

## Nuclear Weapons Proliferation : a Blessing or a Curse ?

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The problem of nuclear proliferation is an old problem, dating back to the first nuclear weapon used and may be abused in 1945<sup>1</sup>. It resurface with each new nuclear power : the Soviet Union in 1949, the UK in 1952, France in 1962, China in 1974 and India in 1974. Israel pretend to have it, Brazil, South Africa, Argentina could have it but stop their programs of nuclear weapons, while Iran, Iraq and may be a lot of others desire to possess nuclear weapons. If nuclear weapons are a real threat on others governments intrusions or invasions, we expect that there will be a high demand on part of smaller nations to protect its territory and political independence through nuclear weapon production or acquisition. The French government clearly uses this argument against the Americans when De Gaulle came to power. At the same time technological and political changes have reduced the cost of acquiring such weapons. More than that, the technological progress includes the miniaturization of this type of weapon. Small groups or entities could have an access to it. This proliferation or expected proliferation is currently considered as a curse, not as a blessing. Why ? Mainly because every body fears that such a proliferation of mass destruction weapons combined with advanced means for their delivery intensifies "the problem of ensuring global security" as Dagobert Brito and Michael Intriligator<sup>2</sup> wrote in a recent paper published in Economic Affairs.

This idea that the proliferation of any weapon individually destructive or massively destructive, in the hand of the ordinary citizen or in the hand of the politician is a threat for every one is the first step in the direction of a centralization of power at the world level. It is directly linked to the political philosophy of Hobbes. It is always interesting to see how intellectuals or politicians are sensible for such arguments. It is very important also because it is through this rhetorical argumentation that individuals have been deprived from basic right of self-protection by using arms of their choice against the threat of the tyrants governing their own countries.

The question is in fact in the change of the technology and the terror that it creates on others if we are using it. Imagine that the miniaturization and the cost of adopting a nuclear weapon of small dimension with the same capacity of massive destruction is affordable to an ordinary citizen. I bought it and now I am doing what the French government is doing to foreign governments, I am saying to him : "if you predate my resources through taxation and invasion of my property, I will use my nuclear weapon to destroy Paris". Are you sure you want to be my neighbor ? Imagine I am not a good guy. I use the argument in the reverse side ; " If the inhabitants of Paris do not pay me a tribute I will use my nuclear weapon". Are you sure you want me to have such a weapon? What I am doing is to use pure rhetoric to frighten you. I am picking a non existent situation or a potential threat to convince you that the non-proliferation of nuclear weapon is a "blessing" while the proliferation is a "curse"<sup>3</sup>.

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<sup>1</sup> Remember that the US government of the time uses the nuclear bomb twice Hiroshima and Nagasaki.

<sup>2</sup> D.Brito and M.Intriligator 1997 "Deterring nuclear weapons proliferation" in Defence Economics , Economic Affairs IEA (December)

<sup>3</sup> Who can afford for investing and developing such a massive destructive power on its own private resources without diminishing the value of its property or of its wealth ? Microsoft ? Unilever, Philips Morris? In fact only the state can produce such weapons just because he can collect an huge amount of money through taxation to produce them.

Facts and common sense do not accept such argument. In 1991, in France, there were 16000 arrests for possession of illegal arms, while only 1600 homicides. Only 45% of them were committed with the guns, shotguns or hand-held weapons. The probability of use of restricted weapons is very low – around 4,5%. Since arrests constitute only a fraction of persons carrying or possessing such weapons regardless restrictions, real probability of using such weapons is even lower. The only time in the history where the nuclear weapon has been used is in fact when the US had a monopoly power to deliver the nuclear bomb without fearing retaliation.

### *Is proliferation a curse ?<sup>4</sup>*

Correlation has to be established between arms proliferation and the number of assaults originated by such proliferation. Does each additional armed person (legally or illegally) increase probability of aggression? Or does it decrease it? Does probability of nuclear war increases with each additional country possessing nuclear weapons? This issue interests many experts. D.Brito and M.Intriligator through a cardinality theorem try to answer positively to such a correlation<sup>5</sup>. Unfortunately the discussion is poorly organized and ill-defined. As mentioned by the authors, the formal debate on this issue should be viewed with caution. Their thesis is in fact quite traditional in the sense that the dominant factor is not the proliferation of nuclear weapons as such but the increase in the occurrence of an accident or an inadvertent behavior by those possessing it. The non proliferation case stays always on the irrationality of the marginal actor who can destroy the "terror equilibrium of nuclear weapons". A classical argument to justify any cartel.

