

How rational are decisions in defence?

Michael Brzoska

Economists have often felt uneasy about what is happening in the military and defence-related world.

Many famous economists, in the past and today, were very critical of defence efforts as obstructing business and reducing the wealth of nations (Fontanel and Coulomb, 2003). At least one economic writer won a nobel peace price for arguing that war was irrational and that smart people would work to avoid it, namely Norman Angell. He published his ideas in a book first in 1913, unfortunately just before a new, quite major war broke out, and got the peace price in 1933. War and defence efforts are often equated with foolishness, on the basis of the argument that we would be better off without them, anyway but also economically. A former chancellor of my country, Willy Brandt, repeatedly called world armaments “a madness” and many, including a good number of economists, have found that a very apt description, at minimum of the nuclear arms race during the Cold War, and at maximum of the whole enterprise.

Ironically, at the same time, many economists became much happier with the way defence issues were decided upon, beginning in the 1950s, when economic thinking was brought into defence analysis, particularly but not exclusively in the US (McKean and Hitch, 1960). It had its heyday in the 1960s, when Robert McNamara and his team of RAND-trained systems analysts were running the Pentagon. They claimed to be better able to decide on the level of resources needed for the military and weapons, which weapons to procure, personnel planning etc. using traditional economic methods, such as cost-benefit assessment, and new ones, developed within the field of game theory. After all, defence was just another case of optimal allocation of scarce resources, and that is what economists are priding themselves to be expert in.

So economists today come out with very different views about whether the defense effort, for instance in terms of the overall allocation of resources, currently more than 800 billion Euro worldwide, of which about half in the US, and almost one-fifth in the European Union, is madness, just right, or actually too little. And what strikes many non-economists, they all tend to argue with the concept of rationality.

Rationality probably is the most basic of all principles of economics. Rationality says, put simply, that resources should be used to optimise the attainment of pre-set objectives. This is a fairly broad concept. Many economists are narrowing it down in two respects. One is about

what the objectives are that people want to attain. They assume that people know what they want and decide to maximise their self-interest. The second is that they behave consistently across all decisions they make, maximising self-interest in everything they do. This kind of rationality, which I will call instrumental rationality, can be, and has been, applied, to practically all spheres of human life, from marriage to defence decision-making. As a good number of the pioneers of such analysis have come from the University of Chicago (and have been males), a person who would be living by the principles of instrumental rationality has, only half-way jokingly been called “Chicago man” (McFadden, 1998).

The application of instrumental rationality, in all aspects of life including defence, is so commonplace nowadays, that it seems self-evident. However, as I will try to show, rationality is a broader, quite complex concept, of which instrumental rationality only captures one, albeit very important, aspect.

Interestingly, economists have increasingly come to question the ubiquity of “Chicago man” . While the analysis of defense decisions has had little to do with, to put it somewhat bluntly, the “crisis of rationality” in economics, it opens, in my view, some interesting fields of study of the complexities of rationality. It also includes, in my view, a dose of scepticism into a good part of economic modelling of defence decisions.

Much of economic modelling and a good part of economists’s advice on defence issues are based on very straightforward perceptions of rationality, with all actors, from individuals to societies, maximizing their self-interest, often assumed to be income or power. This is also reflected in collective decisions, such as decisions on defence.

My argument in this lecture is that rationality is not a simple concept. Rather, I want to show that there are various conceptions of rationality. I will be, for the sake of simplicity, talking of three such types of rationality, namely instrumental, bounded rationality and behavioural rationality. Instrumental and behavioral rationality are extreme types of rationality, and bounded rationality I understand as a mixed type that more closely resembles reality.

My point is that in collective decision making none of these types of rationality should be excluded a priori, rather that decisions need to be based on political discussions among those concerned who will possibly argue on the basis of differing perception of rationality. Instrumental rationality needs to be prominently brought into this decisions-making process, but cannot and should not be the only consideration. I realize that there are many good reasons for requiring that defense decisions are political processes, as part of democratic societies. However, probing the foundations of rationality, in my view, supplies another good reason, grounded in economic thinking.

I will, in this lecture, probe the rationality of defense decisions, and links to the current debate among economists on rationality, on four levels. One is global and regional defense spending, the second is joint transnational weapons production, the third national weapons procurement, and the fourth is defence exports. I will start off, however, with an, admittedly quite cursory, presentation of some points from the recent debate on conceptions of rationality, which I will take up in the later parts of my presentation.

Rationality and its critics

Let me then start with a brief discussion on rationality. I will first look at some of the complexities of rational behavior when we look at real world decision-making. This is still within the realm of “Chicago man”, although it makes life difficult, and possibly even impossible, for him. I will then briefly introduce a few insights from recent research on the foundations of rationality, which question the universal prevalence of “Chicago man”.

A first important aspect of all decision-making is the complexity of many decision-making situations. It can require a lot of information gathering to make decisions which take into account all the facts. It can be rational, in the sense of maximizing net benefit, not to dig deep, but rather be satisfied with a sufficient level of information. Very often, it makes sense to apply some simple rules, such as to compare a situation with an earlier one, and decide the same way, if the situation looks rather similar.

The recognition of the limitations of our brains in comparison to the multitude of decisions and the complexity of information requirements is the origin of the concept of “bounded rationality”, first formulated by Herbert Simon (1957), who received a Nobel prize for economics in 1978. In practice, no full application of instrumental reasoning is likely. It is just too costly and, also, complex. Therefore decisions are made on the basis of a limited grasp of all the relevant factors for decisions. In addition, human economic behaviour has a complex structure where at least three kinds of mental processes interact: motivation, adaptation and cognition (Selten, 1998). The concept of bounded rationality has later been differentiated and expanded, a point to which I will return after the discussion of a few more interesting features of the complexity of rationality.

