

# Modeling Rumors: The No Plane Pentagon French Hoax Case

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## Abstract

The recent astonishing wide adhesion of french people to the rumor claiming ‘No plane did crash on the Pentagon on September the 11”, is given a generic explanation in terms of a model of minority opinion spreading. Using a majority rule reaction-diffusion dynamics, a rumor is shown to invade for sure a social group provided it fulfills simultaneously two criteria. First it must initiate with a support beyond some critical threshold which however, turns out to be always very low. Then it has to be consistent with some larger collective social paradigm of the group. Otherwise it just dies out. Both conditions were satisfied in the french case with the associated book sold at more than 200 000 copies in just a few days. The rumor was stopped by the firm stand of most newspaper editors stating it is nonsense. Such an incredible social dynamics is shown to result naturally from an open and free public debate among friends and colleagues. Each one searching for the truth sincerely on a free will basis and without individual biases. The polarization process appears also to be very quick in agreement with reality. It is a very strong anti-democratic reversal of opinion although made quite democratically. The model may apply to a large range of rumors.

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# 1 Introduction

Very recently, the assertion from an individual stating indeed there were no crash plane on the Pentagon on September the 11, received in France an unprecedented massive adhesion notwithstanding the obvious nonsense of the assertion. Within a few days more than two hundred thousands copies of his book [1] were sold. Every one was debating the issue with millions of people adhering to the lie. To stop this overloading of misinformation, all newspaper leader-editors made firm stand on denouncing unanimously an ashamed and unacceptable make-up of reality [2]. A counter book with a detailed proof of the Pentagon attack was even published [3].

But since then, all has been forgotten, or almost. No one is any longer interested in the issue. But yet this astonishing event may prove useful to grasp the complex dynamics behind the more general and broad phenomenon denoted under the generic name of rumor [4]. It offers an opportunity to analyze the process of individual choice making from public and open discussions. In particular it allows to connect the effect of backmind collective social paradigms in yielding the direction of a public opinion polarization.

The subject of rumor formation is becoming of a strategic importance at all levels of society. The control and possible handling to manipulate information are now major issues in social organizations including economy, politics, defense, fashion, and even personal affairs. Especially with the existence of Internet which provides a support to anybody to say anything and then consequently to be possibly heard by millions of people. To be read can imply to be automatically perceived like truth, and retransmitted as such to others. There exist no parapets.

However, information shared by a very great number of people does not obviously prove of anything its authenticity. But it can induce quite concrete and sometimes dangerous follow up acts. It may also happen that once a point of view on some specific issue is widely adopted, the presentation of objective facts proving its falseness, does not produce the abandonment from this same false point of view. At contrast, a rumor can prove to be true while first set false by official media. The frontier between a rumor and information turns out to be very fragile [4].

To try to put on some new light on this rather complicated phenomenon, we evoke a recent study on minority spreading in random geometries [5]. Using a majority rule reaction - diffusion model, it shows how an opinion at the extremely minority beginning propagates in a random geometry of

social meetings. It is found to always gain an overwhelmed majority in a group provided it starts beyond a certain very low threshold value [5, 6], if it is also coherent with some social paradigm. Otherwise it dies out. The associated dynamics appears to be extremely quick (few days) in both cases of total spreading of dying out in accordance with empirical fact about rumor phenomena [4].

It is worth to stress that above model is not the reality itself. But it aims by making crude approximations at discovering certain essential and radical aspects of this very reality which are otherwise totally hidden by the complexity of the full phenomenon. Such a sociophysics treatment [7] of a social problem is symptomatic of a new emerging trend from physicists of disorder [8-13].

The paper is organized as follows. The chronology and the content of the Pentagon french hoax are first reviewed in Section 2. In Section 3 we present the minority model [5]. It is then applied to the french case in Section 4. The massive and quick adhesion of french people to the no plane Pentagon hoax is shown to result from an existing collective anti-American bias which is independent of the issue itself [14]. The same mechanism explains why the hoax did not spread in other country like for instance England. To conclude, the existence of systematic collective bias active in the forming of public opinion is emphasized in last Section.

