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"Causes of the Recent Rise of Worldwide Military Expenditures"

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1 Introduction

1.1 Stylized Facts

World military expenditures reached 1 464 billion dollars in 2008 (SIPRI 2009).
Since then, the countries of the world are spending more money for their military
than they did during the peak of the Cold War in 1987/88. With that money, the
current (2008) development aid could be increased by the factor of 14. If only 40%
of the yearly increase in military expenditures were directed towards development
aid, the millennium development goals could be reached (UNITED NATIONS 2008).

FIGURE 1.1: TOP 40 MILITARY EXPENDITURES[1]
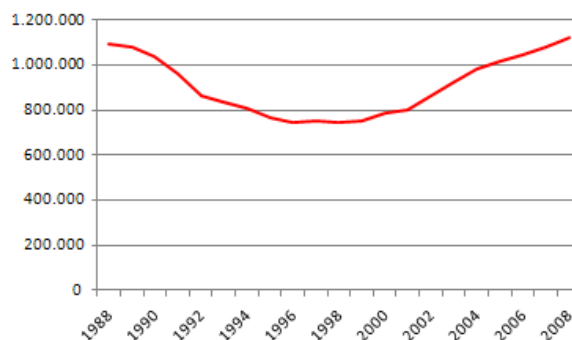
Worldwide total military expenditures increased during the Cold War and reached
a peak in 1987/88. The rise of the Iron Curtain in 1989 and the collapse of the Soviet
Union effectively ended the Cold War and caused a steady decrease in worldwide
military expenditures. This so called "decade of disarmament" lasted until about
1998/99, when military expenditures reached a low. Since then military expenditures are on the rise again in most areas of the world (STALENHEIM/PERDOMO/
SKÖNS 2008). Although the menace of a Third World War between super-arsenal
nuclear powers has virtually vanished, NATO countries enjoy a global hegemony

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[1]Source(s): See section 4.2.2

that is not even starting to be challenged by another power block and there are no open hostilities, threats of hostilities or other aggressive tensions between the Great Powers, governments deem military expenditures higher than during the Cold War necessary and continue to build up their armed forces.

Various reasons have been named for this alarming development. Firstly the period since 2001 can be characterized by the wars in Afghanistan and Iraq that particularly stress the defense budgets of the United States and their allies. Secondly, with the dissolution of the Soviet Block, ethnic wars have erupted all over the world, partly due to the sudden absence of control that the Soviet bureaucracy exerted on their leadership, which created power vacuums. Thirdly, the economic rise of China, India and to some degree the economic rise of Russia has given these nations the possibility to devote a considerable amount of money of their budgets to the military sector. Last, terrorism and various other new challenges to national security are said to require new expensive military equipment (STALENHEIM/PERDOMO/ SKÖNS 2008, MCGUIRE 2006).

On the other hand it might be the case that military expenditures per GDP, which contrary to total values has been more or less steadily decreasing since the end of World War II, have reached a "natural" minimum.

In any case a deeper investigation is necessary to determine the causes of the recent worldwide rise in military expenditures.

1.2 Theoretical Background

The government's decision of the defence budget is usually agreed to depend on the – mainly economic – interests of a nation, which usually refers to the interests of the nation's elite (SMITH 1977, GRIFFIN/WALLACE/DEVINE 1982). The level of the defence budget thus very much depends on the definition of the "national" interest and to what extent military means are vital to reach or secure that interest. Questions such as "How can the military contribute to the economic well being of a society?" are important in order to understand the government's motives. This is why my thesis starts in its first section with models of this relation: The "neo-classical model" of demand for military expenditures focuses on the maximization of utility through a trade-off between security and consumption. Another model, the

"arms race", focuses on military competition between two rival countries and models the demand for military expenditures as a function of the rivals' defence budget. While the Richardson (1960) Model consists of two differential equations, more sophisticated models include electoral cycles, perceived level of threat etc. Perhaps a synthesis of both models is the "security web" (Rosh 1988), which modifies the neo-classical model. It introduces defence budgets of neighbours and rivals.

1.3 Strategies And Doctrines

Although the theories mentioned above have some explanatory power, it could be the case that the determinants of military expenditure are unique for every country and that it is difficult to find a common model that fits everywhere. After all, how much a nation invests in its military does not only depend on its environment but also on the decision of the leaders how to act in this environment and which role the country should play in the international community. In the "Western World", there are countries like Iceland, which does not have a military at all, as well as military Great Powers such as the United States. Keeping that in mind, it seems unlikely that the geostrategic environment alone provides a good basis for a model. The third chapter will therefore analyse the strategic environments and resulting challenges and ambitions of the actors. Beginning with the Cold War era, I will review containment and deterrence theories, as those theories were fundamental in explaining the behaviour of western states. Furthermore I will try to assess the impacts that the end of the Cold War as well as various previously named "new challenges" have on the necessity to spend money for the military in the post Cold War world.

1.4 Empirical Analysis

With the results from chapter one and two in mind, I will test the key hypotheses with data on military expenditures. Data sources and estimation methods are discussed in detail in chapter four. The main hypotheses that I plan to test are the influences of economic, political and strategic variables on military expenditures.

In order to test these hypotheses I will construct a working model of demand

for military expenditure. Macroeconomic data such as the gross domestic product (GDP) will be the basic economic variable. An analysis of this component's coefficient will help to assess whether military expenditures per GDP has reached a "natural low". Data on the strategic environment include occurrence of wars in the proximity of a nation as well as the military expenditures of neighbours, allies or rivals (if any). Various dummy variables classify the countries depending on their wealth and membership in alliances. I also plan to test the explanatory power of other explanations for the recent rise in military expenditures such as commitment in conflicts, war frequency and terrorism or economic growth. Results will be summarized in the last part of the fourth chapter and the fifth chapter.

2 Theoretical Models

2.1 Arms race

2.1.1 The Basic Outline of the Model

The Quaker meteorologist Richardson was one of the first to ask the question, why nations are *"increasing their armaments as if they were mechanically compelled to do so"* (RICHARDSON 1960, p. 11). His paper marks the beginning of research in the field of demand for military expenditures. Richardson's attempt to use his mathematical skills to solve the question focuses on an arms race between two rival nations. The military build-up of one nation causes a reaction in its rival's military budget. Thus, dynamics emerge that can lead to an exponential arms race.

In his model, three main factors determine the dynamics of an arms race: Firstly, a measure of "reaction", which in Richardson's case is a linear function of the enemy's military budget and portrays the need of the nation to counter enemy military potential with equal forces. Reaction will increase if fear of an enemy attack becomes more prevalent. The second term is the "fatigue" coefficient, which describes the country's resistance to large armament programmes. This represents the unwillingness of the decision maker to commit the nation to a large military programme and its opportunity costs. The third factor is called the "grievance term" and reflects the country's ambition to battle the enemy nation. This grievance term is independent of other variables and can be positive or negative.

Embedded in a system of linear differential equations describing the annual change of military expenditure levels, RICHARDSON (1960) gives the following set of equations:

$$\frac{dM_i}{dt} = r_i M_j - f_i M_i + g_i \tag{2.1}$$

$$\frac{dM_j}{dt} = r_j M_i - f_j M_j + g_j \tag{2.2}$$

where M denotes military expenditures, r and f denote reaction and fatigue coefficients and g denotes the grievance term. The subscripts allow for differences among those coefficients between the two rival nations i and j.

Depending on the values of the coefficients, there are four possible outcomes of an arms race. Firstly, there could be a stable equilibrium where $\frac{dM_i}{dt} = 0$ and $\frac{dM_j}{dt} = 0$. The levels of military expenditures of both rivals reach an optimum, where fear equals fatigue adjusted by grievance.

However, the existence of such equilibrium does not guarantee that it will be reached. Apart from cases where the equations have no or no meaningful solutions it might be the case that the equilibrium is not stable and any disturbances, which are likely to occur in international relations, will lead away from the equilibrium even if it is ever reached.

If reaction is high enough an arms race will trigger. Since both the restricting fatigue term and the reaction term are linear functions of military expenditures, the arms race will never reach an equilibrium and defence budget will grow infinitely. This is the case if $r_i r_j > f_i f_j$. In the opposite case both nations will disarm and reach a point where no money is spent for military expenditures at all.

Since the grievance term is independent of the levels of military budget, its influence does not rise as military budgets rise. Depending on the value of the grievance term in some cases, the starting levels of the military budgets will determine the long-term outcome. The grievance term also shifts the equilibrium plevels of military expenditures.

2.1.2 Discussion of the Arms Race Model

The answer that Richardson gives to his own question concerning the militaristic behaviour of states would be that, given the coefficients, states *are* mechanistically compelled to build arms, unless political intervention to stop that tendency is under-

taken. According to Richardson (1960, p. 12), this is because of their "*tradition*" and "*instincts*". This approach in essence sees threats and military expenditures as causes for military expenditures and threats, thus fails to explain why states issue threats and what they perceive as threats.

This lack of understanding of the political role of the state is the main critique McGinnis (1991) directs at Richardson and has caused researchers to focus on theoretical concepts of security and the role of the state. The neo-classical model, featuring a welfare function maximizing state facing resource constraints, is one answer.

Bureaucratic models are an other attempt to address the political plane of armaments. While complex bureaucratic models feature various actors within the state, who have various interests in mind, bureaucratic adoptions of the Richardson model express the longing of bureaucrats to reach a "desired" level of military expenditures, usually increasing the last year's budget by a certain percentage. This desired level of military expenditures enters the differential equation and shifts the equilibrium position of the arms race and thus changes its dynamics.

Ultimately, most refinements of Richardson's arms race model continue his tradition by explaining behaviour of states by adding factors to differential equations. But this constitutes a description rather than an explanation. As McGinnis (1991, p. 451) says,

> "The cause of the arms race resides not in each state's mechanistic reaction to threat, fatigue and grievances, but rather in the fundamental conflict of interests between rival states."

These conflicts of interest are the cause for both arms races and wars. Richardson's claim, that arms races are the origin of wars, thus seems spurious, and a more thorough analysis of the function of military defence is necessary.

2.2 Security and the Role of the State

In modern societies, the military has the explicit task of protecting the state's territory and its citizens from outer threats. The introduction of constitutional states

has brought two main rules for the military. Firstly, the military exercises the state's monopoly of violence as far as threats from "outside" are concerned, while maintaining public order within the society is the task of the police. Accordingly, equipment and training of the military is designed to deter possible enemies and to protect assets from damage or destruction in event of a war. This is achieved by unfolding enough military power to separate assets from threats. Second, the military is subordinate to the civil government, usually the defence ministry, which determines the defence strategy according to the threats it perceives and doctrines it applies (see HALTEINER/KÜMMEL 2008).

SOOS (1979) points out that this clear relation between the state, society and military did not always exist, but is the result of the military's subordination under civil authorities and the introduction of constitutional states. ADELMAN (1985) further investigates the relation between military and the state throughout history.

Speaking in economic terms, the function of the military is to produce "security". In this context security is a public good because it is non-rival and non-excludable within a society. Security is also a good example of a natural monopoly since the expensive equipment necessary to provide it implies economics of scale. SMITH (1980) introduced the security function to express the level of freedom from attack perceived by the society. In his model, security depends on military expenditures and the "strategic environment". Thus the security function has the form:

$$S = S(M, E) \tag{2.3}$$

Instead of the annual rates of military expenditures, stocks could be used. With better data available, we could use depreciated stocks of military equipment plus annual rates of operative costs, however this is not the case for most countries.

Threat

Similarly to security, threat is the key determinant of how much military expenditures are necessary to guarantee a certain level of security. In analogy to security, we can define threat as probability and strength of an enemy attack against own assets, capable of lowering the level of utility. Following this definition, threat is

per se unobservable. However, in the case of modelling the demand for military expenditures, a decision taken by officials or politicians who cannot observe threat as well, it is reasonable to think of the threat variable as *perceived* threat. This is usually designedas a function of "enemy" military expenditures.

2.3 The Neo-Classical Model

2.3.1 The Basic Outline of the Model

The neoclassical model regards the decision of how much military expenditures are necessary as a trade-off between military spending and civilian expenditures. The GDP is the sole resource, representing the total economic capability of the society, and the government devotes a certain fraction of it to the military, so that the welfare function is maximized:

$$max! U = U(C, M) \tag{2.4}$$

where U denotes utility, M denotes military expenditures and C denotes expenditures on all other good.

This welfare function could, for example, be derived from the median voter's preferences. The welfare function could however also originate from the mind of a benevolent dictator, who has the ability to state the ideal welfare function considering all citizens, or even from the management office of an arms manufacturer (see SMITH 1980).

In order to determine the optimum, it is necessary to consider the budget restraint:

$$max! U = U(C, S(M, E)) \tag{2.5}$$

where Y denotes income, p_C and p_C denote relative prices and S denotes the security function.

Applying the rule that in the optimum marginal utility per cost-unit of both

goods[2] must be the same[3], the optimum is characterized by:

$$\frac{\frac{\partial U}{\partial C}}{p_C} = \frac{\frac{\partial U}{\partial S}\frac{\partial S}{\partial M}}{p_M} \qquad (2.6)$$

Under the quite logical assumption of monotonic decreasing partial utility of non-military consumption, loosening the budget restraint, i.e. a rising GDP, will also lead to a higher military budget. This means that a richer society will simply spend more money on the military because it has the means to do so. Note that it is not clear whether the share of income that will go to the military will increase or decrease. Steadily decreasing shares of the military sector over time however seem to indicate that the partial utility of military production decreases faster than the partial utility derived from non-military production.