A second important aspect of decision-making is that it influences the behaviour of others, and is therefore not independent of their decisions. However, if others also behave rational, I can influence their decisions through my decisions. It would not be very smart for me to ignore these interdependencies. It is rational for me to act strategically, that is in a way considering and shaping the likely reactions of others to my decisions. Of course, strategic behavior is fully consistent with the traditional perception of instrumental rationality, still it introduces a new

level of complexity. This is the subject of game theory, an interdisciplinary enterprise of large proportions, with a big footprint in defence analysis. Let me just illustrate that with a small example of what has been called a “tacit bargaining” game (Schelling, 1963). Two players, A and B, who are not allowed to communicate, are to choose among two alternative, lets say “heads” or “tails” of a coin. If both chose “heads”, A gets three Euros and B gets 2 Euros, if both chose “tails”, B gets 3 Euros and A gets 2 Euros. If they chose different, neither gets anything. Now, A and B each need to consider the behavior of the other. If they both act to maximize their immediate expected gains, with A choosing “heads” and B choosing “tails”, they will not get anything. If they both just pick their choices randomly, there is a 50-50 chance of coincidence and an expected value of 1,25 Euros for each player over the long run, less than even the 2 Euros the one choosing the less attractive option will get. However, if both are defensive, trusting that the other will be greedy, and choose the option with the lower gain, they again both lose. One of the players has to choose his best option, and the other the defensive one to obtain the best overall result of the game.

Strategic behaviour obviously introduces much complexity and insecurity into decision-making. I do not always know for certain how many others are influenced by my decisions, and what their decision-making rationale is. This is no special insight of economics, but everyday knowledge. Still, it introduces a lot of difficulty for traditional instrumentality, without shaking its foundation. It can be in people’s long-run self-interest to act against their immediate self-interest.

A third important aspect of much real-world decision-making is that I seldom only want to attain one objective, irrespective of other objectives. Sometimes I can simply attain a second objective as a side-effect of attaining the primary objective I am after. Sometimes however, the relationship is not so simple, and optimizing resource use for one objective is not helping me with attaining others, while compromising a little on the primary objective would give me a lot in terms of other objectives. If I have a clear understanding of my own objectives, and can apply them quantitatively, I am fine. That is quite often the case when I go out as a consumer. When I buy a pair of shoes, for instance, I want it to fit, to look nice, to last long, and also want it to match my other cloths. Quite a list of objectives, which I however think I can handle. However, I am much less certain in social settings, for instance when I am in a new location and want to make new friends. How to value the relative merits of different aspects of a person?

A fourth important aspect is that decisions are often not made by me alone. I like to buy my shoes myself without my wife, because I have my preferences in shoes, basically very

comfortable and black, and hers are not identical, she wants me to buy more stylish shoes and in more courageous colours. When we go shopping together, I can decide but have to compromise. Technically, one could say, I have to add the objective of pleasing her, and factor that into my decision. That's actually a very simple case compared to many others where more than one individual is involved in decision-making. The aggregation of welfare functions of individuals into social welfare functions is a major subject in economics, as well as other disciplines, such as political science. Collective choice is a messy affair beyond a few simple cases. Economists are generally not very happy about the outcomes of collective decision-making, particularly in politics, even though they often can be explained in terms of rational public choice theory.

So far so good, or rather bad. Real-life rationality needs to figure in strategic behaviour, multiple objectives and collective decision-making. The task becomes more complex, with high demands on quantification of objectives and relations between input and output, and a lot of uncertainty. However it remains, at least in theory, manageable. The simple principle of instrumental rationality, or the optimal use of resources for the attainment of a set of objectives principally remains in force. It just takes a lot of extra effort to apply, expert knowledge, consistent ranking of objectives and consideration of consequences of alternative decisions. Or, alternatively, and more likely, rules of thumbs, past behavior and other simplifying mechanisms are applied. This is the essence of "bounded rationality".

Note, however, that individuals need not, and in general will not, apply the same simplifying mechanisms. Individual decisions on the basis of bounded rationality can and will differ from each other – different from decisions based on instrumental rationality, for which there is only one solution. However, when individuals come together for a collective decision, simplifying mechanisms can be compared and scrutinized. If differences remain large and decisions important, a competitive process of differentiation can occur, reducing, if you want, the degree of "boundedness" of rationality and bringing it closer to what would be decided under complete information. Because of the uncertainties of strategic interaction and public choice, there may be a residual of differences of judgement, but these are real-life complexities within the concept of bounded rationality.

This is quite different in another line of economic research, which questions the usefulness of instrumental rationality as the prime principle in human decision-making. Recent empirical research has raised grave doubts on the assumptions about "Chicago man", that people decide consistently in their self-interest to attain an optimum of a pre-determined objectives. Most people seem to reason fundamentally differently. At least, there are large discrepancies between

what economists traditionally perceive as rational behaviour and the way real-life people actually behave, cognitive anomalies, circumstances in which individuals exhibit surprising departures from traditional instrumental rationality (McFadden, 1998). Two of the leading economists studying such cognitive anomalies are Amos Tversky and Daniel Kahnemann, the latter winner of the Nobel price for economics in 2002 (Kahnemann, 2003), and the former a likely candidate for the price had he not died in 1996.

Let me give you a few examples of such irritating behavior that are frequently mentioned in the literature.