## **2 The Pentagon french hoax**

On September the 11 all french media as like all other world media announces the news "a plane has crashed on the Pentagon" in the series of the terrorist attacks on the US. The fact is naturally perceived as an objective truth. No one questioned it? There were no doubt what so ever about the fact itself. Nevertheless, its reality could have proven disturbing for some people, as far as their global ideological worldview was concerned. For those who hold America as a satanic and very powerful country, this barbarian and unacceptable aggression against the same America deeply disturbed their global vision of the world. They had to live with it.

But then, when later on an isolated individual starts diffusing on the Net his counter truth, "not only has no plane crashed on the Pentagon, but moreover the blow was assembled by the United States", all above unease people absorbed this counter truth at once and literally like a saving truth.

For them, America was indeed the beforehand well-presented monster. This coming back to coherent ideological world view certainly acts on tens of thousands of French people. The selling of more than 200 000 copies of the hoax claiming book in less than a few days demonstrated such an immediate release for a huge amount of French people.

However, even if up to twenty percent of the French population was immediately adhering to the lie, its immense majority, that is to say eighty percent, was felt not concerned with this "revelation". For them, it was at best perceived more like a sectarian wild imagining. The phenomenon remained contained and confidential, though with a hard core of believers.

But afterwards, the TV came in to mediate the issue. It has played a key role in the following warming up process of tuning on a generalized public debate. There, one of the major national French TV channels presented at a large audience show the untruth as a new possible scenario to explain the Pentagon destruction. The thesis of no plane crash was defended together with the claim it was set up by American secret services. This presentation was not put on as the truth but as an alternative to the current view on the event. De facto, it created a doubt in the public mind. From there, the questioning of the event was legitimated at least as a doubt about the nature of what did really happen to the Pentagon on September the 11.

In addition, the sounding right of the question "why they are no pictures of the carcass plane on the Pentagon", drove an unbearable doubt. The hugeness of this revelation made it a necessity for the people to clear up the issue at stake. Consequently, a public debate started as the essential medium to resolve the mystery. Moreover, as the response to the absence of plane carcass was counter-intuitive, once someone made up its mind from discussing with friends or colleagues, it could always be shaken again in its view. The fragility of the individual making choice has resulted in a series of local and repeated discussions. The truth was perceived as emerging from the making of a collective truth setting up the facts within a clear explanation. It was up to the public opinion to decide what had actually occurred at the Pentagon on September the 11.

Nevertheless, it could have been expected that starting with a majority of eighty percent of the population holding on the truth "a plane has crashed on the Pentagon", the public debate would automatically lead to enforce the truth on the initial twenty percent of people believing on the untruth "no crash plane on the Pentagon, it was set up by American secret services". But in fact, and in an astonishing manner, the opposite did happen. The lying

minority did turn on its side the majority of the people first holding on the truth.

### 3 The minority spreading model

To understand above paradox, let us follow the process of an individual searching for the truth from open and repeated discussions with friends and colleagues. Discussing this kind of issue occurs at social gatherings at which people chat freely about any matter like the weather, a sport event or some news. These gatherings take place at most at social times like coffee breaks, lunches, or dinners. At each one of them, a small number of people get together, usually from two to six or a bit more, to enjoy a drink or some food. There, while discussing, arguing and drinking, often the whole small group lines up within a more or less consensual opinion [4, 5]. However this opinion is fragile since resulting from an informal discussion and not from an irrefutable demonstration. As such it is suitable for a shift at another meeting. People have no individual bias towards the issue.

To visualize the phenomenon in a simple manner, we consider a perfect society where each individual has only one and even power of conviction, whether it is for or against the truth. To be more perfect we also make the assumption that each individual taken in a local discussion eventually aligns along the position of the initial majority within the actual group. Thus, from each group sitting, informal discussion leads to a local consensus with each participant sharing the same opinion, that is the one of the initial majority. After the dinner, lunch or drink, everyone is convinced of either the truth or the untruth. That is because people are sincere and open mind in their search to answering the question of what did happen to the Pentagon on September the 11. They hold no a priori.