Also, military expenditures will obviously change if the utility function U changes. This indicates that if less military expenditures are deemed necessary, this is because the decision deems security less important or because the situation is more favourable so that less military expenditures are required to maintain the same level of security. The security function helps to distinguish between these two cases, as changes in the strategic environement are made distinguishable from changes in the utility function.

2.3.2 Discussion of the Neo-Classical Model

The neo-classical model sees the demand of military expenditures in a ways characteristic for economics. In a world of scarce resources it optimizes utility by allocating resources to the defence and non-defence sectors, so that marginal utility is equal. This straightforward approach cuts to the point of having a military, which ultimately is – as always in economics – to enjoy utility, specifically to enjoy security.

The only open questions are how exactly to define the corresponding functions, and once that is clear, so is the optimal level of military expenditures. Reality however is not that simple. The fact that utility functions need to be known is the first obstacle. Some authors (e.g. SANDLER/HARTLEY 1995) derive the society's

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[2]Military goods do not generate utility per se, but rather through the increase in security they provide.

[3]This is not true in case of a boundary solution. However, since with virtually no exception every state possesses a military force, it is safe to rule out that option.

utility function from the median voter's preferences. This assumes the median voter has clearly stated preferences and that we live in a form of democracy that in fact executes the median voter's preference regarding the level of military expenditures. Both assumptions are highly questionable. SMITH (1980) points out that the *mechanics* of the neo-classical work out no matter how the functions are derived. They could very well be dictated by the arms lobby itself. However, this is not what models of demand of military expenditure examine. For a realistic representation of the mechanisms which determine arms build-up, the functions need to be correct. Otherwise the neoclassical models will perform inadequate when tested with real data.

The question also remains of what security covers. Germany prior to the Second World War is a good example of a nation that obviously spent more money on its army than was necessary to guarantee defence from threats, but rather planned to defeat and occupy her neighbours. The utility of her arms build-up is generated by the loot pillaged from the occupied countries rather than absence of threats. The neoclassical model is usually pointed out to describe a peaceful nation, however security might cover some "preventive" action to eliminate threats. This proves that not only the level of threat determines the response but that the general situation a country faces might push it in the one or other direction. Generally, it is difficult to draw a line between defensive and agressive military actions.

To put it in the nutshell, the viability of the neo-classical model depends largely on how well the utility and security functions are defined. Any additional information such as political stability, applied doctrines or decision finding mechanisms will improve the results if applied correctly.

2.4 Alliances

One of the key issues of the neo-classical model is the correct assessment of the strategic environment. Basically, this concept covers several factors important for a country's security: (1) the defence resources provided by its own or allied military forces, representing the capabilities to deter aggression or limit danger in case of a war, (2) enemy nations' military capacities, and thus their potential to inflict damage in case of war, (3) estimates of threat, i.e. the probabilities that the country will become target of an attack by a certain enemy nation and (4) geographic consider-

ations, which might allow the use of natural barriers to aid defence and improving security this way.[4] This chapter will deal with the role of alliances in contributing to the defence capabilities of a country.

A wide variety of literature exists that deals with the question of international institutions, their purpose and the motives of nations to join them (e.g. SNYDER 1997). Since it would go well beyond the scope of this work to analyse these issues in depth, I will assume alliance membership and international relations as given and focus on the effects of these alliances on the behaviour of the states.

2.4.1 Pure public good model

The pure public good theory assumes that every alliance member profits not only from her own military expenditures, but from the sum of the alliance's efforts. The idea behind is that the key purpose of an alliance is deterrence. Since the alliance will respond in full force to an attack against any of its members, the total military capability of the alliance determines the deterrence potential. Thus, security is provided by own plus allied military expenditures:

$$S_i = S_i(\sum_i M_i, E_i) \tag{2.7}$$

As SANDLER/HARTLEY (1995, p. 19) point out, this concept of alliance benefits has several implications. Firstly there are no limits to the size of the alliance, since any new member makes a contribution to the security level of the alliance. Secondly, since small members have limited capabilities of changing their security status, they will more likely substitute military goods with non-military production than larger states, whose military budget will have a larger impact on their own security. Generally we have to expect a free rider problem, leading to a lower than Pareto-optimal level of military spending. Governments won't consider positive effects of their military production's spill-ins to other countries while they see their allies' defence efforts as perfect substitute to their own military programs.

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[4]In panel data, these geographic factors can be considered constant over time and to be represented by the country dummy.

2.4.2 Joint product model

VAN YPERSELE DE STRIHOU (1967) points out that there are military goods that are not entirely public within the alliance. On the one hand, military resources may be rival in the sense that if they are deployed in one area, they cannot be used somewhere else – a phenomenon called "force thinning". This is especially relevant in the case of defending borders with conventional forces and is a good example demonstrating that an alliance does not always gain if a new member joins – it could be the case that having to defend this country outweighs the benefits.

Another major factor of non-public benefits of military programs are the economic benefits they create, such as unemployment, research & development incentives and general stimulus to the economy. While it is true that efficient non-military government spending can probably provide the same effect at a cheaper cost it is likely that economic incentives of military programs are taken into account when determining the optimal level of military expenditures. VAN YPERSELE DE STRIHOU (1967), who contributes to the debate of how defence costs should be shared in NATO, suggests that these private benefits from military programs should be subtracted from the military expenditures / GDP ratio used to compare NATO defence burdens.

The publicness of the defence good may vary over time and depend on the enemy the alliance faces and the way it plans to fight it. An alliance that bases its defence on deterrence will profit from allied military expenditures to a much higher degree than an alliance that is relying on conventional arms. Likewise, nuclear deterrence will prove more effective against a well identified nation than against individual terrorists or rogue organisations. If an alliance is at war, deterrence has failed and the remaining defence effort is much more likely to be subject to force thinning.

2.5 Models of Bureaucratic and Organisational Politics

2.5.1 Models of Bureaucratic Organisation

Basic bureaucratic models bear a resemblance with Richardson arms race models. They explain usually rising military expenditures by the fact that the bureaucracy in the armed forces strives for controlling a larger budget every year. The *desired*

military budget thus is

$$m_t = cM_{t-1} \tag{2.8}$$

where c > 1.

2.5.2 Models of Organisational Politics

Models of organisational politics investigate the interaction of institutions involved in determining the military budget. The task of the theory of organisational politics is to find reasonable simplifications that allow a systematic, testable model of these complex interactions. OSTROM (1977) uses a model that focuses on four basic decision guidelines: Experience (past observations), simplification (ignoring complex context), satisficing instead of optimizing and an incremental approach.

In the simplest model of organisational politics, military expenditures are determined by the armed service's request and Congress' decision of how much of this sum will be granted (see DAVIS/DEMPSTER/WILDAVSKY 1974).

$$m_t = aM_{t-1} + u_t \tag{2.9}$$

$$M_t = bm_t + v_t \tag{2.10}$$

Here, the armed services request a proportional amount of the last year's budget for the next year (for example so as to make approval more likely). Congress in return approves a certain percentage of the armed service's request, probably because it believes that the request is quite sound, but exaggerated. Thus, $a > 1$ and $b < 1$.

A more sophisticated model by DAVIS/DEMPSTER/WILDAVSKY (1974) includes five steps: The request from the armed services, the President's budget proposal, the budget approved by Congress, the defence ministry's additional appropriations and de-facto military expenditures. The defence budget thus is the result of the interaction between this "*conglomerate of semi-feudal, loosely allied organisations, each with a substantial life of their own*" (OSTROM 1978, p. 942 citing ALLISON 1971), expressed in the coefficients a_i.[5] Depending on the political realities these institu-

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[5] Note that for this model to make sense at all it is necessary to have data on the actual values of defence budget proposed by the various organisational units available, otherwise the reduced form of these equations will suffer from collinearity.

tions face, such as elections or the need to gather support for their agenda, their individual decision function could be seen as depending on the median voter's preferences, being subject to lobbyism etc. This however does not change the basic functions of the model.

2.5.3 Combinations of Politics and Arms Race models

OSTROM (1978) links models of organisational politics and arms race models. The motivation of this approach so seems obvious: On the one hand, both models fail to explain U.S. military expenditures, as OSTROM (1977) argues in the second part of his paper. On the other hand, the shortcomings of each model include the non-consideration of the other model's primary focus. While the arms race model was often criticised for neglecting domestic political factors, the main critique on the purely organisational models is that they try to explain defence expenditures without considering who takes the decisions.

This "reactive linkage model" adds environmental stimuli to the decision functions of the organisational units: The Soviet Union's defence expenditures (X_1) and U.S. military battle deaths (X_2). The trend in congressional appropriation of defence budget levels is the only "organisational" explanatory variable (X_3) and corresponds to the coefficients a_i in section 2.5.2. Thus the model takes the form:

$$m_{i,t} = a_{i,t}H_{i,t} + \sum_i \sum_j b_{i,j}X_{j,t} + u_{i,t} \qquad (2.11)$$

where i denotes the four organisational units armed services, President, Congress and Defense Ministry, H represents historical basis and $a_{i,t}$ as well as $b_{i,j}$ are coefficients. Note that the coefficients of the explanatory variables X are organisation-sensitive, which makes it possible for different organisational units to react differently to environmental stimuli.

In OSTROM's specification the armed services are the only institution that considers "enemy" (i.e. Soviet) military expenditures in its decision function. Besides that, figues of battle-related casualties also play a role. The effect of battle deaths is supposed to cover not only replacements but is also an indicator of commitments the U.S. military requires money for other than deterring the Soviet Union, the scale of which can be indicated by the number of casualties.

The President and Congress play a similar role and consider the diplomatic and financial situation of the nation. The latter, resembling "fatigue" in the arms race model, is particularly attributed to the Congress as the custodian of the American tax money. This is represented by a coefficient which cuts a certain proportion of the military budget. As previous decisions of Congress are part of the "historical" knowledge of institutions, they are capable of taking advantage of Congress' "moods".

2.5.4 Discussion of bureaucratic/political and organisational models

Bureaucratic models try to explain the level of defence expenditures as a result of the political process that decides the national budget. They do so by defining decision rules for political actors. Most of these models are very simple as this decision function is a linear function depending on someone else's decision or the previous year's defence budget. This raises doubt concerning the validity of this approach, since *any* more or less steady adjustment of military expenditures over time will yield acceptable results for these models. This makes interpreting the results especially difficult, since little is said about why political actors behave the way they do.

ROSH (1988, p. 681) sums up why, although models whose main feature is a percent increase provide significant results, the challenge is to find alternative models:

> "[E]ven if the best predictor of how the universe looks today is a description of the universe the day before, that should not prevent one from finding the underlying causes that shaped the universe in the first place. A number of internal factors that may affect defense allocations are theoretically more interesting and empirically more easily testable than incrementalism."

The degree of detail and specialisation of Ostrom's model is very high. MCGINNIS (1991) criticises that this imposes too harsh restrictions on the actor's abilities to base their decisions on all available information other than those specified in the model, such as intelligence, forecasts or other kinds of expertise available to them. He argues that

> "our models cannot, and should not, be dependent on an exact specification of organizational structures or the particular decision rules employed by individuals or organizations" (MᴄGɪɴɴɪs 1991, p. 457).

I tend to agree with that notion. It's usability is also limited to the United States, since other nations probably face a different institutional setting. Sᴍɪᴛʜ (1995) argues that models of demand for military expenditures provide little more than a vague idea of what is behind a "*poorly understood*" process. Attempting to explain it in too much detail seems bound to lead to unreliable conclusions.

There is however a theoretical justification for a linear setup of models of demand for military expenditures. Lᴜᴄɪᴇʀ (1979) argues that, since threat evaluation is a very complex process, decision makers do not reconsider their priorities every year. Once they set up a "*standard operation procedure*" (SOP) they delegate further decision to the bureaucracy, resulting in a proportional increase of military expenditures until the SOP are changed. Unfortunately, revision of SOPs does not necessarily follow traceable events such as administration changes, expiring of international treaties or alike. A more suitable proxy might be the change of defence doctrines, as it was implemented with success in alliance models, where flexible response changed the degree of publicness of military expenditures within NATO.

2.6 Marxist / Keynesian Models

2.6.1 Introduction: The Effect of Military Expenditures

So far, all theoretical models considered have treated military expenditures as governmental consumption of resources. Since resources are limited and rival, this implies less resources are available for civil use. Since defence expenditures result from a trade-off between consumption and security in the neo-classical model and are a reaction to threat in the arms race model, this is an accepted loss. However, once you consider the possibility that military expenditures can, most likely by stimulating demand, cause economic growth, another possible explanation for military demand arises. Governments opting for a positive economic effect could use military expenditures to spur the economy. This kind of state intervention through military expenditures is referred to as military Keynesianism.