The first one is the so-called “ultimatum game”. The ultimatum game is a simple bargaining game where two players have the opportunity to receive a sum of money. The first player, the proposer, is asked to offer a portion of the sum to the second player, the responder, who is unknown to the first player. The responder has the choice of accepting the offer, and getting the rest of the money, or to reject the offer, in which case neither of the two players gets anything. Note that this game is fundamentally different from the above mentioned “tacit bargaining” game, in that players need to think about issues of issues such as “fairness” and “justice”.

Instrumental rationality prescribes and predicts that the proposer offer the smallest amount possible, since the responder will gain from even a very small share in the stakes compared to rejecting the offer and getting nothing. Lets take the example of a booty of 1000 Euros and the single Euro as the smallest unit of division. “Chicago man I” would offer 1 Euro and “Chicago man II” would accept, as otherwise he would get nothing. However, very few players actually follow the prescription. The average offer, from a large sample of experiments, to the responder is just above 40 % (Camerer and Thaler, 1995), with small but interesting differences among people coming from different cultures.

Why do people behave so irrational? When asked, two considerations voiced stand out. One is fairness. The majority of people just think it is not fair to grab a large share of a free ride. The other is the related fear, that the responder may reject the offer because he feels unfairly treated and rejects for that reason even in the event that is instrumentally irrational. Such behaviour is found in many societies, though societal values, rules of behaviour and expectations of the behavior of others are important. Westerners tend to offer more than for instance indigenous people from the Peruvian Amazon, who seem to be less concerned with the fairness of offers (Henrich, 2000). Economists, it may be of interest to note, behave similar to the indigenous Peruvians, and also tend to offer, and accept, less than other people. This experiment demonstrates the pitfalls of a simple application of instrumental rationality. Chicago man’s offer will be rejected, to his own disadvantage. He needs to be instrumentally irrational in order

to be successful. Best is if he has a good perception of how instrumentally irrational the other players are, that is, what kind of minimum offer they are likely to accept.

Another frequently studied game in experiment that reveals the seeming irrationality of people is the “gambler’s fallacy”. People are consistently fooled, or fool themselves, about the links between past and future events, even if there is none. Lets say, a perfect coin has come up with head 5 times in a row. What is the likelihood that the next throw will also result in head? Since the next throw of the coin is completely independent of the earlier ones, it is exactly one half. But in experiments, people will consistently judge this much lower, and be willing to bet fairly high that the next throw will produce tails. Why? Some make foolish arguments about the very low probability of six heads in a row. The probability of five heads in a row is certainly low (one-sixty-fourth) but that is completely besides the point for the sixth through when five throws have already occurred. Some gamblers actually seem to believe that coins are “fair” and that therefore a tail becomes more likely ~~he~~ longer the streak of ‘heads.’ Contrary to the ultimatum game, the assumption of values such as “fairness” or “justice” is nonsense in this case. Strict instrumental rationality would be best for ones pocketbook. Still, its the way many people behave. Risking a little money on the basis of some strange idea that enters ones head seems to please many people. Its the fun in many popular gambles and games.

Let us go to another game, called the St. Petersburg Paradox, first described by the eighteenth-century Swiss mathematician Daniel Bernoulli that brings out a related feature, albeit in the opposite direction, not of risking a little, but risking a lot. The St. Petersburg game is played by flipping a fair coin until it comes up tails, and the total number of flips, n , determines the prize, which equals 2 to the n th power Euro. Thus if the coin comes up tails the first time, the prize is $2^1 = 2$ Euro, and the game ends. If the coin comes up heads the first time, it is flipped again. If it comes up tails the second time, the prize is $2^2 = 4$ Euro, and so forth, until heads come up. The St. Petersburg game offers the possibility of huge prizes. A run of forty tails would, for example, pay a whopping 1 trillion 99 billion 511 million and 628 Eurasia. Of course, the likelihood of this happening is very low, exactly once in 1 trillion 99 billion 511 million and 628 times the game is played.

The paradox is this: If the game is offered like this, it is rational for a gambler to offer any price to play the game. Why? Because the expected pay of this game, defined as the sum of the products of payoffs times their probability is infinitely large. The probability-weighted payoff is one for the first throw, one for the second and so on, and this goes on until infinity. But still, few gamblers are willing to offer more than 100 Euro, the average in experimental situations is about 25 Euro.

This is irrational in the instrumental sense, but it strikes me as very rational human behaviour. Half the time, the game will pay only 2 Euro, and you're 93,75 % likely to wind up with a payment of 16 Euro or less. What I find very rational in this example is risk-aversion, behaviour that treats losses different from gains, and small loss different from large losses.

Let me reflect on some aspects of the two last-mentioned games. I don't find playing in a lottery particularly rational, because I know that the organisers take their cuts. But many people still do, albeit with small amounts of money. But imagine there was a fair lottery paying out all its intake. I guess that most of us would find betting all of our life's earnings in such a lottery foolish, but betting a small amount quite sensible. The statistical odds, however, are the same, so the probabilities of winning are the same for both cases.

The St. Petersburg paradox is a special case of a general and familiar objection to classical decision theory. It is not in line with observed human behaviour not to distinguish between losses and gains and small and large losses and gains. People are particularly averse to large losses, and are comparatively uninterested in large gains.