Let's imagine that there is a single armed person (or a country possessing nuclear weapons). Temptation for aggressive behavior instead of peaceful conflict resolution for such person is very high. There is a certain imbalance and comparative advantage in confrontation for those possessing weapons. In this particular case, temptation is strong to use force and aggression to resolve conflict. This is exactly what happens with the monopoly that the State has over armed violence. If it were not the case, the State would not be able to impose its own view of the law. French state does not succeed in imposing its own law over other European states.

Now let us imagine another individual (or country) which possesses similar weapons. Fundamental question is whether both sides will use aggressive <Hawk> strategy in the case of a conflict over the appropriation of a territory or a resource, or will cooperate. If the use of weapons will lead to a deadly war in which both sides not only loose their money but their lives, aggressive strategy is no longer the preferred one for our first individual. If we suppose that both are rational individuals, they will adopt peaceful <Dove> behavior over <Hawk> strategy only if future gains of the <Dove> strategy exceed those of the aggressive one. The problem is that future gains in adopting one of the two strategy depends on the behavior of the other. There is some probability of a conflict. But this probability is already much lower than the previous case when the sole possessor of weapons is sure that if he uses it in case of conflict he will not fears any retaliation. In that case the dominant strategy is to play "Hawk" whatever the behavior of the other. Even he can uses it just to demonstrate its power as happens in Hiroshima and Nagasaki.

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<sup>4</sup> I am indebted to Nikolay Gertchev in writing this section. He help me to discuss and develop a formal model of conflict based on the traditional Hawk and Dove interaction in game theory.

<sup>5</sup> D.Brito and M.Intriligator 1996 " Proliferation and the Probability of War" The Journal of Conflict Resolution, March (pp 206-214)

Let's formalize<sup>6</sup> such an interaction between John and Peter (two individuals or two princes representing their countries)

		Peter			
		$1-\lambda(2)$		$\lambda(2)$	
		Dove		Hawk	
Dove	$\lambda(1)$	$V/2$	$V/2$	0	V
John					
Hawk	$(1-\lambda(1))$	V	0	$(-C)$	$(-C)$

V measures gains from the conflict. C is the cost of war for each of them. If they use Dove solution, they split gains in two,  $V/2$ . If there is a balance of power, nuclear weapons will impose a heavy cost on war. When both make war the use of nuclear weapons imposes only losses:  $(-C)$  for John and for Peter. In case of a monopoly of John on the nuclear weapon there is no fear of retaliation, then we suspect that there is only gains  $V > 0$  for John and no losses neither gains for Peter as he surrenders.

In the monopoly case for John, the dominant strategy for him is always to choose "Hawk" then to fight<sup>7</sup>. In the case of a balance of power, each part will adopt with certainty the Hawk strategy if and only he is sure that the adversary plays the Dove. If both play the Hawk strategy losses are the only outcome of the fight. If John plays Hawk and Peter plays Dove, he will get the totality of gains V. In the opposite case he loses everything and his gain is zero. The game is symmetric since both sides have the same type of weapons. We can immediately see that the Hawk strategy is not the most attractive behavior as the outcome  $(-C)$  is negative. But the Dove strategy is not either since  $V > V/2$ . Thus, John is playing the Hawk only if Peter plays the Dove. In the absence of such information John has to make estimations on Peter's behavior.  $\lambda(2)$  is the probability that Peter adopts a Hawk strategy and  $(1-\lambda(2))$  the Dove strategy the way John estimates it. It is the same for Peter.  $\lambda(1)$  is the probability that John adopts a Hawk strategy and  $(1-\lambda(1))$  the Dove strategy the way Peter estimates it.