2.6.2 The Underconsumption Hypothesis

Other than providing an alternate specification to the welfare trade-off model, the military Keynesian hypothesis also gives an answer to the anomaly of non-reaction. Much research focussing on arms races comes to the conclusion that "reaction" coefficients are insignificant, shaking the very foundation of arms race models. This established a branch of defence economics that derives military expenditure from the behaviour of organisational units within governments – the bureaucratic / political models, which have been reviewed in section 2.5.1. Similar to that, Marxist theory claims that the mechanics of the capitalist system itself promote military expenditures. MANDEL (1991, p. 9) writes:

> "Kapitalismus bringt Konkurrenz mit sich. Mit dem Auftreten großer Körperschaften und Kartelle – d.h. mit dem Beginn des Monopolkapitalismus – nahm diese Konkurrenz eine neue Dimension an. Sie wurde qualitativ mehr politisch-ökonomisch und deshalb militärisch-ökonomisch."

While this represents a "domestic" explanation, it does not apply restrictive rules of behaviour of organisational units but rather addresses general economic issues.

Both Marxist and Keynesian traditions grant the military a special role within the capitalist economy, although the Marxists do so more specifically than the Keynesianists. For Keynesianists, military expenditures are merely one form of government expenditures – and, since Keynes was a liberal anti-militarist, probably not the best one. Some Marxists however argue that the military serves a special function to counter tendencies of underconsumption (or overproduction), which are – despite for different reasons – a key factor in both economic theories.

2.6.3 Monopoly Capitalism and the Defence Sector

Several neo-Marxist authors have stressed the importance of the monopolized structure of the economy in late capitalism. These monopolies are characterized by a high degree of capitalization, the ability to produce considerably more economic surplus than competitive sectors and tight bonds with the state. Due to the inherent susceptibility to economic crises, this secotr has recurring problems of realizing or "absorbing" this surplus. Instead of reducing prices the preferred way to raise

profits is to cut production, which is why there is a tendency towards stagnation in monopoly capitalist economies. This tendency is countered by a series of policy instruments, such as *"improved sales and marketing techniques, epoch-making inventions, imperialism, and civilian and military expenditures."* (GRIFFIN/DEVINE/ WALLACE 1982, p. 115).

The intentions behind the state's economic intervention are a result of the character of the state as protector of the interests of the bourgeois class. In this respect, the Marxist approach differs radically from the neo-classical model, which leaves out the question if the state or the society as a whole takes the decision and finances military expenditure.

According to the Marxist theory of the state, its prime function is to maintain order and assist the monopoly capitalists with expanding their profits. Due to several reasons, military expenditures are a popular way of fulfilling that role. TREDDENICK (1985, p. 81) sums up the reasons which make them a particularly useful instrument:

> "[T]hey do not interfere with the ability of capitalists to extract surplus from the workers; they do not divert profitable enterprises to the government; they do divert resources away from capital accumulation and hence increase the rate of profit on existing capital; and they are continuously expandable as a result of rapid obsolescence arising from intense technological competition."

Other than that, military expenditures help to gain access to markets and maintain the dominance over the capitalist world. Marxist authors also stress the importance of nationalism, patriotism and militarism in helping to justify military expenditures and ensure the support for an economic policy which is probably suboptimal compared to interventionism through civilian expenditures (TREDDENICK 1985, p. 83).

The task of maintaining order is best achieved by integration of the working class, i.e. their mass organisations, into the state. GRIFFIN/WALLACE/DEVINE (1982) argue that a "Keynesianist Coalition" composed of supporters of New Deal-like economic interventionism, Cold War militarists and business elite struck a deal with union leaders to dedicate the economy to a large scale interventionism project in the form of military expenditures. This again demonstrates the fact that defence spending is often a convenient policy, since it can serve the interest of various powerful interest groups while alienating only a minority of the population.

2.6.4 Stagnation

If military expenditures are caused by stagnation, for empirical analyses indicators are necessary that capture this phenomenon. Obviously, the correct choice of proxies for economic downturn, or stagnation, that causes capitalists to call for state intervention, will make the difference between useless and suitable models to test this hypothesis.

GRIFFIN/DEVINE/WALLACE (1982) try to find suitable indicators for stagnation. The "GDP gap" and the "manufacturing gap" represent the difference between the actual output and the hypothetical output if all unemployed workers were employed. This however produced insignificant results. Of all their other attempts, only last year's economic growth rate and last year's change in consumption were significant in regressions controlling for standard variables.

GRIFFIN/WALLACE/DEVINE (1982) develop a model for military expenditure that follows the theory of BARAN/SWEEZY (1966) and O'CONNOR (1974). They regress the defence burden on indicators of economic health *in the monopolized sector* of the economy and unemployment *in the unionised sector*.[6] This specification represents a system where the government is only sensitive to the needs of the certain sectors of the economy. O'CONNOR (1974) argues that this is the case because the monopoly sector is both more important to the state in terms of tax revenue and by far more relevant for the functioning of the economy as a whole, since it holds over 90% of all corporate assets and generates about 78% of corporate profits (GRIFFIN/WALLACE/DEVINE 1982, p. 126).

The results they produce with these explanatory variables are impressive. Both unionised unemployment and last year's change in monopoly profits are significant in all alternative estimation equation specifications. Another interesting result is that the best stagnation indicators of GRIFFIN/DEVINE/WALLACE (1982), last year's economic growth rate and consumption growth rate, turn insignificant once sector-specific indicators of stagnation enter the regression equation. Geo-political and domestic-political variables also turned out to be insignificant, with the exception

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[6]The monopolized sector consists of the sectors "mining, construction, transportation, communications, public utilities, finance, insurance, real estate, and all durable and non-durable manufacturing except lumber, leather, furniture, textiles and apparel" while the unionised sector consists of "mining, manufacturing, construction, transportation, and public utilities" (GRIFFIN/WALLACE/DEVINE 1982, p. 125-126)

of an "election year" dummy. It seems that administrations are much more willing to offset stagnation with stimuli through military expenditures when there is an election ahead.

2.6.5 Discussion of the Marxist Hypothesis

Marxist theory provides answers to many crucial questions regarding the determinants of military expenditures. While the neo-classical model requires some theory about how the welfare function is generated and will produce different results depending on how this question is resolved, Marxist theory gives a plausible answer to the question whose interests are being served by state interventionism in form of military expenditures.

Marxist theory also addresses the anomaly of non-reaction: Threats from the outside do not determine the level of military expenditure, militarism as well as patriotism and nationalism rather help the state to fulfil its integrative function. However, Marxist theory still recognizes the benefits especially the United States reaped from having the capitalist world's best military force at their disposal. SMITH (1977) argues that maintaining this military force also represents a substantial burden to the economy and thus contributes to economic down-turn in the long run although designed to improve the economy in the short run.

However, the detailed representation of U.S. military expenditures by GRIFFIN/ DEVINE/WALLACE (1982, p. 139) comes at a price. It is rather unlikely that the model specified for the United States of America can be used for any other capitalist power, since it bases on assumptions that may only apply to the U.S. Additionally, interpreting the results of GRIFFIN/WALLACE/DEVINE (1982) is not straightforward. Even if stagnation causes military expenditures, that does not necessarily mean that military expenditures offset stagnation, but might indicate that in face of an economic downturn conflicts are more likely or, as neoclassical conflict theory would say, more profitable than other economic activity.

Finally, the validity of the theoretic background of the model GRIFFIN/WALLACE/ DEVINE use is hotly debated among Marxists. The key question is whether spending money on the military has the effect of stalling or reversing the tendency of the profit rate to fall or not, may it be in the short or the long run, and whether militarism is the solution to inherent crisis susceptibility or a drain on profits. The

"permanent arms economy" is a theory suggesting that capitalist economies use military expenditures, which consume surplus the way luxury consumption does, with the effect of slowing down the change of the organic composition of capital, easing realisation problems in the long run. The author of these lines tends to agree with BROOKS (2008) in that it is unlikely that devoting resources to an (on society-wide scale) unproductive endeavour such as arms production plays a vital role in increasing economic well-being in the long run – even if arms production is probably quite profitable for the single arms manufacturer.[7]

2.7 Conclusions

Most theories on military expenditures are adjustments of more general theories to the subject of defence outlays. The neo-classical theory, for example, describes resource allocation in general, and the idea that the defence share of GDP or total government expenditures should follow the same pattern sums up the neo-classical approach to military expenditures. Likewise the situation of allied countries resembles any other (semi-)public good produced by individuals who face the temptation of free-riding. The military-Keynesianist approach, by pointing out the possible positive effects on economic growth, applies Keynesian theory to military expenditures, although military-Keynesianists need to argue why expansive policy should be done via military as opposed to civil public spending. Finally, Marxist theory on the determinants of the surplus rate influences Marxists' view on military expenditures.

Thus, as this paper has argued in detail in the various chapters, all theories share to a certain degree the theoretical issues of the theory they were inspired by. While the neo-classical system fails to answer the important question of who decides the utility function of the state, "institutional" models tend to be purely descriptive. Concerning Marxist theories, the debate is characterized by different views on the way military expenditures countervail the tendency of the surplus rate to fall, and how the production of a good without inherent utility value affects the composition of total surplus.

The fact that various models originating from utterly different theories are capable of providing significant results seems to indicate that, while no explanation can claim to explain all aspects of military expenditures, the "real" model contains elements of

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[7]This debate is summed up in DUNNE/COULOMB (2008) and BROOKS (2008).

multiple theoretical approaches. Thus, the task lies in finding useful combinations of several theoretical models. Ostrom (1978) and Rosh (1988) are two examples of such efforts.

Implementing this approach, my working theory of determinants for military expenditures for the empirical part will assume that the military fulfils several roles. These roles are summarized by Grey (1974) as follows:

- Deterrence: A state may engage in an arms race in order to deter inimical military behaviour – a threat is perceived.
- Defense: A State may engage in an arms race in order to attain a more favorable outcome if war should occur.
- Diplomacy: A state may engage in an arms race in order to increase its diplomatic weight.
- The functional "threat": A state may engage in an arms race because an external "pacer" of military endeavor is both convenient and necessary to the racing "agents."
- Vested interests: A state may engage in an arms race because its defense policy is essentially the captive of domestic industrial, bureaucratic (official), and legislative interests — all of which share in the spoils of a high rate of defense expenditure, and all of which therefore need an external threat.
- Reputation: A state may engage in an arms race in order to preserve or enhance the measure of dignity or prestige it deems appropriate (or essential).
- Technology: A state may engage in an arms race because a rapid succession of generations of weapons technologies ensures bloc obsolescence if a unilateral slackening of qualitative effort is not reciprocated abroad.

It could be argued that some of the functions of the military are bonuses rather than vital functions. While it may be true that maintaining a military force yields prestige, few countries will spend their taxpayer's money on weapons just because of that.

Some of these functions are rival while others are non-rival. A military force capable of projecting power will also increase a nation's prestige, and any arms

project that spurs the economy will also provide security-related benefits. On the other hand, the nuclear arsenals of the Cold War superpowers served as deterrents but were useless in all other applications of military force, thus lost their strategic value after the end of the Cold War. The fact that the money spent on these deterrence weapons ceased to effectively increase security is a result from the fact that nuclear deterrence is in this sense rival to other functions of the military.

When more means are necessary to fulfil one of those functions, military expenditures will rise. Interpreting coefficients of regression estimations can help identifying which function of the military made increased defence spending necessary. An additional variable, GDP, will express how much military expenditures can be sustained and capture rising military expenditures resulting from easening budget constraints.

3 Historical Analysis

3.1 Defence Economics in the Cold War Era

The initial setup of the Cold War was a direct consequence of the result of the Second World War and deteriorating relationships between the communist Soviet Union and the Western Allies. After the Second World War the United States emerged as the leading capitalist nation, however with a capitalist bloc reduced by Eastern Europe, the Balkans, China and parts of Indochina (with considerable influence of communist parties in the rest of Indochina), France, Italy, Greece and later Latin America. In this geostrategic situation, the only capitalist nation capable of doing so faced the task of countering the advance of communism worldwide. This was the key motivation for the "containment" doctrine calling for a resolute stance against Communist activities on a worldwide scale.

Another key strategic element was the introduction of nuclear weapons to the superpower's arsenals in the late 1940s and early 1950s. The main effect of the atomic bomb was to make any direct war between nuclear powers much more costly, thus successfully deterring it. As a result deterrence theory, an offspring of realist theory, served as key model for international relations (JERVIS 1979). In the world of the Cold War, both superpowers imposed their bipolar order on the rest of the world, thus recreating their view of international politics.

3.1.1 Deterrence Theory: Introduction

Deterrence theory derives from the school of political realism, which sees nations struggling for resources, influence and other given national interests in an archaic system, in which the stronger power prevails. It provides answers to questions such as how to project military power to gain political influence, prevail in crises

FIGURE 3.1: THE "GAME OF CHICKEN"

		B	
		confront	*yield*
A	*confront*	$-2, -2$	$1, -1^*$
	yield	$-1, 1^*$	$0, 0$

and prevent wars. Although deterrence is possible with various kinds of weapon systems, a nuclear arsenal combined with first and second strike capability introduce a qualitative change in the level of threat that explains the prevalence of deterrence theory. Since there is no way to use nuclear weapons defensively and their tactic effectiveness (i.e. usability against military forces) is limited, deterrence is the main function of nuclear weapons.