Finally let me at this point come back to the tacit bargaining game I mentioned earlier, the one where persons A and B had difference of interest in choosing between heads and tails. Now what happens here in experimental situations? A strong majority of people chooses "heads". Schelling, for instance, reports that 16 out of 22 "As" chose heads and 15 out of 22 "Bs". Why? Schelling argues that there is some kind of cultural preference for heads, they are always named first in such games. He tries to reinforce that with a related game. Three players are assigned the letters A, B and C. Each is to write these three letters in any order. If the order is identical, the person whose letter is first gets 3 Euro, the player whose letter is second gets 2 Euro and the last gets 1 Euro. If the order is not identical nobody gets anything. A large majority of players writes down A, B, C and wins at least something. If one plays these games repeatedly, people get very good at it pretty rapidly, by repeating successful strategic behaviour, but they are also pretty good at it already the first time the game is offered.

The above games illustrate what I call here behavioural rationality, the way people actually behave in decision-making situations. This can be quite different from the way in which "Chicago man" behaves. The games bring out this point nicely and neatly, and that's why they are so favoured by academics doing such research. People can still decide like a "Chicago man" or woman, in many situations. However, they often will not.

I would like to pull this brief discussion together. What do these games and many other similar ones tell us?

One consideration is that people have perceptions, ideas and values and these are very important in decision-making, even to the point of foolishness, as in the gambler's fallacy. Coins are not fair, neither are cards, neither are lottery numbers. But still, a good number of people base their behaviour on the assumption that there is some ultimate agent of justice that will nullify what they perceive as injustice.

The second consideration is that people link past and future, even if there is no sound basis for such a link. Instrumental rationality assumes that people think ahead, in terms of attaining a predetermined objective, making decisions on the basis of the future outcome of their actions. However many human beings seem to be prisoners of the past.

A third is that people view gains and losses differently. There has long been a perception that increments of gains and losses are not independent of their absolute sizes. Bernoulli was the first to formulate this expected utility theory by positing that the increment of utility associated with an increment of wealth is decreasing with wealth. Kahnemann and Tversky have expanded this into what they called "expected utility theory", where losses and gains are treated differently.

A fourth is what has been called "framing" (Selten, 1998). We saw in the tacit bargaining games, that people are able to cooperate even in the absence of communication, because of some prior conventions, such as about the "natural" order of things. Framing is quite a nice term, with, I suspect, intentional double meaning. It has been shown in many experiments, and certainly is no surprise for any conscious consumer or voter, that the way an issue is presented often is decisive for the response given to it. A good example is public opinion research, but experimental economic research is also full of such examples. Framing is the result of interaction of the cognitive sources of behaviour mentioned above. One does not have to be a post-modern theorist, who believes that everything is relative and subjective, to be convinced that different people draw differing conclusions out of the exact same set of facts and draw differing consequences out of the interpretation of these facts for the decisions they make. Obviously, and this is the double meaning, such perceptions can be manipulated, but its effect go deeper and further. Let me give you one example for the effects of framing:

Imagine that there is prediction of an outbreak of a new disease, such as SARS a year ago. It is expected to kill 600 people in a given country, let's say the UK. Two alternative programs of equal cost have been proposed. They are presented to the decision-makers as follows: If program A is adopted 200 people will be saved. If program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved. In this version of the problem, a substantial majority of respondents favour program A,

indicating risk aversion. Now the programs are presented to a different group of decision-makers: If program A is adopted, 400 people will die. If Program B is adopted, there is a one-third probability that nobody will die and a two-third probability that 600 people will die. Now a clear majority of respondents favour program B. Thus the certainty of saving people is disproportionately attractive, while the certainty of deaths is disproportionately aversive (Kahnemann, 2002).

To sum up the recent research into rational behaviour, here is a quote from Tversky (1977) summarising his and Kahnemann's research: "Our research has shown that subjective judgements generally do not obey the basic normative principles of decision theory. Instead, human judgement appear to follow certain principles that sometimes lead to reasonable answers and sometimes to severe and systematic errors. Moreover, our research shows that the axioms of rational choice are often violated consistently by sophisticated as well as naive respondents, and that the violations are often large and highly persistent."

So we have, in my view, two conceptions of rationality in addition to instrumental rationality. They are different in theory, though overlap in practice. One is bounded rationality, the inability of the human mind to cope with all information related to a decision. The other, more radical one, is what I called behavioural rationality, founded on "cognitive anomalies" of human behaviour.

Differences in the foundation of decisions will come from a number sources, including:

- ? *Motivation* provides the driving force, or interest behind, behaviour. In my examples above, and most of the economic literature, the motivation is financial gain. Obviously, there can be other motives for, and objectives of, behaviour. As mentioned earlier, very often there are multiple objectives involved in decision-making. Values and rules will also shape motivation, as in the ultimatum game, where the motive for financial gain is moderated by considerations of fairness.
- ? *Adaptation* is routine adjustment to situations based on earlier decisions but without case-specific reasoning. History, personal experience and past behaviour have an important role in decision-making, when there is uncertainty and when there is none. Actual behaviour is often not very forward looking, but rather based on what one might call "ex-post rationality" that is experience of the past. Furthermore, experiments have shown that experiences of the results of decisions are interpreted in the light of prior beliefs, and that therefore routine decisions are assumed to be more rational than they may have actually been (Selten, 1998).

? *Cognition* is reasoning on the particular case. This can be limited or extensive. In real-life people use short-cuts in order to cope with the limits of decision-making. The application of these rules leads into the direction of a mode of decision-making that is automatic and rational, which Kahnemann and Tversky have called intuitive (Kahnemann, 2002). This they contrast with another type of cognition, which is based on reasoning. With respect to the future, it is important to note that, as Tversky and Kahnemann have shown, most people are risk-averse.