Future expected gains for John in adopting Hawk strategy are:

<sup>6</sup> The model is a variant of the "Hawk and Dove" model of the modern game theory first developed by J.M. Smith 1982 Evolution and the Theory of Games Cambridge University Press

<sup>7</sup> Asymmetries, imbalance of power and hierarchy of political forces are usually the source of political power. In the analysis we made hypothesis of perfect symmetry of forces as a result of the spread of nuclear weapons. Military technology was available or accessible at a certain price for individuals or groups. Let's drop this hypothesis. We introduce asymmetry between John and Peter. Costs and gains for them are divergent. The matrix looks as following:

		Peter	
		Dove	Hawk
John	Dove	$V/2, v/2$	0, v
	Hawk	V, 0	$(-C), (v-c)$

For some reason Peter has comparative advantage in aggression  $(v-c) > 0$ . John is aware that Peter will play Hawk due to such advantage. Because Peter definitely will play Hawk, John strategy will be to surrender to Peter, since  $0 > (-C)$ . Peter beats John. Certain hierarchy establishes between them and it is prudent for John. This interaction will lead to the domination of one party against the others, which is so praised by political scientists. The origin of such domination lies not in such asymmetry, but in the belief in it from John's part. This helps to understand the role of misinformation as military strategy and at the same time the role of technology in the conflicts.

$$1) E(U)_H = (1 - \lambda(2))V + \lambda(2)(-C)$$

If he plays the Dove they are:

$$2) E(U)_D = (1 - \lambda(2)) \cdot \frac{V}{2} + \lambda(2) \cdot 0 = (1 - \lambda(2)) \cdot \frac{V}{2}$$

Thus he plays the Dove if and only

$$3) E(U)_D = (1 - \lambda(2)) \cdot \frac{V}{2} > E(U)_H = (1 - \lambda(2))V + \lambda(2)(-C)$$

and he will play Hawk when :

$$4) E(U)_D = (1 - \lambda(2)) \cdot \frac{V}{2} < E(U)_H = (1 - \lambda(2))V + \lambda(2)(-C)$$

He will be indifferent between the two strategies when :

$$(1 - \lambda(2))V + \lambda(2)(-C) = (1 - \lambda(2)) \cdot \frac{V}{2}$$

5) that is when

$$\lambda(2)^* = \frac{V}{2C + V}$$

The interpretation of this ratio is straightforward : it is a ratio between the gain of an Hawk strategy,  $V$ , when the other plays Dove and the opportunity cost of the war ( $2C + V$ )<sup>8</sup> when the other plays Hawk.

If John estimates that the probability,  $\lambda(2)$  for Peter to play Hawk is less than this ratio,  $\lambda^*(2)$ , he will play Hawk. Otherwise, if he estimates that such probability is higher than the ratio he will play the Dove. We also notice that an increase in the damage from the war compared to gains the more likely John (respectively Peter) will adopt the Dove strategy as the threshold probability is lower. If the ratio of costs over gains from the war is close to zero (which is the case of using nuclear weapons), probability of peaceful conflict resolution increases drastically. Now as the game is symmetric we have  $\lambda^*(1) = \lambda^*(2)$ .

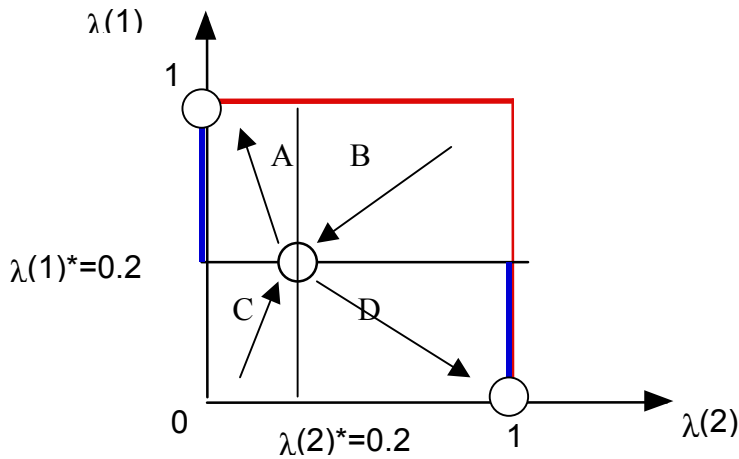
In such an interaction,  $\lambda(2)$  and  $\lambda(1)$  are key variables in the decision to enter a nuclear conflict.

Assumes that John is convinced erroneously by a third, Paul, that Peter will play Dove or that Peter will play Hawk with a high probability (while Peter in fact is ready to play "Hawk"). Then John will adopt an Hawk strategy based on this wrong information. The nuclear war is then the outcome of this wrong information. This explains simply why governments have developed direct communications between those who have the power to start a nuclear conflict and have protected themselves against such wrong decisions. But as players are rational they anticipate such a difficulty in forming their beliefs on the behavior of others. A natural consistency requirement is that expectations are also rational.