3.1.2 Deterrence and Game Theory

KAHN (1960) compared nuclear deterrence to the "game of chicken". In this resemblance of a game played by venturesome teenagers, two drivers drive their cars towards each other in the middle of the road. Whoever breaks or swerves first loses and is the "chicken", while the other teenager wins the reputation of being the bolder one. If nobody undertakes an evasive manoeuvre the result is a crash which causes enormous costs to both drivers.

Figure 3.1 represents the "game of chicken". Obviously this 2x2 representation is a simplification, since it requires players to choose their strategy before the game starts and does not allow them to reconsider. The preferences of the players are in this order: winning, drawing, losing, crashing.

There are three Nash-equilibria in this game. The two pure strategy Nash-equilibria are denoted with a star. There is a third mixed strategy Nash-equilibrium where players decide to evade or drive on depending on the exact payoffs. The key feature of the game is that the players decide whether to evade or to drive on depending on what they think the other player is doing, which makes it possible to influence the opponent's behavior by taking an aggressive or submissive stance (provided, of course, that this is possible in the framework of the game).

In the real world, deterrence theory describes the situation when a challenger or

aggressor tries to topple the status quo in his favor, i.e. by claiming some resource that is in the possession of the defender. The defender then uses threat of force and tries to change the behaviour of the aggressor. One of the two powers has to "break" (i.e. yield) in order to prevent a full-scale nuclear war. The "game of chicken" may be misleading in the sense that it is symmetric, while deterrence theory suggests that the dangerous situation is deliberately caused by one power.

3.1.3 Options

During the Cold War several attempts were made by the superpowers to influence the specification of the "game" and to gain an advantage by doing so.

One way to do so was to increase the stakes by making a commitment. The president of the United States could, for example, announce that her administration will resign if she did not manage to solve a certain crisis in the best interest of the USA. This effectively raises the costs of losing and will make yielding less preferably. The Soviet Union would therefore assume that the probability that the United States will back down has dropped, which will make it more costly to persist, as they would be faced with an increased chance of nuclear war. JERVIS (1979, p. 315) points out that this kind of commitment is only possible if a nation has a plausible interest (be it a strategic or symbolic value) in the issue involved, otherwise it would be seen as a noncredible threat.

Noncredible threats are another key issue about nuclear deterrence, especially once both super powers obtained second-strike capabilities by deploying submarine-based strategic missiles and sizeable stocks of land-based ICBMs. Once *mutually assured destruction* is reached, nuclear deterrence would not work anymore, which can be shown by the following example of backwards induction: Whenever faced with the decision to start the nuclear war or not, decision makers could not press the button since that would also mean the destruction of their own cities. Knowing that the other side will not strike due to that very reason, aggressors could get away with any provocative attempt to change the status quo carried out with conventional weapons.

In deterrence theory, there are two answers to this dilemma. The *theory that leaves something to chance* states that in reality, there is always a chance that things can go wrong. By bringing such a situation about willingly (e.g. by deploying

strategic forces in a crisis area that have limited authority to decide about the use of their weapons themselves), leaders can force the other side to concede without actually having to start a nuclear war. In reality, NATO generals worried by the lack of options in the face of mutually assured destruction promoted the *flexible response* doctrine, which envisioned the use of conventional forces to counter limited aggression by the enemy. This development led to a decrease in the publicness of the NATO defence good over time.

Finally, by obtaining equipment such as missile defence systems, nations could reduce their losses in event of a nuclear war. This is a precondition for making a nuclear missile exchange a feasible option and winning the Cold War for good. This is why plans for missile defence systems such as the SDI were seen as a greater threat to peace than a build-up in nuclear arms. Talks about limitation of anti-ballistic missile systems were of significant importance in the negotiations conducted between the super powers during the time of *détente*. In reality, attempts of the United States to construct a laser missile defence were countered by the introduction of *multiple individual re-entry vehicles* (MIRV) which had the capability to overburden any missile defence system. However, ultimately the Soviet Union was not able to continue the nuclear arms race and failed to bear the burden its defence budget put on the economy (SANDLER/HARTLEY 1999, p. xi).

3.2 Conversion

3.2.1 The End of the Cold War

While the end of the Soviet Union came rather surprisingly to contemporaries, the inferior competitiveness of the Soviet economic system compared to Western capitalism became more and more obvious since the 1970s. It could be argued that without the Reforms of the Gorbachev administration the Soviet Union would not have collapsed – however Perestroika and Glasnost were no random or arbitrary decisions made by Gorbachev. They expressed the necessity to cope with the fact that the Soviet system was no longer capable of satisfying the needs of the population in respect to economic performance or civil liberties.

The end of the Cold War marked the start of the discipline of economic conver-

sion – the shift from military to civilian usage of resources. The process of declining necessity for military expenditures accelerated with the collapse of communism in Eastern Europe, and thus the disappearance of the most noteworthy "public enemy" as well as the emergence of governments friendly to the West in most of said countries.

3.2.2 Peace Dividend

The end of the Cold War, the collapse of communism in Eastern Europe and successful arms reduction talks nourished expectations that reduced military budgets will bring a substantial "peace dividend". There are several ways the economy could benefit from lower military expenditures: Most prominent among them is the fact that a significant proportion of government spending can be used otherwise.

On expectations of the "peace dividend", KLEIN (1997, p. 2) writes:

> "People are impatient and want to be able to see immediate concrete manifestation of the peace dividend in the form of more hospitals, cultural facilities, educational establishments, technologically advanced infrastructure and other tangible evidence."

and

> "The dividend is already present and will, in due course, become much larger."

As MINTZ/STEVENSON (1995) argue, counting on a "peace dividend" implies the assumption that military expenditures hinder economic development – a hypothesis that is heavily contested in economic theory. They extend RAM's (1986) model of economic growth, which includes government spending, to distinguish between military and non-military government expenditures.

Their empirical analysis suggests that military expenditures do not have a significant influence on economic growth in most countries. However, increases in non-military expenditures provide significantly better economic growth stimuli than military expenditures. Although these results justify hopes on a "peace dividend", MINTZ/STEVENSON argue that the effects depend on how the saved money is spent

and they will only materialize in the long run.

3.2.3 The Scale of Disarmament

Indeed disarmament after the Cold War freed a huge amount of resources. Global military expenditures dropped from their all-time high of $ 1.36 trillion in 1987 to $ 864 billion in 1995 (U.S. ACDA 1996). This resembles a drop of 34%. Likewise, between 1986 and 1999, procurement spending dropped by almost 50% (BRZOSKA 2007, p. 1179).

The main factor of this sharp drop was the collapse of military spending in the Soviet Union, which fell from $ 217 billion in 1987 to $ 18 billion in 1997 – an astonishing drop by approximately 92% (BICC 2003). Former communist countries in Eastern Europe also reduced their military budgets drastically. Unfortunately, the breakdown of planned economy in former communist-governed countries caused contractions of the economy at almost the same scale, leaving no savings from reduced military spending (BRZOSKA 2007).

The EU member states reduced their military budgets by about 18%, while the U.S. budget dropped by about 31% in the same time period (BICC 2003). One possible reason for the higher drop of military expenditures in the United States might be the reluctance of European countries to participate in the last "hot" phase of the Cold War following the failed "détente" at the end of the 80s. The predominant use for these free resources was the reduction of public debt. Civil expenditures did by far not rise by the same amount military expenditures shrank (BRZOSKA 2007).

3.2.4 Discussion of Effects

BRZOSKA (2007, p. 1205) writes that "*expectations in the late 1980s and early 1990s of a big peace dividend, or major economic push through the civilian use of military technology proved illusory.*" Former military assets were found to be of no particular civilian use. Firms switching from military to civilian production were not competitive, land previously owned by military bases could not be sold and the skills of former soldiers were not in demand on the labour market. The positive long-term effect of the "peace-dividend" never came. Instead of that, the world faced an eco-

nomic downturn at the end of the 1990s, which also marked the end of the "decade
of disarmament".

Another factor important to the success of conversion that BRZOSKA (2007) names
is the general performance of the economy. In the United States, where economic
growth was higher during the 90s than in Europe, conversion was more successful
than in Europe, because a faster growing civilian economy is rather capable to put
new capacities into use than a stagnating one.

However, there is evidence that the peace dividend had a little effect. BRZOSKA
(2007, p. 1991) lists several economic analyses which identify benefits from the re-
duction of military spending. According to them, the reduction of the public debt
spurred investment and about a fourth of the wealth gained in the United States
during the 1990s can be attributed to the "peace dividend". Germany, for example,
funded economic restructuring programs in the East from the money saved from
reduced military expenditures.

3.2.5 The End of the Cold War, Disarmament, Peace Dividend, and Economic Theory

The end of the Cold War and the subsequent disarmament period provides a good
test for theories of demand of military expenditures. How well can these develop-
ments be modelled by the various theories?

The Neo-Classical Model

From the neo-classical point of view, the strategic environment drastically changed
with the adoption of Gorbachev's new political stance towards the West. All of
a sudden, the danger of war virtually ceased to exist, and thus the same level of
security could be maintained with much less military spending. It could be argued
that it took some time to build trust, but besides that the neo-classical theory would
suggest a more or less instant drop of NATO military expenditures after the collapse
of the Soviet Union – not a slow, 14 year long decline.

Due to the fact that the neo-classical model assumes a trade-off between security

and consumption, a "peace dividend" is self-evident in the neo-classical framework. After a period of transition, resources previously devoted to generating security would be used to increase consumption and welfare would rise.

The Arms Race

The arms race model describes changes in the enemy's diplomatic stance towards each other as parameter change. In the case of the end of the Cold War one might argue that developments in the Soviet Union led to the Soviet citizen not being ready to sustain a high military burden any more, thus their "fatigue" coefficient raised. At the same time, leaders were willing to settle their issues in negotiations, thus "grievance" was reduced. As an effect of these negotiations, the United States did not consider the Soviet Union (later Russia) as an enemy, which reduced "reaction". The transition from an arms race to a phase of cooperation is expected to be smooth.

In this model, changes of the framework are necessary to portray disarmament. RICHARDSON (1960) expected the parameters of his model to stay the same over time, a specification that has been rejected by those who further developed the arms race model.

Models of Organisational Politics

Models of organizational Politics offer very little explanatory power regarding the end of the Cold War and disarmament. They would attribute any change in behaviour to parameter changes, but fail to explain why they happened.

Marxist Underconsumption Theory

Since the underconsumption theory explains military expenditures mainly through domestic economic developments, the end of the Cold War would not trigger disarmaments. According to this theory, disarmament happens particularly whenever the general condition of the economy improves and it is easier for the monopolized sectors to realize surplus. To some extent this is what happened after the Cold War. With the introduction of capitalism in Eastern Europe, sizable new markets

were opened up for investment, providing new investment possibilities. Since for the markets to become attractive it is necessary to establish institutions favourable to foreign investment, we would expect this to be a slow process. It is noteworthy that the end of the "decade of disarmament" coincides with the crisis in the new economy.

3.3 The New Geostrategic Environment

3.3.1 The Unipolar World

After the dissolution of the Soviet Union, the United States remained the only global superpower. For defining the security of the Western World, this poses two central issues. Firstly, the prime determinant of threat, i.e. Soviet military capacities, is lackig. Hence, according to most theories, virtually no military would be needed anymore.

The second result from the end of the bipolar system is the different international security system that took form. Instead of a hostile power bloc, security issues involve local ethnic wars, terrorism, and rogue states. In the bipolar world, the superpowers were keen to keep their allies in line and, by channelling them in the Cold War system, prevented several crises from escalating. Nowadays, in many of these cases the concept of security cannot be adopted in the same way as during the Cold War, because it is unclear what level of de-facto threat these challenges pose. In such situations, the definition of the national interests has great impact on the level of security. If the "national security" covers access to cheap raw materials and foreign markets, this justifies wars even if no national assets are under the threat of destruction.

McGuire (2006, p. 4) argues that, as the U.S. is unquestionable the unique world power, "*U.S. security, by default, has become inherently global*". Yet the wars in Afghanistan and Iraq show that this comes with increasing costs and uncertain results, revealing the problems the United States have enforcing their unipolar system.

3.3.2 Revolution in Military Affairs

In the recent decades, technological improvements changed the way wars are fought. This *revolution in military affairs* (RMA) consists mainly of new information technologies and precision targeting adopted in modern armies (DUNNE/COULOMB 2008, p. 9). A generation change like this has the potential of shifting the balance of power, because powers who adopt the RMA enjoy a significant advantage over their enemies who don't.

The most important feature of the RMA is the explosion of costs in the defence sector. Even the United States, which are responsible for about 47% of worldwide defence expenditures, have problems affording newest generation equipment such as the F-22 stealth fighter (DREW 07/21/2009). One solution to this issue is out-sourcing of military tasks. By *"importing private sector practices"* (DUNNE/ COULOMB 2008, p. 10), governments hope to reduce the costs of their military operations. Currently, only the United States and, to a lesser extent, few European countries and Russia were able to introduce newest generation weapons to their armoury. This leads to the conclusion that future conflicts will be characterized by an inequality of opposing forces – *asymmetric conflicts*.