As mentioned, there is a lot of overlap in practice between the three conceptions particularly in collective decision-making because of a number of processes of decision-making. One is the widespread use of simplifying mechanisms for decision-making, which are the core of bounded rationality. These will very often be based on history, but also on values, and be open to manipulation, features that have a root in behavioural rationality. Bounded rationality, in this sense, is a mixed case of instrumental rationality and behavioural rationality.

Another, in my view very important, process is communication. “Chicago man” can try to convince the gambler afflicted by the “gambler’s fallacy” and he may even be successful in many cases. He might even convince a few people to play the “Petersburg Paradox” at high cost, though I doubt that.

Obviously, in some cases behavioural rationality is plain irrational. I personally find that a lot of consumer behaviour is, thinking here, for instance, of my own younger son, who will not wear anything but expensive brand clothes. Framing provides many examples where some more rational thinking would be quite useful. But to declare all behaviour that is not consistent self-interest maximisation irrational does not help much if we want to analyse and explain human behaviour. People simply behave differently. Think of the Ultimatum Game or the St. Petersburg Paradox where we would need to assume that a large majority of people behave irrationally. This is an extreme case, but as argued above, less extreme cases, often in the form of bounded rationality, are ubiquitous, linked to risk aversion, framing and values.

Now some writers go very far and throw out the “baby with the bathtub” as we say in German, and deny that rationality is a useful category. This is a position that some post-modern thinkers have taken, who argue that there is nothing certain, everything is relative and rationality an instrument of power by those who claim that they are behaving rationally while their opponents are not. I find this not at all convincing.

My view is that we have to accept that there are different rationalities, and that these need to be reconciled, when it comes to collective decision making, in political processes of decision making.

Instrumental rationality, and behavioural rationality are extreme cases, bounded rationality of various shades will result as a mixture with limited information and uncertainties about strategic interactions. There are many efforts, including “expected utility theory” to reconcile the two extreme types of rationality. However, in my view, a full reconciliation is not possible because of the different natures of the concepts: Instrumental rationality is, in the end, normative, a feature behavioural rationality completely lacks, and bounded rationality is a preliminary concept, open to further improvement under reasoning.

What I argue is that the various forms of rationality need to be taken into account when scrutinising and predicting decision-making. Neither instrumental rationality, nor actual behaviour should be seen as the last word.

With respect to collective decision-making on the societal levels, including defence decisions, the difficulties with rationality lead me to the conclusion that transparency, deliberation and a proper participatory decision-making process are important. The foundations of what is perceived as rational need to be made clear. Discussions should question but not degrade these possibly differing foundations. Arguments but also values need to be included in open and transparent deliberations. Decisions can not be left to experts, who claim to be experts in instrumental rationality, nor to any single group with special interests. They can also not be just made on prior experience. They need to be looked at from all sides, debated and then decided in a political process, that is by those affected by the decision in some way, or more often, their chosen representatives.

Competitive arms spending

Let me now come to the first level of defence decision-making I want to look at. States spend money on arms and armed forces. For what? The answer that almost all making these decisions routinely give is, that they spend money to protect against attacks from other states that also spend money on arms and armed forces. If you look up defence management in the Encyclopaedia Britannica, for instance, you will find an article that explains that defence spending is basically deterrence of an expected military attack.

Lets look a little closer at this justification of defence expenditures. At first sight it seems like a good application of instrumental rationality. But if one looks at this argumentation closer, there are two problems with instrumental rationality here. One stems from the strategic nature of the interaction, and is thus within the realm of instrumental rationality, though producing a suboptimal result. The other is more fundamental and has to do with the cognitive anomalies discussed above.

The first problem is strategic in the game theoretic sense of the interdependence of my behaviour with that of my opponents. My objective, namely to provide protection from some opponent, and the instrument, funding an armed force, are not independent of each other. This has been expressed since, the 1950s, as the “security dilemma”: the defence effort of one state is perceived as the cause of the defence effort by another state. Depending on the parameters of how the threat from the military efforts of the opponents is perceived, the situation can be stable or unstable, in which case we have a dangerous arms race. The strategic interaction of decision-making on military expenditures was first investigated by a mathematician and meteorologist, Lewis Fry Richardson, and it has been a mainstay of academic analysis for almost 50 years.

We have here the familiar problem of rationality in strategic situations that is contained in the “tacit bargaining” game noted above, except that in this case a suboptimal outcome is most likely because the interaction of behaviour is not producing co-operation but competition. The outcome of this strategic interaction is not optimal from the point of view of the gamers. The same level of security, in the sense of protection from an armed attack could be attained without funding armed forces. It would be rational to abandon armed forces in the absence of military threats.

When international armament efforts are denounced as “waste of resources”, or even “madness”, this kind of reasoning is usually applied. Everybody would be better off if the cause of the military effort were eliminated. This could be done stepwise or gradual through negotiations.

One recent study looking at defence expenditures this way is by Paul Collier and Anke Hoeffler. They first find for a sample of developing countries that the level of military expenditures is strongly influenced by expenditures of neighbours. They then calculate an arms race multiplier, that is the extent to which an initial increase in military spending escalates as a result of interdependence of defence expenditures. The overall multiplier they come up with is 2.52, split among the neighbouring countries. As a policy prescription they argue that defence expenditures could be drastically reduced through regional negotiations, as the multiplier also works in downsizing military expenditures (Collier and Hoeffler, 2002).