The convergence of anticipations between John and Peter is crucial. Look at the following figure.

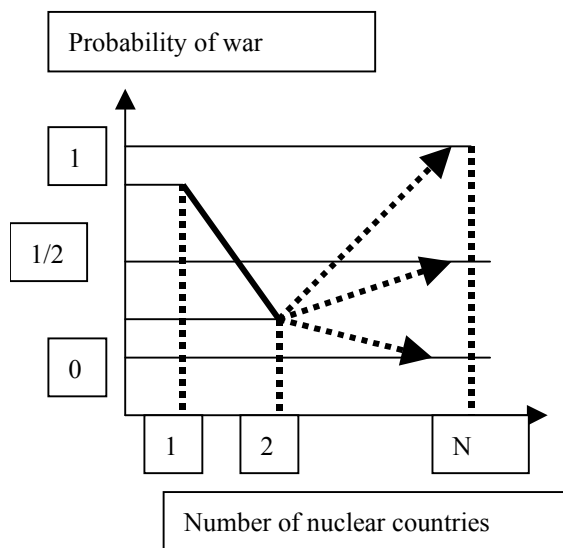
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<sup>8</sup>  $2C + V$  measures on both players the sum of the direct cost of war,  $C$ , and the loss suffered by each player in losing the gain of the Dove strategy  $V/2$ .  $2(C + V/2) = 2C + V$



On the horizontal axis, we plot the anticipations of John  $\lambda(2)$  on the behavior of Peter while on the vertical axis we plot the anticipations of Peter  $\lambda(1)$  on John's behavior. Assume we are in zone A. In that case  $\lambda(1) > \lambda(1)^*$  while  $\lambda(2) < \lambda(2)^*$ . The result means for Peter to play Dove is the best response to the behavior of John as John rationally plays Hawk. For anticipations located in zone A a stable strategy is the couple  $\lambda(1)=1, \lambda(2)=0$ . John plays Hawk and Peter plays Dove. In zone D we will observe the reverse case,  $\lambda(1)=0, \lambda(2)=1$ , John plays Dove and Peter plays Hawk. There are two pure strategies either John dominates or Peter dominates. In region B or C both play the same strategy either Dove or Hawk as  $\lambda(1) > \lambda(1)^*$  and  $\lambda(2) > \lambda(2)^*$  (zone B) or  $\lambda(1) < \lambda(1)^*$  and  $\lambda(2) < \lambda(2)^*$  (zone C). Zone C, then, is the area of generalized conflict. The mixed equilibrium  $\lambda(1)^* = \lambda(2)^*$  is not in fact stable in regions A and D. But when C increases drastically like with nuclear weapons, the value of  $\lambda(1)^* = \lambda(2)^* = V/(2C+V)$  is going close to zero, such that regions of peace A, B and D increase in size such that the outcome of the interaction is in terms of probability going closer to a situation of peace.

Consequently the arms race between two nuclear countries to establish power equilibrium is very important in decreasing chances of potential conflict. The more deadly the weapons become the more it is dissuasive. The question, which derives from proliferation, is following: does the introduction of additional individual or state increases or decreases, or leaves unchanged the probability of conflict? Refers back to the following figure.



On the vertical axis we plot the probability of war and on the horizontal axis the number of countries or governments having nuclear weapons. With a monopoly the probability of war is closed to one. With two adversaries the probability of nuclear war is closed to zero. Adding others countries or individuals either lowers this probability to zero or increases it until we are coming back to pure uncertainty<sup>9</sup> (The probability of war is 1/2) or pure certainty (the probability of war is coming back to one) .