Theory-wise, the neo-classical model is the only one even considering the relative prices of military goods. However, the effect of the sum spent for defence depends on the form of the utility function and thus cannot be generalized. All the other theoretical models treat military expenditures either as economic factor or as a representation of military capabilities and thus do not include considerations about unit prices and would attribute such developments to a changing strategic environment.

3.3.3 Asymmetric Conflicts

While asymmetric conflicts are not new, the RMA suggests that it will be unlikely that evenly equipped armies will face each other in the near future. The large weapons stockpiles that the industrialized countries have amassed represent a commitment to fight in a specific way – one, which challengers might be able to counter with an unsuspected strategy. OMITOOGUN/SKÖNS (2006) suggest that asymmetric conflicts are why data on military expenditure become increasingly irrelevant for determining security levels. In asymmetric conflicts, countries could face non-

governmental enemies, whose military capabilities are not captured by any state's military expenditures. Also, the very nature of asymmetric conflicts could render technological or quantitative superiority useless if the enemy successfully employs a surprise tactic.

Asymmetric conflicts significantly raise the costs of military operations of the "traditional" powers, as the wars in Iraq and Afghanistan show. This is because their answer to asymmetric conflicts is to improve the same efforts they already undertake: to deploy more troops, to intensify attempts to crack down the enemy trying to elude them. Another very costly alternative is trying to alter the social basis of the enemy insurgency. Pacifying a country, i.e. creating incentives for people not to get involved in insurrections, is a cost-intensive task that might add to the tasks of military operations in the next decades (McGuire 2006).

3.3.4 Terrorism

Terrorism is a form of asymmetric warfare that attracted a lot of attention since the terrorist attacks concluded by Al Qaeda against the World Trade Center and the Pentagon on September 11, 2001. The "war on terror" was the key element in U.S. military posture and involved the invasions of Afghanistan and Iraq in 2001 and 2003, respectively. Since the conquest of these countries, the occupation army has been contested by insurgencies. Since the "war on terror" was declared, several other terrorist attacks or attempted terrorist attacks have caught the attention of politics and media, making it the most prominent security issue.

Terrorism is a form of asymmetric warfare that is characterized by the ability to cause damage to superior enemies with little resources. For terrorists, the cost to cause one dollar of damage is much lower than one dollar, while the cost to prevent this damage is greater than one dollar (McGuire 2006, p. 632). This questions the very concept of defense against terror attacks. Instead, anti-terror measures should be entirely replaced by anti-terror insurances – however there might be political incentives to react to terrorism.

Sandler/Hartley (1995, p. 324) describe two ways a country can react to the threat of terrorist attacks. The passive option is to protect oneself using technological barriers and increased security at strategically important locations as well as anti-terror laws and international cooperation in terror-prevention and improved

counter-terrorist intelligence. The active strategy consists of preventive and retaliatory strikes as well as infiltration and covert operations directed against terrorist cells. Of these measures, only preventive and retaliatory strikes are undertaken by the military. Installing defensive technological barriers will raise the costs of the operators, but will not alter military expenditures.

A sceptical point of view concerning the role of counter-terrorism is also supported by defence economic research. Summarizing empirical evidence from data on frequency on terrorist incidents, ENDERS/SANDLER (1993, p. 328-331) conclude that defensive measures consisting of barriers or fortifications that protect certain assets cause substitution, i.e. terrorists choose other, less fortified targets. Likewise, retaliatory strikes only succeed in preventing further terrorist actions in rare cases and can even lead to increased terrorist activity (SANDLER/HARTLEY 1995, p. 330). These findings are consistent with MCGUIRE (2006): From an economic point of view, counter-terrorist measures are ineffective, and states should not bother to undertake them.

4 Empirical Analysis

4.1 Hypotheses

4.1.1 Determinants of Military Expenditures in the Post Cold War Era

Keeping in mind the recent developments in international relations and defence economics helps identifying which factors are likely to play key roles in determining levels of defence expenditures. With the End of the Cold War, threat levels in NATO and Warsaw Pact countries are bound to drop. Instead of arming against an enemy alliance bloc, we observe an increase in importance of peace-keeping, crisis intervention and nation-building (MCGUIRE 2006). This most likely translates to smaller, but better equipped armed forces (as long as no occupying force needs to be maintained).

ROSH (1988) and DUNNE/PERLO-FREEMAN (2003b) use the concept of the Security Web for an analysis of the demand of military expenditures in developing countries. Developed countries, so their reasoning, are to a large degree included in the web of alliances and so their military expenditures are much less likely to depend on the military expenditures of the countries in their vicinity. Since with the end of the Cold War, the military expenditures of those countries cannot be explained by those of the opponent side in the Cold War, this leaves us with no apparent "threat" value applicable to those nations. Hence, we lack a vital part for assessing how much military force is deemed necessary. Consequently, recent panel data analyses have omitted those countries that are responsible for the bulk of military expenditures.

GADEA/PARDOS/PÉREZ-FORNIÉS (2004) is the only exception known to me. They use identical time series analysis methods to explain the military expenditures of NATO countries between 1960 and 1999 by their income, spill-ins from allies and

threat. Threat, however, is represented only by a set of dummy variables that reflect "*changes in the nature of the threat, or in the strategic doctrine of the Alliance.*" (GADEA/PARDOS/PÉREZ-FORNIÉS 2004, p. 234)

Given the lack of a clearly distinguished enemy block, it is no wonder that OMITOOGUN/SKÖNS (2006) come to the conclusion that military expenditures play an increasingly irrelevant role in determining threat. Thus the question emerges what causes threat, and consequently makes military expenditures necessary, in the post Cold War era.

4.1.2 The Trade-Instability Web

I suggest that the answer to this question is to be found in the nature of the missions previously mentioned that the military forces of today's NATO powers perform: Intervention in crises, peace-keeping and nation building. Obviously, the necessary strength of such an intervention force does not only depend on military expenditures of potential enemies, since it will not be exclusively used against regular armies of governments. If regional instability is what makes such missions necessary, political stability (or the lack thereof) should be a good proxy for the necessity of performing military interventions.

Furthermore it is necessary to investigate which countries' political instability developed nations are concerned about. Political activists and journalists regularly accuse U.S. presidents of being deeply concerned about human rights in countries where the leadership is hostile to the U.S. but caring little about human rights situations in other nations. Obviously, (potential) vital trade partners and close neighbours are much more important than other countries. This makes sense if you take the military, or foreign policy in general, as a means to promote economic policy, as the mercantilist and Marxist approach to international relations suggest. The variable used to estimate the demand for military expenditures of developed countries therefore consists of trade volume (imports plus exports) times instability measures.

4.1.3 Effects of Stagnation or Economic Downturn

The last two decades have been characterized by the rise of the "new economy" as well as the largest recession since 1929. Developments characteristic for the imperialistic phase of capitalism such as of capital concentration took place at a large scale. This makes the recent period especially interesting for revisiting the Marxist hypotheses that relate military expenditures with economic well-being. The question that I will try to answer is: Are governments using military expenditures to spur economic development?

Since the theory presented by GRIFFIN/WALLACE/DEVINE (1982) is specific to the United States, it might not be applicable to every other country. However, in nations with a strong military-industrial complex it might be possible that the same relation between economic downturn and military expenditures are observable.

I will thus include measures of stagnation (i.e. falling profits) in the regression equation, allowing for different reaction of every country by multiplying the stagnation indicator with country-dummies and check if any of them are significant.

In a broader attempt to find relations between economic downturn and military expenditures I will construct more general indicators of "stagnation" that do not exclusively rely on the theory of BARAN/SWEEZY (1966) but rather resemble a general approach of military Keynesianism. The construction of such indicators is described in 4.2.5.

4.1.4 Publicity of the NATO Defence Good

Throughout its history, NATO was a defensive alliance relying on nuclear forces to deter possible aggression directed against its members. Especially in the first years of NATO, the United States' nuclear arsenal was the backbone of the alliance.[8] ONEAL/ELROD (1989) argue that this was even the case after the adoption of the flexible response strategy in the 1970s.

In essence, the task of the NATO was to produce an alliance-wide public good

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[8]The fact that NATO acted purely defensively during the Cold War does not mean that its member states did not resort to aggression in "solving" international crises or serving their interests.

of defence, particularly aimed against the Warsaw Pact. The absence of official NATO-wars during the Cold War is thus no indication of the uselessness of NATO but could be interpreted as success. The scale of the success could be measured in the measure of threat caused by the Warsaw pact that NATO neutralized.

In section 2.4.2 I described the proliferation of semi-public defence efforts within NATO as a result of the spread of use of conventional military equipment. With the dissolution of the communist bloc the question emerges if NATO still provides an equivalent defence good. As described in 3.3.1, the nuclear arsenals' deterrence potential became increasingly redundant as the global strategic environment changed. Do the NATO members still benefit from alliance membership?

Following the theory, the best way to answer this question, i.e. to determine the effects of spill-ins from alliance members on the demand of military expenditures, would be to regress military expenditures and check the coefficient of the sum of allied military expenditures. If, as theory predicts, nations benefit from allied military spending, their own and their allies' expenditures are complements and the coefficient should be negative, since a higher military expenditure of allies leads ceteris paribus to a reduced need to arm. However, military expenditures of allies are determined by threat as well as own military expenditures are, so a rise in military expenditures of allies could also indicate an increase in threat not covered by explanatory variables. GADEA/PARDOS/PÉREZ-FORNIÉS (2004) use the average of NATO military spending as a proxy for threat. However, if I succeed in finding explanatory variables that cover threat sufficiently, I should be able to read the true effect of spill-ins from the respective coefficient.

4.2 Data

4.2.1 Sample Size

My dataset contains data on 174 countries over up to 38 years. I have collected or computed 138 variables that might affect military expenditures. The scale of the dataset forced me to limit my analysis to a reduced number of countries. I decided to investigate the determinants of military expenditures of those 40 countries that spent the most money on their military program in the year 2008. These

40 countries are responsible for about 95 % of the military expenditures in 2008 and for 96 % of all military expenditures between 1988 and 2008 as reported by the *Stockholm International Peace Research Institute* (SIPRI 2009). This selection still includes countries such as Algeria, which is with 0.34 % of worldwide defence outlays a "minor player" compared to the Great Powers. Since it is quite unlikely that the determinants of military spending of countries the size of Malawi will allow conclusions valid for powers such as the United States, the focus on the 40 largest spenders will not debase the results.[9] Since it is very likely that countries that are not in the top 40 group will react different to determinants of military expenditure, it is not possible to apply results obtained with the limited dataset to other countries. However, for my subsample the results will be unbiased, and hence 96% of the rise in worldwide military expenditures will be covered.

4.2.2 Military Expenditures

"Data on nominal military spending is itself suspect."

This statement by SMITH (1995, p. 78) reminds us that there are different definitions and a lot of guessing behind the figures of military expenditures, as obtained for example by SIPRI or the *U.S. Arms Control and Disarmament Agency* (ACDA). Dishonest reporting, i.e. governments trying to disguise the true size of their military program, are not the only issue, as even honest governments face different situations. Conscript soldiers serve at a price lower than their true cost, pensions of militaries are treated differently across nations, as well as paramilitary forces such as the French *Gendarmerie* are. Military-related R & D and space programs are other examples of expenses that could be reasonably argued to be included as well as excluded from military expenditures.

The two main sources, SIPRI and ACDA, also have their own specific issues. ACDA only reports military expenditures of the previous 11 years in their reports. Since they revise their data, the various ACDA reports are rendered incompatible. DUNNE/PERLO-FREEMAN (2003a) argue that these revisions do not introduce a systematic bias and thus only increase the "noise", but especially when searching for changing dynamics such incompatibilities between different versions of the ACDA's

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[9]The reduced dataset still contains data for more than said 40 countries because factors such as the military expenditures of all countries neighbouring any of the top-40 spenders need to be taken into account.

reports are most likely problematic.

SIPRI is the most substantial database available, but it suffers from missing data. While it is reasonable to leave out values for the Soviet Union in 1991 or Yugoslavia during the Yugoslav War, since any number would be a well-educated guess at best, I have argued in section 2.2 that even or especially values of estimated "enemy" military expenditures are useful for constructing threat proxies. SIPRI and ACDA define military expenditures of countries that do not follow NATO definitions differently, thus replacing missing SIPRI values with ACDA data might cause a severe bias, since the values of SIPRI and ACDA in some cases differ by a magnitude of up to 10.[10] Thus, I decided to deal with cases of missing data the same way I figure decision makers would – by comparing the various estimates of SIPRI and ACDA of the previous years' defence burdens and assuming an equal share of GDP is spent on the military in the following year.[11]

Another issue with military expenditure data is demonstrated by the case of the 1975 re-evaluation of Soviet productivity by the CIA:

> "The CIA calculated Soviet military spending by first estimating the number of goods and services purchased – number of troops, tanks, ships, soldiers etc. – from intelligence sources. It then estimated what these would have cost the USA to get a dollar figure. This was then multiplied by an estimated rouble/dollar exchange rate, to get a rouble figure, which could then be expressed as a share of CIA estimates of Soviet GDP. In 1975, the CIA decided that the Soviet military industry was much less efficient than previously thought and altered the exchange rate to reflect this, raising the estimated share of military expenditure from 6-8% to 11-13%. Although this did not change their estimate of Soviet forces or the dollar figure for Soviet military expenditure, the revision to the estimated Soviet share of military expenditure was widely interpreted in the US as indicating an increased Soviet threat" (DUNNE/SMITH 2007, p. 919).