At the same time they note that this has seldomly happened, even in situations where external development donors are pressing for reductions in military expenditures. The main reason they give is a lack of transparency among parties, giving rise to mistrust, but that does not seem to me a particularly good argument. Such issues could be solved in agreement. They also mention lobby groups within countries as a powerful obstacle to reductions in defence expenditures, but

that influence could, at least within the confines of their model, also work at lower levels of military spending. The question remains, in my view, why contrary to what one would expect from the conventional theory of rational choice, the demonstrable interdependence of military spending only very seldomly leads to negotiations among neighbours to achieve the lowest possible level of military expenditures.

The logic of strategic interaction among neighbouring countries is one problem for rationality in decisions on military spending, the other one is more fundamental and hard to explain with traditional notions of rationality.

Let me illustrate what I mean this with two recent sets of facts. One is the change in defence expenditures of NATO member countries after the end of the Cold War, that is since the late 1990s. The end of the Soviet Union and the Warsaw Pact was related to a large drop in defence expenditures, about 30 percent for Nato and 28 percent for the US. But that drop was not as large, I would argue, as one would have expected given that the major opponent, the Warsaw Pact, disappeared, and its constituent armies were weakened. For the US, for instance, the drop in military spending was smaller, if measured in terms of percentage drops of defence expenditures than after the Vietnam war, with 31 percent, and only slightly higher than after the Korean war, with 22 percent (Gholz and Sapolsky, 1999, p. 15). Defence expenditures of the former Warsaw Pact states decreased by 80 percent in the 1990s. Possibly even more striking is that defence expenditures increased again beginning in the late 1990s, although a number of former Warsaw Pact member countries had now joined NATO and relations to a militarily ever weaker Russia were improving.

That's one set of data which puzzles me. The other comes from Central America, that is the country of Costa Rica. Costa Rica has not had a regular army since the late 1940s. Has that influenced the behaviour of other countries in the region? At best to a limited extent. The neighbouring countries, with one exception I will come to, also have armed forces. However, the level of spending is low compared to the rest of the world. Interestingly, although the neighbouring countries maintain armed forces, Costa Rica has not suffered from lacking a regular armed forces, it has not been attacked or interfered with by military means.

Still, the model of Costa Rica has hardly ever been emulated elsewhere. The former Costa Rican President and winner of the Nobel Peace Prize, Oscar Arias, who is a great promotor of the model of his country, can count two successes in the 1990s. One is Panama, which never built up a regular armed forces after the US intervention of 1989, the other is Haiti, where the former President Aristide abolished the armed forces after he had been reinstated by US forces

following a coup d'Etat. However, in many other countries to which Oscar Arias went to lecture on the Costa Rican model, in Latin America and Africa, he was not convincing.

Why this resilience of defence spending even in situations where one can argue that it would be rational to reduce them drastically or to zero?

One standard answer one hears very often is that of an insurance against uncertainty, the maintenance of a broad portfolio of instruments to meet a large number of threats. In principle this sounds like a good argument in terms of rationality. If nobody knows where the threat is coming from, it makes sense to prepare for a broad spectrum of such threats and maintain a certain level of armaments.

The problem with that argument of instrumental rationality is that the diversity of threats is not relevant. Relevant is the sum of the products of the probability times the level of threats. Both probabilities, and particularly levels of most threats, particularly the one of nuclear annihilation, seem to me to be down from 20 years ago. In fact, it is very arguable whether there were actually any new threats in the 1990s.

Another explanation is that strong interest groups within individual NATO-countries, and first suspects are defence industry and the armed forces, lobby very hard to maintain high levels of military expenditures. Depending on who is using this argument, people then put an emphasis on the strong links between these interest groups and political decision-makers or argue, that these interest groups "frame" the issues, to pick up a phrase used earlier. In any case, the ultimate customer, the taxpayer and voter, is argued to have been "fooled" into making irrational decisions, similar to the way in which consumers are "fooled" to buy certain product. But that assumes that there are a lot of fools around.

I would argue that this is not what happened in NATO countries in the post-Cold War years of the 1990s. The level of defence expenditures was much higher than what can be argued for with the insurance against uncertainty argument. I find striking that the share of NATO-members in global defence spending increased quite considerably in the 1990s, from 59 to 64 percent. So is this irrational? Arguing on the basis of instrumental rationality, and of thinking and arguing in Richardson-type action-reaction models, it probably is not.

However, the resilience is fairly easily explained by the factors of perceptions, experience and risk aversion, which are marks of bounded and behavioural rationality. There is a widespread perception that high military expenditures is useful to fight even such threats, where the links are tenuous, such as in fighting terrorism and nuclear proliferation. In the past, high levels of

defence expenditures have been concomitant with security, so why not in the future. Finally, risk aversion is well-served by maintaining a fairly-high level of military expenditures.

Thus bounded rationality reasoning predicts that defence expenditures will not shrink proportionally to the reduction in external threat. In fact, the closer defence expenditures come to zero, the less proportional the reduction to changes in the threat. As the example of Costa Rica, or rather of the very few followers of Costa Rica, shows, there is probably a kind of minimum level of military expenditures we should expect even in the case that there is no military threat at all, unless there was, as in the case of Costa Rica, Panama and Haiti, an extraordinary event shaping the decision.

As mentioned earlier, my view on this is to neither accept the simple view that current levels of defence expenditures in NATO countries are irrational, because their instrumental value is questionable, nor the view that they must be rational, because they are what they are. Rather, my view is that the important issue is whether the decisions about the level of military expenditures have been made in a participatory political process. Framing should be minimised, through open and transparent discussions about what defence expenditures are supposed to buy. Transparency and discursive decision-making are all important to arrive at decisions that reflect the breadth of approaches to rationality

National weapons procurement

The next type of decision-making I want to briefly look at is procurements of weapon systems.