To moderate this local majority rule dynamics, we introduce the possibility for a group to doubt about the issue. In our model such doubting states result spontaneously from even groups with an initial local parity between the two opposite opinions. In this case, while doubting from their respective individual arguments, the people need some extra information to establish a choice. That additional ingredient is naturally sought in the shared collective social paradigms which are specific to the overall population the group members belonged to. These common cultural settings are upstream of any particular consideration. They are a common sensitivity about wide view of

the world. Here, for the french population taken as a whole, it spurs from a rather skeptical feeling about America. Thus in case of a doubt, the group chooses to believe in the untruth since it is coherent to its common background of suspicion towards the United States [14]. An illustration of the dynamical process is showed in Figure 1.

It is worth to stress that in another country this collective backmind can be different. For instance in England it is a rather American sympathizing feeling. Thus, there the same group in the same doubt would decide to believe in the reality of the crash. As is seen below, that is why in England the rumor just died out.

Within the framework of our model, to have a quantitative grasp on the discussion driven evolution of the respective proportions of people holding on the truth and the untruth, it is necessary to fix ratios for the various social-meeting sizes. Denoting  $\{a_i\}$  the probability to be sitting at a group of size  $i$ , we have the constraint,

$$\sum_{i=1}^L a_i = 1, \quad (1)$$

where  $i = 1, 2, \dots, L$ . The including of one-person groups makes the assumption everyone is gathering simultaneously realistic.

Starting at time  $t$  from a  $N$  person population, prior to the public debate everyone is holding an opinion. There are  $N_+(t)$  individuals believing to the truth “A plane did crash on the Pentagon on September the 11”, leaving  $N_-(t)$  persons sharing the untruth “No plane crashed on the Pentagon”, with  $N_+(t) + N_-(t) = N$ . Therefore the probabilities to hold respectively on the truth or the untruth are,

$$P_+(t) = \frac{N_+(t)}{N}, \quad (2)$$

and,

$$P_-(t) = 1 - P_+(t). \quad (3)$$

From this initial configuration, people start discussing the issue at the first social meeting. Each new cycle of multi-size discussions is marked by a time increment  $+1$ . From above simple assumption of a majority rule dynamics, with a bias in favor of the untruth in case of a local doubt, at time  $(t + 1)$  we get for the density truth support,