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[10]Note that the fixed effects estimator will only consider deviations from the mean of variables, thus the level of defence expenditures is irrelevant as long as the variations follow the same pattern and one country's military expenditures aren't exaggerated in respect to other countries in the same category (e.g. potential enemies).

[11]Note that imputations of data were only done for those countries that are not the top 40 military spenders but whose military expenditures contribute to the threat assessment of those countries in the focus of the analysis.

The complex relation of the military's tasks could without doubt be better modelled if data on weapon stocks and disaggregated data on military expenditures were available. Different equipment could be identified to serve a different purpose, and it would be clear how much of the arms stock would be rendered obsolete if the strategic environment or defence technology changed. This however is not the case, especially not when the focus includes several countries over time. This is most unfortunate, since several peace research institutes claim that many Western European nations are building up arms although their defence burdens do not grow.[12] This might be due to the fact that the expansion of NATO and European Union made less territorial defence efforts necessary, so that a build-up of intervention-oriented forces does not increase the military budget.

4.2.3 Security Web and (Potential) Enemies

Following ROSH's (1988) hypothesis that military expenditures will be influenced by the military expenditures of neighbours and DUNNE/COULOMB (2008), who argue that potential or current enemies' military spending could have a larger effect, I constructed a set of security web and (potential) enemies for every nation in the top 40 group. I took the tables that ROSH (1988) and DUNNE/PERLO-FREEMAN (2003a) attached to their papers as a basis and expanded them, added conflicts that sparked after 1997 (the last year of the dataset provided by DUNNE/PERLO-FREEMAN 2003a) for the respective years, removed conflicts that were resolved after 1997 and in few cases altered classifications in cases where it seemed justified to me. Luckily, the number of conflicts of the top 40 countries is limited and patterns are identical in many cases (e.g. NATO).

The case of NATO countries' potential enemies deserves special attention, since this group is responsible for the bulk of worldwide military expenditures and were excluded from panel data analysis of military expenditures in previous studies. After the Cold War, most NATO countries were involved in four wars: The 1991 Gulf War against Iraq, the 1999 Kosovo War against the Federal Republic of Yugoslavia (including previous military incidents involving action against Serbian forces in the Yugoslav Wars), the 2001 occupation of Afghanistan and the 2003 occupation of Iraq. Therefore, Iraq is considered a potential enemy in 1990 and 1991 and an enemy in 1991, then again a potential enemy until 2003 and an enemy in 2003 for

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[12]For example, VON BOEMCKEN (2009) claims that the equipment-related military expenditures have increased by 25% from 2007 to 2008.

all countries that participated in the 2003 invasion. Yugoslavia is a potential enemy of NATO members from 1993 to 1999 and an enemy in 1999. Since the military of Afghanistan was toppled with little direct military involvement of NATO states other than the USA, Afghanistan is only an enemy nation of the United States in 2001. The "cost" of the occupation operations in Afghanistan and Iraq are proxied by the battle deaths variable instead of Afghan or Iraqi military spending, as the official governments of those nations supported the occupations.

Furthermore, NATO as a whole is periodically engaged in attempts to counter Russian or Chinese influence. In a way, Russia and China could be regarded as the "security web" of the NATO alliance, as they are the only two non-allied countries with a military capable of projecting a sizeable amount of power outside their own territory. The question whether Russia and NATO are allies or rivals still seems to be unanswered.[13] Thus, I have constructed alternative versions of potential enemy lists that include/exclude Russia and China in order to check whether NATO countries react to Russian/Chinese military spending (and vice versa) or not.

4.2.4 Conflict Intensity

Obviously, nations currently engaged in conflicts will have higher military expenditures. After all, if there is an ongoing conflict, the military fulfils an expensive task, which is not necessary in countries that are currently at peace, and might be even deemed unnecessary (thus not being prepared) by governments of peaceful nations.

Some empirical studies (e.g. DUNNE/PERLO-FREEMAN 2003a) have addressed this issue by introduction of an *"at war"* dummy to models of military expenditure. However, a binary dummy variable treats all wars the same, whether it is a total war in which both sides commit all their resources to the war effort or a minor campaign such as the Falklands War. Therefore, the use of battle deaths is a more appropriate method of identifying the commitment of a nation to a war.

Another possibility is to use the total number of casualties in a conflict or the number of allied casualties as a proxy. This would constitute an alternative measure

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[13] *"Russia cannot be treated both as a NATO ally and as an enemy, France's president, Nicolas Sarkozy said this week [Feb 11th]. Yet that is how Russia seems to see things. Its new military doctrine paints NATO, and particularly its enlargement, as the biggest threat to Russia."* (ECONOMIST 2/13/2010)

FIGURE 4.1: NUMBER OF CONFLICTS AND CONFLICT CASUALTIES[14]
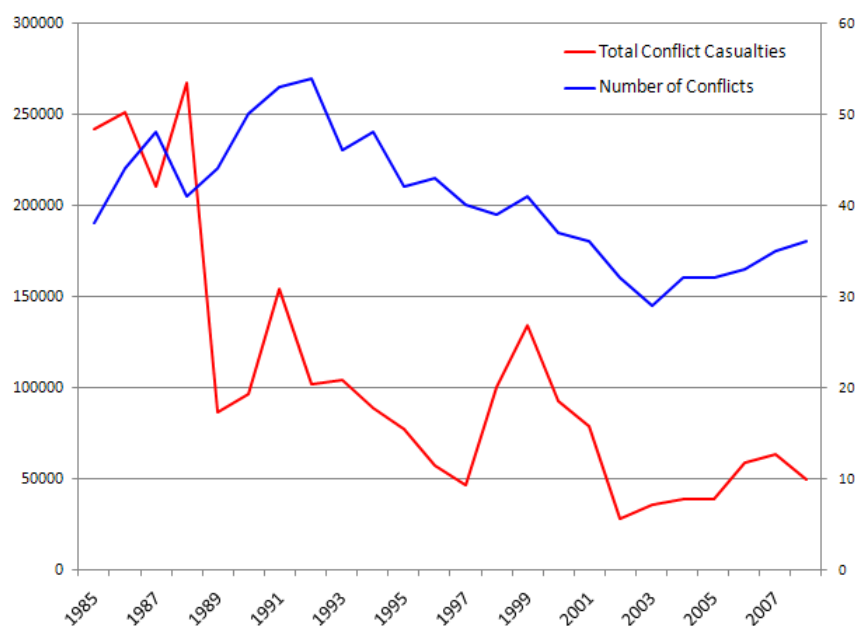
of conflict intensity independent of the number of nationals of a certain country died in a given year.

4.2.5 Economic Variables

The economic well-being is a key factor for the demand for military expenditures according to most theories. Only the Richardson arms race and the bureaucratic models, which explain military expenditures by enemy or past values of military expenditures, do not consider the economy. The most important economic variable, the gross domestic product (GDP), does not only serve as an indicator of a country's wealth, it also quantifies the country's possibility to devote resources to the military.

In the neo-classical security vs. consumption trade-off model, GDP influences military expenditures in three ways. Firstly, a higher GDP eases resource constraints and allows for more military expenditures. Secondly, a higher GDP means that there is more wealth that needs protection, thus increasing the need for military expenditures. Thirdly, through economy of scale and public good effects, once GDP is high enough, a lower percentage of it could be enough to guarantee security from

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[14]Source: MARSHALL (2005)

threats.

In the Marxist underconsumptionist models, indicators of stagnation play a vital role in determining military expenditures. Issues on identifying stagnation have been discussed in 2.6.4. Unfortunately, sector-specific measures for profit are difficult to obtain. EUROSTAT (2009) reports sector-specific gross operating surplus for EU countries between 1995 and 2007, although data is missing for many country-year combinations. This might indicate stagnation as well as the "profits" used by GRIFFIN/WALLACE/DEVINE (1982), so I will investigate if gross operating surplus has effects on military expenditures in EU countries.

However, since the mercantilist / Marxist approach to international relations also argues that any kind of economic downturn could lead to increased international tension due to harsher competition, other indicators of economic downturn could lead to increased military spending. For the purpose of this study, I will use the difference between current and past ten years average economic growth as alternative indicator for economic downturn.

4.2.6 Trade-Instability Web

Using dyadic yearly trade data (BARBIERI/KESHK/POLLINS 2008) I have constructed several alternative versions of the "trade-instability web". The variable in essence consists of a weighted average of either MARSHALL's (2005) *"civtot"*[15], *"actot"*[16] or World Bank's *"political stability and absence of political violence"* (PV)[17] governance indicator (linear rescaled to 0-14 in order to improve comparability with the MEPV indicators) of all trade partners.

The weights consist either of the value of the trade between two nations ($trade$), $\sqrt{trade}$ or $\log trade$.

In an alternative way of constructing the trade-instability web inspired by mercantilist theory of international relations, nations only consider instability within

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[15]This is the sum of ethnic violence, ethnic warfare, civil violence and civil warfare within a country, all of which score between 0 and 10.

[16]This represents the sum of *"civtot"* plus international violence and international warfare (within the country's borders).

[17]This represents estimates of the likelihood that the government will be overthrown by political violence.

countries whose GDP is half theirs or less as possible and thus only take increased instability in those countries as reason to arm ("hypothesis 2" as opposed to "hypothesis 1"). To illustrate this point, let us consider Algeria, which will probably not consider arming itself to battle instability in, say, Great Britain, but might consider intervening in the inner affairs of its African trade partners.

4.2.7 Dummies

A series of dummies was created to describe a country's membership in NATO or Warsaw pact and to classify them in three distinct income groups sorted by average GDP per capita over the time period. Another set of dummy variables captures effects of the Cold War era, the period of disarmament and recent years.

4.3 Methodology

4.3.1 Panel Estimation

The use of panel estimation methods is fairly new in defence economics. Previous studies have focussed on explaining the defence budget of a single country or employed cross-section analysis. However, both methods imply specific issues. Whenever cross-country data is used, country-specific factors will distort the result. Examples of country-specific factors include the border length-land area ratio and institutional characteristics or spending habits. On the other hand, time series analysis is likely to produce results that are only applicable to one country. If the correct methods are employed, panel data analysis is a mighty tool, since it can distinguish between within-country and between-country differences.

Let us first consider the various estimation methods that can be applied to panel data:

Pooled Regression

This method treats all observations from all countries and years the same:

$$M_{i,t} = \alpha + \beta X_{i,t} + u_{i,t} \tag{4.1}$$

where α is the intercept and β the vector of regression coefficients.

In pooled regressions, the time and group dimensions are ignored and within- and between-difference are treated the same, thus all coefficients are the same. This is the correct approach if no individual slopes or intercepts are to be expected. In this case the only advantage that comes with panel data is the increased sample size.

Within / One-Way Fixed Effects Estimator

The "within" or one way fixed effects (FE) estimator allows for country-specific intercepts while keeping slope coefficients equal for all countries and years. The regression equation thus changes to

$$M_{i,t} = \alpha_i + \beta X_{i,t} + u_{i,t} \tag{4.2}$$

This regression method only takes differences over time within a country into account by comparing the values of dependent and independent variables with their time mean. Thus the coefficients are free from differences across individual countries and instead describe how changes over time in single countries affect military expenditures, assuming the same coefficient for all countries. Note that this approach is identical to replacing the intercept of the pooled regression with country-specific dummy variables.

Between Estimator

Contrary to the within-estimator, the "between" estimator only takes differences between countries into account. It does so by constructing the time-average of dependent and independent variables (thus eliminating the time dimension) and uses them in a regression similar to the pooled one:

$$\overline{M_i} = \alpha + \beta\overline{X_i} + u_i \qquad (4.3)$$

Random Effects Estimator

The merit of the random effects estimator is that it allows coefficients to differ over countries. The regression equation takes the form

$$M_{i,t} = \alpha_i + \beta_i X_{i,t} + u_{i,t} \qquad (4.4)$$

This could, if no further restraints were given, represent a system where the equation $M_t = \alpha + \beta X_t + u_t$ is solved for each country independently. However, the random effects estimator assumes that effects are identical distributed and bases its weight of within and between variance on that assumption.

4.3.2 Bias and Heterogeneity issues

Choice of Estimator

The question which estimator to use depends on the data source and the questions the model is designed to answer. If all data was generated by the same random process, then all estimators would yield the same results. However, if there is heterogeneity within the data, the between estimator and the within estimator measure something different.

To illustrate that point, let us calculate a simple regression of military expenditures as reported in U.S. ACDA (2000) on GDP and a constant. The results are presented in table 4.1.

The between-estimator calculates averages over time of each country and then compares those values globally. The results confirm the trivial hypothesis that countries with a higher GDP spend more money on their military than others do. The coefficient of 0.046 suggests that defence is a normal good. DUNNE/PERLO-FREEMAN (2003a) use two between estimations to compare the coefficients of de-

TABLE 4.1: BETWEEN AND WITHIN EFFECTS ESTIMATOR
COMPARISON

dependent variable: military expenditure

	between effects		within effects	
	coefficient	t-ratio	coefficient	t-ratio
const.	-30.407	-0.02	10486.1^{***}	28.43
GDP	0.046^{***}	17.38	-0.008^{***}	-4.93

*** significant at 1% level

mand for military expenditure in developing countries during and after the Cold
War.