Weapon procurement decisions are often critiqued, for a host of reasons. For instance, one can hear pretty often, both outside and inside procurement authorities and the military, that not the best weapon system has been procured, or that the procured weapon systems are not suited for the intended purpose.

One such criticism is framed in terms of the “follow-on imperative” first identified by James Kurth in the early 1970s for the case of fighter aircraft. Weapon systems, so the argument not unfamiliar by now, are procured because there was a predecessor model, not because there was a clear requirement for it. Production facilities and procurement structures are set up and these are in danger if there is no similar follow-on project. Particularly important in the argument are lobbying groups and bureaucratic inertia, which are said to jointly fool decision-makers into buying weapons (Kurth, 1972). Alternative options are not given the consideration that they deserve. If one looks at major procurement decisions, there seems to be much validity in this criticism. Not that much has changed since the days of the Cold War in the composition of armed forces, despite major announcements to the contrary. Even the current intense US debate

on introducing new and different types of military technology does not seem to have had much influence on the composition of procurement, with most of the money going to fighter aircraft and other “big-ticket” items.

Again, one can question whether giving priority to proven weapon types really is irrational, or whether it is not another example of a consumer showing familiar behaviour of bounded rationality and even cognitive anomalies. A perception of success in the past and risk-aversion may be rational reasons for preferring established procurement priorities.

I am positing this as a possible explanation for the follow-on imperative, but I am also aware that there is another strong contender for the explanation of seemingly irrational weapons procurement, namely the influence of interest and lobbying groups.

These will try to work through framing and even direct influence over decision-makers. The most interesting recent study of interest groups in procurement has been published by two US Americans analysts, working at the Massachusetts Institute for Technology, and with good working relations to the US Navy in particular. Harvey Gholz and Eugene Sapolsky argue that the end of the Cold War has led to a dominance of what is called pork barrel politics in the US, because the hitherto savvy decision-making by the armed forces, which needed to field the best possible weapons, gave way to a more benign military situation. In the 1990s, they argue, US defence industry was hard pressed to maintain research efforts and production facilities because of a general lack of a good rationale for demand for its products. It lobbied hard and prevailed in preventing the closure of many production line for weapon systems. “Since the end of the Cold War, lobbying incentives have been compounded by slowing production rates that have weapon plants nearly empty. Stranded investment acts as a barrier to exit and investing in politics is the mechanism by which contractors keep plants open.” (Gholz and Sapolsky, 1999).

Gholz and Sapolsky’s data and analysis have been questioned. They need to posit pretty dumb customers in the Pentagon and the military services to explain their data. I find it more plausible to combine their analysis with considerations coming out of the empirical study of decision-making behaviour. Interest groups were certainly framing the issues in their interests, but their task was facilitated by cognitive anomalies among those making decisions.

One can take the position, and many including Gholz and Sapolsky do, that procurement that is not based on a neutral and objective cost-benefit analysis, and on such an analysis only, is not rational. But is such an analysis possible? And within reasonable cost and time frames? In my view, it makes sense to press for such analysis but realise its limitations. On a more abstract level, I would not insist on a particular type of rationality, but rather acknowledge that there are different perceptions of what is rational. The important issue, again, is that procurement

decisions are made on open, and participatory political processes, and decisions are not made by singular interest groups, who deliberately or accidentally put there individual interests before a decision that benefits the taxpayer.

International co-production of weapons

There are various aspects of international co-production of arms where economists have questioned rationality. It has been demonstrated in a number of cases, that weapons produced under the responsibility of one producer, who can freely choose suppliers, are cheaper than those produced in consortia where the rules are set by a group of procurement authorities. When international co-production still comes about, it is the result of political decisions, where governments with non-competitive defence industries force governments with more competitive industries to agree on collaboration on joint projects. Since procurement is guaranteed, there is little incentive by companies involved to economise, and cost premiums will likely be high. However, such coproduction can still be costsaving, if the advantage of longer production runs outweigh the costs of coproduction. Co-production also has another aspect, it is advantageous from the military point of view, as it increases interoperability of forces operating the same equipment.

Many aspects of international co-production are fairly easily explained in a standard framework of rationality. What I find harder to explain are some of the empirical data.

The first is the observation that coproduction was not the predominant form of arms production among NATO countries during the Cold War. The Warsaw Treaty organisation had a rather rational division of labour in defence production, but NATO did not. In many years of study, I have not been able to detect any logical pattern in the patterns of decisions on procurement in NATO-member countries among import, co-production and domestic production. The predominant explanation again is stressing commercial interests of domestic defence industries. But again: Is that sufficient for explaining what would than be instrumentally irrational decisions by procurement authorities?

The other observation I want to make here are the cycles of intensity in international co-production, particularly in transatlantic relations (Brzoska, 2004). These cycles do not seem to correlate very strongly with the political relations between the US and its major allies. The factor which best explains the cycles is, in my view, US procurement. When US procurement increased, such as in the early 1960s and the early 1980s, there was little interest in co-production in the US. When it decreased, such as the early 1970s and early 1990s, such interest increased markedly. Such behaviour by the US defence companies would imply that there is a

fixed level of output which can be either directed at the US market or, if there is a slack in the US market, also at foreign market.

Such behaviour is not typical for companies, or at least it is not typical of the prediction of the behaviour of an instrumentally rational company, but more so its decisions were based on a perception of the future as history and risk aversion in a peculiar market, with one, political, customer.