Adding one more player in the interaction , says Patrick, implies a new game with three players having always two strategies to play Hawk or Dove:

	Patrick			
	Hawk $\lambda(3)$		Dove $1-\lambda(3)$	
Peter	Hawk $\lambda(2)$	Dove $(1-\lambda(2))$	Hawk $\lambda(2)$	Dove $(1-\lambda(2))$
Hawk $\lambda(1)$	-C,-C,-C	-C,-C,-C	-C,-C,-C	V,0,0
John				
Dove $1-\lambda(1)$	-C,-C,-C	0,V,0	0,0,V	V/3,V/3,V/3

Patrick plays either Hawk or Dove. Then Peter plays either Hawk or Dove conditional on the fact that Patrick has played Hawk or Dove, then what is the strategy of John? In a nuclear conflict if two players play Hawk the destructive power of the nuclear weapon is such that the other actor who plays Dove will be destroy as well<sup>10</sup>. In fact gains occur for one or for all when only one actor plays Hawk while the others play Dove or all plays Dove sharing the value of the resource (V/3). Consequently knowing this matrix John will calculate the

<sup>9</sup> Brito and Intriligator recognize the monopoly case and the duopoly , but they argue that the increase in the proliferation of nuclear powers will increase the probability of errors . In that case the probability of conflict raises to 1/2 that is to complete uncertainty.

<sup>10</sup> One reaction is to think that the third who does not take part in the nuclear conflict will be the last survivor and will profit of the destruction of his ennemies or competitors in the fight for the appropriation of the resource. But in fact he is coming back to autarky a situation which is not a good one and which implies losses compared to a present situation of no conflict. We can add an externality problem with the nuclear war due to the destructive power of nuclear weapons which inflict collateral damages.

expected value of adopting an Hawk strategy versus a Dove one by anticipating the aggressive behavior of the two others players.

Hawk strategy :

$$6) E(U)_H = \lambda(2)\lambda(3)(-C) + \lambda(2)(1-\lambda(3))(-C) + (1-\lambda(2))(1-\lambda(3))V + \lambda(3)(1-\lambda(2))(-C)$$

Dove strategy :

$$7) E(U)_D = \lambda(2)\lambda(3)(-C) + (1-\lambda(2))(1-\lambda(3))(V/3)$$

John will plays Hawk when

8)

$$E(U)_H = \lambda(2)\lambda(3)(-C) + \lambda(2)(1-\lambda(3))(-C) + (1-\lambda(2))(1-\lambda(3))V + \lambda(3)(1-\lambda(2))(-C) >$$

$$E(U)_D = \lambda(2)\lambda(3)(-C) + (1-\lambda(2))(1-\lambda(3))(V/3)$$

He will be indifferent when :

$$9) E(U)_H = \lambda(2)\lambda(3)(-C) + \lambda(2)(1-\lambda(3))(-C) + (1-\lambda(2))(1-\lambda(3))V + \lambda(3)(1-\lambda(2))(-C) =$$

$$E(U)_D = \lambda(2)\lambda(3)(-C) + (1-\lambda(2))(1-\lambda(3))(V/3)$$

As the game is symmetrical and knowing that expectations are rational, that is each player's belief about other player's choice coincide with actual choices the other player intends to make, we can write :  $\lambda(1) = \lambda(2) = \lambda(3) = \lambda$  where  $\lambda$  is the threshold with three players. Solving equation 9) for  $\lambda$ , we find :

$$10) \lambda = \frac{V}{3C+V}$$

The threshold on which John bases its strategy is lower with three players compared with an interaction where there are only two players. Adding N players in this war game leads to a threshold on which all players base their strategy equals to :

$$\lambda = \frac{V}{N.C+V}$$

Increasing N to infinity reduces the threshold to zero. Each nuclear power will be incited to play Dove. Adding N players implies N pure strategies where one is dominant (that is plays Hawk and all others play Dove) and one mixed equilibrium  $\lambda(1) = \dots = \lambda(N) = V/(N.C+V)$ . In the N dimensional space of the  $\lambda(i)$ , the corresponding hull to the C's area in the two dimensional space shrinks to zero, insuring high stability of a peaceful interaction<sup>11</sup>.

From an outside observer the frequency with which a nuclear conflict can emerge is given by

$$11) f(H) = \sum_{i=1}^N \lambda + \Pi(\lambda)$$

Looking at the matrix with three players, we see that there are 3 cases of implying two players and one case where all players are all at war. But the product of a probability raised at power N is negligible. Then the frequency of a nuclear war in a matrix of N players is reduced to :

<sup>11</sup> The idea behind is simple. k players anticipate that (N-k) players will plays Dove, the  $\lambda < \lambda(i)$  then their best strategies is to plays Hawk, but if they all plays Hawk at the same time the outcome is a generalized conflict and their on disappearance due to the externalities of a nuclear conflict. Knowing that each of the k players anticipates that the k-1 others players will have the same bet, they will play Hawk only if they are sure that they will be alone to play Hawk all others playing Dove. But this possibility diminishes drastically with the increased number of possessors of nuclear weapons.