The within-estimator investigates which effects changes in explanatory variables
have on military expenditures. Since the sample time period was characterized
by both falling military expenditures and raising GDP in most countries, GDP is
calculated as having a negative effect on military expenditures. This is obviously a
misleading result due to the fact that important variables such as threat perception
were omitted.

The random effects model uses information from both the within and between
differences and would thus be regarded the best choice. Unfortunately, its strong
assumptions cause significant bias if the effects are correlated with the explanatory
variables – which is likely to occur in the case of military expenditures.

Heterogeneity

The countries of the world vastly differ in all categories used in this empirical analy-
sis. It is thus most likely that this heterogeneity in variables also causes heterogeneity
in coefficients. Regression coefficients will still report average effects, however the
explanatory power of models could suffer. DUNNE/SMITH (2007) suggest calculating
individual regressions in order to test the heterogeneity assumption. Wise choice of
subgroups may help to limit heterogeneity while still keeping sample size high and
ensuring clarity.

One obvious choice for grouping countries is their income. As mentioned before, most panel data studies of military expenditures have focussed on developing countries, so including developed countries to the sample is bound to introduce heterogeneity. Alliance membership is a criterion whose effects on other coefficients will also be of paramount interest.

Dynamic Panel Bias

In regression equations that include a lagged dependent variable another bias occurs. Firstly, if the number of periods is small, the coefficient of the dependent variable will be biased downwards (DUNNE/SMITH 2007). There are various methods to correct for this bias. BUDDELMEYER et al. (2008) use Monte Carlo simulations to compare the bias of various estimators and come to the conclusion, that ARELLANO/BOND's (1991) General Method of Moments, KIVIET's (1995) least squares dummy variables corrected and ANDERSON/HSIAO's (1982) instrumental variables estimator all provide decent estimates. Their mean absolute bias is around 0.005 if $T = 10$, thus it is reasonable to treat results and t-statistics as being accurate. Only in the case of small N and T and a high coefficient of the lagged dependent variable the standard OLS estimator outperforms them with a mean absolute bias of still quite acceptable 0.059.

4.3.3 Model Specification

Several issues have to be considered when deciding on the exact form of the regression estimation. First, the dependent variable can be expressed in terms of absolute values of military expenditures or in form of the defence burden, the military expenditures per GDP. The same applies to the various threat variables. ROSH 1988 uses the average of the military burden of neighbouring countries. The example of China and India, to which the military burdens of Bhutan and Nepal probably have little effect demonstrate that this value has to be weighted with GDP or population.

Another issue is whether or not to apply a logarithmic transformation to the regression equation. DUNNE/PERLO-FREEMAN (2003b) use a logarithmic form since it provides better results. This specification implies that the effect of variables is not additive, but an increase in one variable will lead to a certain percent increase in

military expenditures. This approach is in line with the idea of the military serving several purposes as the same time, since in a logarithmic specification the absolute increase caused by the increase of one explanatory variable depends on the levels of the other explanatory variables, e.g. the size of the effect of an increase in a threat variable will depend on levels of the economic variables.

4.4 Results and Diagnosis

4.4.1 Determinants of Military Expenditures

The first task was to construct a working model that explains military expenditures which can be later extended to test the other hypotheses formulated above. Following previous research, the basic determinants of military expenditures that were considered are GDP, population, military expenditures of the security-web countries, potential and actual enemies, dummies for the Cold War period, the decade of disarmament and the recent years – this dummy was named "crisis intervention" since the end of the decade of disarmament coincided with the formulation of that NATO doctrine.

I tested linear, log-linear and log-log specifications, of those the log-log specifications yielded the best results. This is in accordance with previous studies and theoretical considerations of the functional form of determinants of defence spending. One very interesting result is that population is insignificant in all specifications. This contradicts some previous results (e.g. DUNNE/PERLO-FREEMAN 2003b), but there are two possible explanations. Firstly, in fixed effects panel studies, it is unlikely that major changes of population size occur that could exercise a significant effect on military expenditures. In fact, Germany and Russia are the only exceptions. Also, especially in the largest military powers it is unlikely that there are still improvements to be gained from economics of scale.

Using logarithms of military expenditures and logarithms of defence burdens yielded similar results concerning significance of coefficients, however specifications for *lme* exhibited significantly higher values of R^2.

The basic model of determinants of military expenditures is presented in table 4.2.

TABLE 4.2: BASIC DETERMINANTS OF MILITARY
EXPENDITURES

dependent variable: $\log^a$ military expenditure;

40 groups, 840 observations, avg. obs. per group: 21.0

	coefficient	t-ratio
const.	4.004^{***}	17.54
log GDP	0.847^{***}	22.14
log pe1_me^b	0.020^{***}	5.91
log e_me^c	0.017^{***}	4.99
disarm^d	-0.018	-1.00
R-squared (within)	0.45	

*** significant at 1% level

^{a} In order to increase interpretability and deal with
missing or zero values, $logx$ was always calculated
as $ln(1+x)$

^{b} Potential enemy's military expenditures

^{c} Enemy's military expenditures (cumulative)

^{d} "Decade of Disarmament" (1990-1999) dummy
variable

4.4.2 Serial Correlation

In order to check for misspecification, I calculated the Durbin-Watson statistic in
Eviews7. The value of 0.30 suggests that there is serial autocorrelation in the model.
Likewise, the test for serial correlation for Stata developed by DRUKKER (2003)
rejects the null hypothesis of no serial correlation. This is consistent with the hy-
pothesis that standard operation procedures are not evaluated in a yearly basis and
decisions are delegated to the bureaucracy in the meantime, resulting in a propor-
tional increase of the defence budget over time.

One way to solve this problem is to use a dynamic panel estimation technique.
Therefore, the Arellano-Bond two-step estimation was calculated in Eviews7. Re-
sults are displayed in table 4.3.

The coefficient of 0.75 suggests that the defence budget depends to a large extent
on the last year's budget. However, in a purely incrementalist model we would ex-
pect this coefficient to be closer to (or even greater than) one. The other coefficients

TABLE 4.3: DYNAMIC PANEL ESTIMATION

dependent variable: log military expenditure;

Arellano-Bond dynamic panel estimation;

40 groups, 760 observations, avg. obs. per group: 19.0

	coefficient	t-ratio
log me$_{t-1}$	0.7523***	218.37
log GDP	0.1053***	14.99
log pe1_me^a	0.024***	6.36
log e_me^b	0.015***	2.67
disarm^c	−0.038***	−19.23

*** significant at 1% level

and standard errors follow the same overall pattern, with the exception of the disarmament period dummy being significant in the dynamic model, which is plausible since the essence of the "decade of disarmament" was that the military budgets were smaller than in the years before, not necessarily that defence budgets were smaller, since they were in fact quite high at the beginning of the "decade of disarmament". Also, the coefficient of *GDP* is a bit greater. Still, it is safe to assume that the static model captures roughly the same effects as the dynamic one.

However, as I argued in chapter 2.5.4, even though previous values of dependent variables might constitute fitting explanatory variables, the task is to find models that do without them. Thus, I will try to find acceptable specifications that do not include lagged dependent variables.

4.4.3 Heteroskedasticity

Using the module *xttest3* provided by BAUM (2000) I tested the specified regression for heteroskedasticity. The test rejects the null hypothesis of no heteroskedasticity with high significance. This was to be expected, since heteroskedasticity is likely to occur as countries greatly differ in size.

Heteroskedasticity and serial correlation are likely to occur in all subsequent regression, thus I will use Stata's *clustered sandwich estimator* for computing standard

errors, which provides robust result in the case of serial correlation and heteroskedasticity (HOECHLE 2007).

4.4.4 Group Heterogeneity

The NATO alliance

Although the R-squared of the "basic" regression is quite high, it is possible that systematic heterogeneity exists in the sample. The most obvious candidate for a distinct subgroup is the NATO alliance, since it contains both the richest and the largest spender countries. To test whether those countries behave different than the rest of the top 40, I performed separate regressions for NATO and non-NATO countries.

TABLE 4.4: TEST FOR GROUP HETEROGENEITY: NATO MEMBERS

dependent variable: log military expenditure;

40 groups, 840 observations, avg. obs. per group: 21.0

	NATO members		other countries	
	coefficient	t-ratio	coefficient	t-ratio
const.	7.080^{***}	9.88	3.953^{***}	6.76
log GDP	0.380^{***}	3.58	0.846^{***}	8.21
lop pe1_me	0.012^{**}	2.17	0.018	1.64
log e_me	0.005^{*}	1.82	0.053^{**}	2.56
disarm[b]	-0.0353	-1.45	-0.044	-1.41
R-squared (within)	0.15		0.51	

[***] significant at 1% level
[**] significant at 5% level
[*] significant at 10% level
[b] "Decade of Disarmament" (1990-1999) dummy variable

The results, presented in table 4.4, are very intriguing. First of all, the hypothesis that all coefficients are jointly equal to their counterparts is rejected with high significance (data not presented), thus the hypothesis that NATO members behave differently than non-members is confirmed.

Secondly, the effect of *log GDP* is much greater for non-NATO countries than for NATO allies. A hypothesis test on coefficient equality is rejected at 1% significance level. It seems NATO's military power has reached a level where more capacities are not always useful and the military budget is thus not automatically increased when possibilities to do so are given as GDP rises. The low R-squared for the NATO model suggests that there are important explanatory variables missing.

Although the distinction between potential and de-facto enemies is only significant at a 10% level in the NATO model and not at all significant in the non-NATO model[18], the reaction to "enemy" military spending is found to be significantly higher in non-NATO countries.

The period of disarmament dummy, which is insignificant in both specifications, will be omitted in further analysis.

Income Groups

The 40 largest spenders of military expenditures include rich countries such as Switzerland as well as poor ones such as India or Syria. These countries exhibit vastly different domestic situations, thus it is likely that the military fulfils different functions and thus the determinants of military expenditures are different. I have therefore divided the sample into three groups distinct by the time-average of GDP per capita. 13 African, Asian and South American countries form the poorest group of nations with an average income per capita of less than 5 000 USD over the time period. The middle group, ranging from 5 000 to 20 000 USD consists of 10 "threshold countries" in Europe, Asia and America. The richest group is with 17 countries the largest one and consists of the "First World" plus Kuwait and Singapore.

Table 4.5 indicates that, while groups *1* and *3* differ significantly, the "basic" equation does not seem fit to explain *group 2*'s military expenditures. *Group 2* consists of countries with completely different strategic and economic environments that changed rapidly during the observed time frame, which might explain the poor performance. Furthermore, all coefficients of *group 3* are significantly different from those of *group 1*.

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[18]This should not disturb us, since de-facto enemies are also potential enemies, and once de-facto enemies are dropped from the estimation equation the coefficient of potential enemies rises in size and significance.

dependent variable: log military expenditure;

40 groups, 840 observations, avg. obs. per group: 21.0

	group 1		group 2		group 3	
	coefficient	*t-ratio*	*coefficient*	*t-ratio*	*coefficient*	*t-ratio*
const.	2.246***	3.66	5.944***	6.69	6.906***	3.54
log GDP	1.106***	8.54	0.544***	3.36	0.397	1.35
lop pe1_me	0.045**	2.81	−0.008	−0.56	0.009	1.19
log e_me	0.033	1.18	−0.001	−0.06	0.013***	5.97
R-squared (within)	0.63		0.50		0.15	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Although *log GDP*'s coefficient of 1.106 indicates that defence might be a luxury good for poor nations, the coefficient is not significantly greater than 1, thus the data does not back that claim. The between-group comparison shows that the effect of GDP on military expenditures drops drastically the higher the income is. The insignificant (significant yet low in some other specifications including more sophisticated threat variables) coefficient of *GDP* in the richest countries' group contradicts the hypothesis that military spending has reached a "natural low". This number suggests that, if it were not for the threat variables, military expenditures would grow at a much slower rate than GDP and the defence burden would decrease.

Security Web and (Potential) Enemies

The security web, which is only defined for countries which were not members of either NATO or Warsaw pact in the time frame investigated, has no significant effect on military expenditures in the basic model or in specifications including political/economic variables. For non-aligned countries, the security web is defined as the military expenditures, or the (weighted) average of defence burden, of neighbouring countries and nations that are capable of influencing the security situation of a country, e.g. sea neighbours or regional powers. Thus, the question of which countries to include in a given country's security web is independent of time and strategic or

diplomatic considerations, hence more or less obvious and not suspicious of suffering from poor judgement. An insignificant coefficient of security web military spending indicates that the top 40 spenders have a large enough military force that makes reaction to non-hostile neighbours' military build-up unnecessary.

The coefficient of enemies' military spending was significant only in some specifications. This is in line with current research and indicates that countries do not necessarily react to their current enemy's military spending more than to their potential enemies', perhaps because it is difficult for decision makers to distinguish between these groups in advance.

