hand, a theoretical analysis based on an econometric study. It is unlikely that the information obtained will be very satisfactory at the level of forecasting or that it can serve for the preparation of a complex economic policy. On the other hand, it brings a new understanding of the links between the two variables on which the regression analysis is concentrated.

Mode of operation of our research



Our study is a theoretical investigation of the impact of military expenditure on the fundamental macroeconomic variables of a developed country and of a developing country; for this purpose, we use the power of the methods of theoretical experimentation.

Having defined the principles, we must develop the results obtained on the computer. We shall not be able to present all the regressions tested, since there are over a thousand of them; we shall study the results which are most significant at the theoretical level. The variables adopted, as well as their historical values, are listed in annex 4. It should be noted that the series could have been made longer, but because of basic modifications or different calculation procedures, we considered it essential to put high priority on keeping the data homogeneous.

We shall investigate the impact of military expenditure on the fundamental macroeconomic variables of Morocco and then on those of France. In conclusion, we shall show the differences and similarities between the effects of military expenditure on an arms-exporting developed economy and on an arms-importing underdeveloped economy.

- I - Impact of military expenditure on the Moroccan economy
- II - Impact of military expenditure on the French economy
- III - Conclusion - comparisons of the effects on military expenditure on the French and Moroccan economies. <sup>5/</sup>

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<sup>5/</sup> The listings are available at SPIDO, Grenoble University of Social Sciences, Domaine Universitaire de Saint Martin d'Hères - 38 - Grenoble, France.

All the computer calculations were performed through the effective assistance of SPIDO. I am grateful to Daniel Masson for his programme, to Gilles Dagand for the additional work my presence indirectly imposed on him, to Danielle Hermittan for the data input, and especially to Hicham Hajjar for his extraordinary devotion and his great competence.

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