$$f(H) = \frac{NV}{NC+V} = \frac{V/C}{1 + \frac{V}{N.C}}$$

If  $N$  goes to infinity, the frequency of nuclear war is just the ratio of gains  $V$  over cost of war  $C$ . With a nuclear technology  $C$  is very high compared to the gain  $V$  such that this frequency approach zero. Finally, the lesson from this formal analysis is that the more there are armed individuals, the more the threshold probability to have armed conflicts depends only on the ratio  $V/C$  of doing the war. In such case the more dissuasive are the means, the less are the chances for conflict.

Formalization is always suspect of some rhetorical tricks mainly with such an issue. It is the case with such a demonstration. But at least the formal model appeals to our reason not to our passions. If the model is true then it is important to liberalize the right to have extremely dangerous weapons and accept their dissemination among the population of nation states or individuals.

### **Is the nuclear proliferation a blessing?**

Yes it is. Why? Because things that are good for us are good for others. Terror equilibrium has been guarantor of peace in Europe during the Cold War. Without it Soviets could have a temptation to invade Europe. When there are no nuclear weapons there are classic wars, which can result in massacres comparable to the First World War. Iran/Iraq war was compared to the war between France and Germany. If both sides had nuclear weapons they would hesitate to enter the conflict, which would have saved millions of lives. Possession of nuclear weapons is a good and not a bad. Its dissemination is good and not bad. Indeed, the more countries possess such dissuasive weapon, the wider will be the territory of peace and stability, which we experienced in Europe throughout the Cold War. There have to be serious arguments used in order to prohibit certain country to use such means of dissuading potential aggressors.

This idea of nuclear arms proliferation is very natural for economists but seems almost heretical for non-economists. The countries-members of the nuclear club form the cartel, which is looking to protect its monopolistic position in respect to other countries. They even use violence in order not to let countries, which they do not like, to obtain nuclear technology. If nuclear weapons reduce possibility of armed conflicts, i.e. protect human lives and assure territory from external invaders and violence, it means that it is efficient. It will be more and more required once costs of having it reduce. In such case competition between countries in order to defend themselves against external aggressors will lead to proliferation of nuclear weapons. The cartel of countries (Ex-USSR, UK, France, China and the US), members of the nuclear club, which are not protected by Super Global Power will fail as a cartel. There are two major forces in this process. Club members have reason to cheat by giving nuclear weapons for other countries (for example France and Iraq or China and Iran) or other countries can enter the market offering or acquiring such weapons themselves, for example India, Pakistan, Israel, Iran, Iraq or North Korea. Not to mention Russia, Kazakhstan, Belarus, and Ukraine, who inherited nuclear weapons from the USSR. Tomorrow if Ukraine will keep its nuclear arsenal, Poland will decide to acquire the same. South Africa, Japan, Germany, Brazil and Argentina will in the nearest future have an array of nuclear weapons if they do not have it already.

This iconoclastic point of view is more and more shared by western military strategists. They consider that countries willing to obtain such weapons should be helped and not considered as outlaws. An article by J. Fitchett in the IHT indicates such change in opinion among military advisers. Transition from bipolar system into the competitive one is frightening. If proliferation prevails, he notes, the risk of conflict increases due to inability to control dissuasion process. Pentagon experts note that when communication between USSR and US was limited, it minimized provocative behavior. Imagine though territories like Asia and Middle East, where nationalistic passion and irrational behavior are reality. How do leaders of such countries establish communication? Those leaders frequently are autocratic and are ready to destroy their countries in nuclear conflict just to satisfy their interests or territorial appetites. Even though recent Iraq conflict showed opposite (Saddam Hussein did not dare to use chemical weapons under nuclear threat of Israel and US), we can not extrapolate this to the world where nuclear weapons are proliferated. We should not forget that nuclear conflict is not local and it can affect, like Chernobyl nuclear disaster, third parties not involved in conflict. Radioactive clouds follow winds and not enemies. This argument is not new. It is not different from the one by the French doctors, who in the name of protecting consumers are impeding sale of drugs in supermarkets as it is done in the US. Another argument says that competition in the airline services leads to increase in accidents due to the fact that air companies do not invest sufficiently in security under pressure of competition. It is proved to be false. All defenders of monopoly or cartel use such arguments, including the one concerning nuclear weapons.