Also noteworthy is the fact that for NATO countries, the distinction between "enemy" and "potential enemy" is only significant at a 10% confidence interval (see table 4.4). This is not surprising given the fact that the enemies NATO faced during the investigated time period were – with the exception of the Soviet Union – utterly minor powers when compared to NATO's military power. The fact that non-NATO countries react much more intensively to enemies' military spending indicates that those nations do to a lesser degree maintain just-in-case military capacities and are thus forced to arm once they acquire enemies. Note that the comparatively high coefficient of 0.053 changes to 0.017 if the Warsaw Pact countries are omitted. Unfortunately, the small number of observations for Warsaw Pact countries makes a separate analysis of this alliance impossible.

4.4.5 Political Indicators and the Trade-Insecurity Web

In order to test the "liberal peace" hypothesis of lower military expenditures in democratic countries (e.g. ROSH 1988) I have added several political indicators to the regression equation. Unfortunately, results were insignificant in most cases after standard errors were corrected. World Bank's governance indicator *PV (political stability and absence of violence)* as well as the democracy and autocracy scores are not significant in any specification. This fails to confirm the "liberal hypothesis" of lower military expenditures in more peaceful countries. However, we have to keep in mind that our sample only includes the top 40 military spenders. Those countries chose to maintain a large military force for some reason, and it is possible that this makes reaction to changing scores of democracy etc. unnecessary, since the military is powerful enough to deal with domestic problems anyway. Besides, due to

the specification of the fixed effects estimator, only changes of the explanatory variable during the investigated time period influence military expenditures, while the "liberal hypothesis" states that less democratic *countries* maintain a larger military than autocratic ones.

The total *major episodes of politically motivated violence* (MEPV) index by MAR-SHALL (2005) has a significant influence on military expenditures, however only for the richest group of countries. In this group there are only three countries actually faced with politically motivated violence: Kuwait during the Second Gulf War, UK's Northern Ireland conflict and international terrorism and wars for the United States in 2001 and 2003/04 respectively. Same is true for income group *2*, where civil plus ethnic warfare/violence is significant due to such conflicts in Mexico and Saudi Arabia.

The Trade-Instability Web

I have constructed various variables to test the trade-instability web hypothesis that I formulated in section 4.1.2. Depending on the specification and the included countries, some of the measures are significant. Fortunately, there is a pattern. First of all, countries react most strongly to rises of total political violence and warfare (*actot*) in their trade partners compared to civil plus ethnic violence and warfare only (*civtot*) or World Bank's *PV* governance indicator. For the richest group of countries, "hypothesis 1" as well as "hypothesis 2" (see section 4.1.2) can be confirmed with high significance. In a regression containing both variables, "hypothesis 2" has a significant coefficient and "hypothesis 1" is insignificant, thus "hypothesis 2" performs slightly better. The choice of weights (trade volume, sqr(trade volume) or log(trade volume)) had little effect on the significance of the trade-instability web coefficient, with sqr(trade) producing slightly better results in most cases. Table 4.6 reports the results.

This model is, with an R-squared of 0.56, so far the best explanation of military expenditures for the group of rich countries. Since there is enough variation in the trade-security web variable, it can be concluded that rich military powers do react to increasing instability in their trading partners. All in all, the trade-instability web seems to be a valid concept for a country's involvement in instable regions.

dependent variable: log military expenditure;

17 countries, 284 observations, avg. obs. per group: 16.7

	coefficient	t-ratio
const	7.800***	6.24
log GDP	0.248	1.30
lop pe1_me	0.002	0.49
log e_me	0.006	4.16***
actot	0.116	3.43***
tsw_h2_actot_sqrtrade[a]	0.149	4.33***
R-squared (within)	0.56	

** significant at 5% level

*** significant at 1% level

[a] MEPV's total political violence score of a nation's trade partner's whose GDP is half theirs or less, weighted by square-root of total trade volume

4.4.6 The Role of NATO

In order to check for the benefits of the NATO military alliance I have computed a series of regressions which yielded ambiguous results. Following the procedure derived from the theory, I regressed military expenditures of NATO countries on spill-in from alliance members. The extension of the basic regression however yields a positive coefficient on the *log spillin* variable, indicating that it captures alliance-wide security effects. This changed when I switched to the potential enemies version which included potential hostilities between NATO and Russia plus China[19] and corrected for another commitment indicator: battle-related casualties. Casualties are insignificant for all but the richest group of countries and were thus not included in previous regressions.

Comparisons also showed that the determinants of military expenditures of the NATO allies varied over time (see table 4.7). Since considerable variation of the

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[19]Since here data was used first to determine the correct specification of the potential enemies list and then again to compute coefficients, caution is advised when drawing conclusions concerning the relationship between NATO and the other security council members. The purpose here is to demonstrate that, once enough possible alliance-wide security effects are reflected in other explanatory variables, *spillin* has a negative sign.

explanatory variables is guaranteed even in the shorter time period of "crisis intervention" this split of the sample seemed possible. During the "decade of disarmament", the version of potential enemies without Russia and China performs better than the extended version. Also, battle deaths are barely significant at 10% level in the model covering the whole time period, insignificant for the decade of disarmament and significant at 5% level in the later time period. However, after the turn of the millennium battle deaths and the adapted version of the potential enemies are highly significant. Enemies' military spending was insignificant in both periods and was thus omitted.

The results suggest that the NATO alliance is, since the beginning of the 21st century, sensitive to the military expenditures of the remaining Great Powers Russia and China, which could be argued to constitute the "security web" of the NATO. This does not necessarily indicate hostility but could reflect the wish of NATO to remain the most powerful military bloc. Another result that is in line with alliance theory is that during the decade of disarmament the public good produced by NATO lost its use. With the wars in Iraq and Afghanistan, NATO allies recommenced profiting directly from allied military expenditure, most likely by substituting own with allied deployments in crisis regions. The significance of the casualty variable shows that this is a valid proxy for commitment in military operations.

4.4.7 Economic Indicators

In order to test the effect of economic variables such as GDP growth or various stagnation indicators, I added those measures to the regression equation. None of the possible stagnation indicators (total surplus in monopolized sectors, change of total surplus in monopolized sectors, deviation from past ten year average GDP growth) was significant in any specification, including those leaving out the above political variables.

However, once again a disaggregation of the data revealed an intriguing pattern. Although the full sample of countries for which sector-specific surplus data was obtained from EUROSTAT (2009) showed no significance, considering only the five largest EU-economies United Kingdom, France, Germany, Italy and Spain, *log total surplus* turns significant and renders the other variables insignificant. Results are presented in table 4.8.

dependent variable: log military expenditure;

	disarm		*crisis*	
	coefficient	*t-ratio*	*coefficient*	*t-ratio*
const.	7.139	2.16[**]	11.715	10.87[***]
log GDP	0.306	1.72[*]	0.262	1.76[*]
log pe3_me	0.067	3.45[***]	0.200	2.89[***]
log cas[a]	0.006	0.49	0.036	4.88[***]
log spillin[b]	−0.014	−0.07	−0.442	−3.52[***]
# of obs. (countries)	141 (15)[c]		135 (15)	
R-squared (within)	0.20		0.39	

[***] significant at 1% level
[**] significant at 5% level
[*] significant at 10% level
[a] Battle-related deaths as reported by UPPSALA UNIVERSITY (2009)
[b] Sum of allied military expenditures
[c] Poland joined NATO in 1999

Although these results are not sufficient to prove BARAN/SWEEZY's (1966) hypothesis, especially because the sample size is very small and a significant correlation does not prove all of the underlying assumptions, a negative correlation between monopoly profits and military expenditures in the largest EU-economies is interesting. Also noteworthy is the coefficient of GDP growth, which is insignificant in the full sample. For income group 1, the poorest countries, it is positive and significant at 10% level in some specifications (those controlling for political violence) but for income group 3, the richest countries, it is negative and significant.

There are two possible interpretations of these results. Firstly, for poorer countried GDP growth might mean more capacities for government spending und thus lead to a higher defence budget, while in richer countries military expenditures could be used to counter economic downturn, in the five largest EU economies represented by profits in the monopolized sector. This could for example be done by adjusting the timing of planned arms projects. Secondly, military expenditures could be seen as helping economic growth in poorer countries and hindering it in the advaned capitalist countries, resulting in a negative correlation between military expenditures

TABLE 4.8: ECONOMIC DETERMINANTS OF MILITARY EXPENDITURES

dependent variable: log military expenditure;

	model 1		model 2	
	coefficient	*t-ratio*	*coefficient*	*t-ratio*
const.	6.578^{***}	12.18	7.029^{***}	4.10
log GDP	0.716^{***}	6.70	0.385	1.49
lop pe1_me	-0.003	-0.80	0.008	1.17
log e_me	0.004	0.91	0.014^{***}	6.09
log total surplus[a]	-0.141^{*}	-2.40		
GDP growth rate			-0.016^{***}	-9.02
# of obs. (countries)	$59\ (5)^{b}$		$357\ (17)^{c}$	
R-squared (within)	0.55		0.23	

[**] significant at 5% level

[***] significant at 1% level

[a] Log of *total surplus* generated in the monopolized sectors of the economy, obtained from EUROSTAT (2009).

[b] Germany, France, Italy, Spain, United Kingdom

[c] The 17 largest military spenders with GDP per capita > 20 000 USD

and economic well-being. In any case the coefficient of -0.016 indicates a rather weak correlation between military expenditures and the GDP growth rate.

4.4.8 Terrorism, Battle-Related Casualties and other Global Indicators

Finally let us consider the effects of terrorism and other global indicators on military expenditures. I have regressed military expenditures on the number of terror bombings or the number of victims respectively. Other global indicators include the number of wars listed in the UPPSALA UNIVERSITY (2009) conflict dataset, the number of victims in local or global civil wars, the number of national, allied or total casualties of conflicts that nation is active in.

Of those indicators, only the number of conflicts and the global *actot* score, weighted by population, were significant. Income-group specific analysis reveals

that global indicators are more significant for richer countries and insignificant for the poorest group.

5 Conclusions

The decade of disarmament ended around the millennium and military expenditures are on the rise again since then. Since there are no open hostilities between the great powers this is impossible to explain in the context of the Cold War understanding of arm races. However, several significant developments have altered the strategic environment. The gain of security via improving international relations was, starting around 1999, offset by other factors causing the military budgets to rise again. This diploma thesis identified the following factors:

- The development of high-tech military equipment (the "revolution in military affairs") led to a cost explosion in the defence sector. Up to date arms can only be afforded by devoting vast amounts of money to the defence budget.

- Meanwhile, the proliferation of asymmetric conflicts has blurred the line between war, organised crime and terrorism, and made it more difficult to utilize superior military strength to win conflicts. Fighting asymmetric conflicts and pacifying occupied nations proved to be a very costly endeavour, since it requires creating incentives for people not to participate in insurrections.

- The ongoing wars in Afghanistan and Iraq are two examples of this development. The level of commitment in those wars is an important determinant for a country's level of military expenditures.

- The economic rise of developing countries such as China, India, Brazil and Russia contributed to the rise of worldwide military expenditures in particular, because poorer countries' military budgets are stronger affected by GDP growth than those of industrialized countries.

- NATO members are sensitive to the military build-up in China and Russia and thus also raised their military expenditures.

- In the industrialized world, there is a negative correlation between economic well-being and military expenditures. This could indicate that nations use

military budgets to counter economic downturns, in the case of the five largest EU economies falling monopoly profits.

- Although there is a connection between scores of politically motivated violence and military expenditures, terror incidents are not significantly related to arms build-up in those countries suffering from terrorist attacks.

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Eidesstattliche Erklärung

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Wien, im Mai 2010

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	Baccalaureat Wirtschaftsinformatik

Abstract

Although the Cold War has ended about 20 years ago and there are no open hostilities between the great powers, worldwide military expenditures are constantly rising and have surpassed the peak values of Cold War military spending in 1987/88. This diploma thesis aims to identify the causes of this alarming development. To this end, I review theories on demand for military expenditure throughout history, examine the changing strategic environment during and after the Cold War and perform an empirical analysis with panel data on the 40 largest military powers. The main findings suggest that there are several contributing factors to increasing military budgets. Among them are the proliferation of conflicts and overall politically motivated violence since 2001, such as the campaigns in Afghanistan and Iraq, these conflicts' character as asymmetric warfare, and the economic ascension of many formerly poor countries.

Zusammenfassung

Obwohl der Kalte Krieg seit 20 Jahren vorbei ist und es keine offenen Feindschaften zwischen den Großmächten gibt, steigen die weltweiten Militärausgaben konstant an und haben den Höchststand während des Kalten Krieges 1987/88 bereits übertroffen. Die vorliegende Diplomarbeit versucht die Ursachen dieser alarmierenden Entwicklung zu identifizieren. Zu diesem Zweck diskutiere ich Theorien für die Nachfrage nach Rüstungsausgaben im Lauf der Geschichte, untersuche die wechselnde strategische Umgebung während und nach dem Kalten Krieg und führe eine empirische Analyse mit Paneldaten der 40 größten Militärmächte durch. Die Hauptergebnisse deuten darauf hin, dass es mehrere Faktoren gibt, die zu steigenden Militäretats führen. Darunter fallen die Verbreitung von Konflikten und allgemein politisch motivierter Gewalt seit 2001 wie die Interventionen in Afghanistan und im Irak, der Charakter dieser Konflikte als asymmetrische Kriege und der wirtschaftliche Aufstieg vieler ehemals armer Länder.