Subsidies to domestic arms production and arms exports

Let me end with a few observations on subsidies to domestic arms production and arms exports.

A host of rational reasons has been brought to the defence of such subsidies, most of them arguing along the familiar lines of protectionism, such as to protect jobs, technology or the prospect of future competitiveness. There are also some specific arguments, such as security of supply in the case of domestic production, and cost savings for national procurement through the subsidy of exports.

I find none of these arguments convincing from the point of view of instrumental rationality. Protectionism is generally recognised as a bad idea in economic. Security of supply seems to be a concern that belongs to the past, not the interconnected world of today. And the cost savings for national procurement through export subsidies are demonstrably small at best (Chalmers et al. 2001), because the incentive for companies to transfer such gains to domestic procurement authorities is low.

Then why do we still have such a strong level of subsidies to domestic procurement and to arms exports, why is there such a strong pressure to move to possibly even increase protectionism on the European level, as for instance the French government seems to propose?

Again, one can find some rational arguments, such as maintaining levels of competition, and not all falling prey to US defence industry giants. But they do not seem convincing to me. Competition has also continued in other markets where there were seemingly dominant companies, such as in the personal computer business in the 1980s.

Risk-aversion, history of the past and framing may again provide some explanation. In some accounts, high values are put to domestic defence production, for non-economic reasons, and therefore subsidy of such production is seen as rational. I wonder, however, what kind of rationality that is supposed to be. Again, my conclusion from this is not to argue about what is really rational, but to allow for a broad perception of rationality and emphasise the importance of transparent and discursive decision-making over the issue.

Conclusion.

So what is one to make of the many diversions of actual defence decisions from the model of instrumental rationality and “Chicago man”? Should we insist on more rigorous application of the rules of rationality or adopt the post-positivist position that there is no rationality and that all is story telling?

In my view, the first is view is naive and the second is cynical.

We have to realise, in my view, that the simple model of instrumental rationality is not sufficient. It is an important element in defence decision-making and in judging such decisions. But it cannot be the only consideration. It can not capture, in many cases, the full complexity of decision-situations. It also does not reflect the full set of preferences people legitimately have. It is not fully in line with actual behaviour. In particular it undervalues experience, perceptions and risk-aversion. On the other hand, expressed preferences and simple rule-based behaviour cannot be the last word either. It is prey to framing and lack of intellectual investment into reasoning. Thinking an issue through with the instruments of instrumental rationality help to remove a lot of smokescreens.

What is the best way to go about making and modelling defence decisions, then? In my view it is to increase transparency and accountability of defence decisions. Such decisions can not be left to experts, who may perform good cost-benefit calculations, who however will also possibly be subject to cognitive anomalies. There’s cannot be the final word. Decisions can also not be left to the politicians. There needs to be open deliberation in order to eliminate the more egregious elements of irrationality, but also a realisation that in the end there needs to be a choice which, quite correctly, not everybody will judge as rational.

List of references

- Brzoska, Michael. 2004. The cycles of transatlantic defense cooperation. In: *Jocelyn Mawdsley and Eric Remacle*, eds., *Armaments and Arms Control in the European Defense and Security Policy* (Working title), Nomos: Baden-Baden.
- Camerer, Colin F. and Richard H. Thaler. 1995. Anomalies: Ultimatums, Dictators and Manners. *Journal of Economic Perspectives*, Vol. 9, No. 2, pp. 209-19.
- Chalmers, Malcolm, Neil V. Davies, Keith Hartley and Chris Wilkinson. 2001. *The Economic Costs and Benefits of UK Defence Exports*. University of York Centre for Defence Economics, November.
- Collier, Paul and Anke Hoeffler. 2002. *Military Expenditure: Threat Aid and Arms Races*, World Bank Policy Research Working Paper 2927, November 2002.
- Fontanel, and Fanny Coulomb. 2003. Disarmament: A century of economic thought. *Defence and Peace Economics*, Vol. 14, No 3, pp. 193-208.
- Gholz, Eugene and Harvey M. Sapolsky. 1999. Restructuring the US Defense Industry, *International Security*, Vol. 24, No. 3, pp. 5-51
- Henrich, Joseph. 2000. Does Culture Matter in Economic Behavior? Ultimatum Game Bargaining Among the Machiguenga of the Peruvian Amazon. *American Economic Review*, Vol. 90 No. 4, pp. 973-979.
- Hitch, Charles J. and Roland N. McKean. 1960. *The Economics Of Defense In The Nuclear Age*. Cambridge, MA: Harvard University Press.
- Kahnemann, Daniel. 2002. Maps of bounded rationality: A perspective on intuitive judgement and choice. Nobel Prize Lecture, Stockholm, December 8.
- Kurth, R. James. 1972. The Political Economy of Weapons Procurement: The Follow-On Imperative. *American Economic Review*, Vol. 62, No. 2, pp 304-311.
- McFadden, Daniel. 1999. Rationality for Economists? *Journal of Risk and Uncertainty*, vol 19, No. 1, pp. 73-105.
- Selten, Reinhard. Features of experimentally observed bounded rationality. *European Economic Review*, Vol. 42, No. 4, pp. 413-436.
- Simon, Herbert A. 1957. *Models of Man: Social and Rational*. New York: Wiley.
- Tversky, Amos. 1977. On the Elicitation of Preferences: Descriptive and Prescriptive Considerations. In Daniel Bell, R. Kenney and Harold Raiffa, eds, *Conflicting Objectives in Decisions*. Wiley: New York.