We have a hard time to believe that the taxi drivers' monopoly is created to protect consumers. When the Medical Board is pronouncing the argument that monopoly is beneficiary for consumers, we are impressed immediately. Indeed, the ability to argument is being significantly distorted when the arguments are related to our lives, when we think about nuclear bomb and our ability to think clear is destroyed.

Let's go back to the economic argument: transition from the situation of interdependency into competition. Before 1989 there was nuclear parity between USSR and US. We can regard this situation the same way as the Cournot bi-polarity. Essential question of that time was arms race in terms of nuclear missiles. For the given level of Russian war power, additional production of missiles was profitable, measured in dissuasion capacity. The same way, for given level of American offensive capacity, increase of the nuclear war-heads in Russia was advantageous.

Intersection between these two functions is Cournot equilibrium. The number of missiles being produced is very high. It is possible to increase profits for both adversaries by mutual arms reduction. If both parties agree to reduce their arms and obtain higher dissuasion capacity, optimal for them is not to miss such opportunity. From the beginning of Cold War we have witnessed conferences on arms reduction and treaties on non-proliferation. They correspond to the common solution. Each side in such agreement maintains certain quota of missile production or brings excessive level of arms to the level that maximizes profits for both parties.

All those conferences between Superpowers were simple agreements to maximize their dissuasive capacity or minimize their costs for given dissuasion level. Failure of such agreements is very intriguing. Why is it so? Because agreements have to be respected. Majority of such treaties not only gave exact details concerning quotas but also means to check if those quotas were respected. In other words, the issue of agreement or cartel is being

confronted by a well-known prisoner's dilemma. Significant advantage is obtained by the one who cheats if the other respects agreement.

If Russians do not respect agreement and Americans do, then Russians obtain significant advantage in the arms race. This incentive not to respect agreement explains continuous failure of such agreements. This period is characterized by missile production at the Cournot point with attempts to reduce these arms at the equilibrium point. Only disappearance of the USSR ended this strategic interdependence. Bi-polar structure disappeared.

### **Two directions of development.**

1. US install the monopoly on nuclear dissuasion and plays the world cop, excluding international exchanges for countries, which are looking for nuclear weapons. Such position is expensive and US role is not legitimate for such activity.
2. We enter the competition where more and more countries possess nuclear weapons.

First lesson of history is that in the absence of legal monopoly no agreement or cartel, even being organized by States can resist interactivity. One of the best known examples is disappearance of the oil cartel. Nuclear club is another one. The second lesson is following: competition is the mean by which we maximize our exchange profits. Nuclear arms possession is the most efficient defense of territory because it produces fear. It reduces armed conflicts and does not require many personnel. Such technology once it is produced more and more cheaply will face increased demand from the countries with fewer resources. Such democratization is result of competition and not of the monopoly.

You have noticed that by using the word "democratization" and not "dissemination" we demonstrate positive aspect of the competition for those who have sympathy for the poor. This shows how our brain is obscured by simple words. For many the words "democratization" bring positive connotation. If a poor Iraqi or Pole can benefit from such protection it is democratization. For a rich French or American it is dissemination. For an economist it is competition. Sometimes words are more important than we think.

The argument that an Iraqi, Pole or Libyan is more irrational than French is fundamental. This is the argument that is used against nuclear arms proliferation. It was evoked during the Gulf War. Saddam Hussein is not one of us, he does not share our values and he may be a dictator, but he is not irrational or crazy. But those who share this point of view insist that we can not extrapolate from Saddam Hussein case. But if we follow their logic we will have to demonstrate that non-democratic political systems constantly elect as their leaders irrational and crazy persons. There is no proof of such theory. It will also have to be proven that democratic systems are immune to such phenomena. Hitler and National Socialists came to power through democratic mechanisms. Thus, such argument is not acceptable. For the moment it is pure rhetoric.

We can also link this theory to the one, which prohibits citizens to carry firearms. Another side of the problem is that citizens are defenseless and the only armed persons are police, which does not know how to shoot or gangsters, who use their arms in total security against citizens disarmed by the State. It is the same argument with the only difference that there is no World Super State.