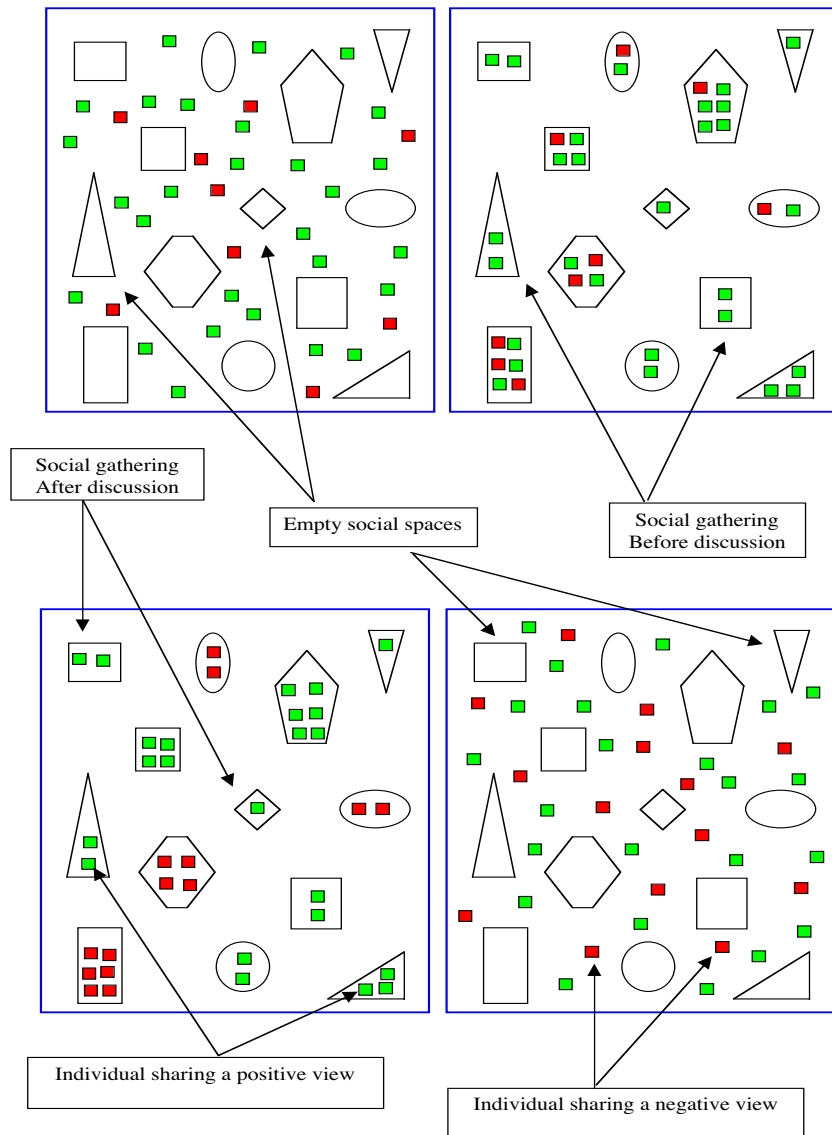


Figure 1: A one step social gathering dynamics. Up left, people sharing the two opinions are moving around. Grey are for and black are against. No discussion is occurring with 28 grey and 9 black. Upper right, people are having lunch by groups of various sizes from one to six. They start discussing. No one yet change its mind. Below left, people are ending their lunch. Consensus has been reached within each group. As a result, they are now 23 grey and 14 black. Below right, people are again moving around with no discussion. The balance stays at 23/14.



$$P_+(t+1) = \sum_{k=1}^L a_k \sum_{j=N[\frac{k}{2}+1]}^k C_j^k P_+(t)^j \{1 - P_+(t)\}^{(k-j)}, \quad (4)$$

where  $C_j^k \equiv \frac{k!}{(k-j)!j!}$  and  $N[\frac{k}{2} + 1] \equiv \text{IntegerPart of } (\frac{k}{2} + 1)$ .

In the course of time, the same people will meet again and again randomly in the same cluster configuration of size groups (see Fig. 1). At each new encounter they discuss locally the issue at stake and may change their mind according to above majority rule applied to each local group. To follow the time evolution of the truth support, Eq. (4) is iterated again and again. A monotonic flow is obtained towards either one of two stable fixed points  $P_0 = 0$  and  $P_1 = 1$ . The flow and its direction are produced by an unstable fixed point  $P_K$  located between  $P_0$  and  $P_1$ . Its value depends on both the  $\{a_i\}$  and  $L$ . We denote it the Killing Point.

For  $P_+(t) < P_K$  it exists a number  $n$  such that  $P_+(t+n) = P_0 = 0$  while for  $P_+(t) > P_K$  it is another number  $m$  which yields  $P_+(t+m) = P_1 = 1$ . It is either a “Big Yes” to the truth at  $P_1 = 1$  or a “Big No” to it at  $P_0 = 0$ . Both  $n$  and  $m$  measure the required time at reaching a stable and final public opinion. Their values depend on the  $\{a_i\}$ ,  $L$  and the initial value  $P_+(t)$ . Accordingly, public opinion is found to be non volatile. It stabilizes rather quickly ( $n$  and  $m$  are usually small numbers) to a clear stand towards the issue at stake.

## 4 Quantitative illustration

Figure 2 shows the variation of  $P_+(t+1)$  as function of  $P_+(t)$  for one particular sets of the  $\{a_i\}$  with  $a_1 = 0$ ,  $a_2 = a_3 = a_4 = 1/3$  and  $a_5 = \dots = a_L = 0$ . There  $P_K = 0.847$  which puts the required initial support to the truth to survive the public debate, at a such very high value of more than 85%. Simultaneously an initial minority above 15% to support the untruth is enough to produce a final total blindness towards the truth. It is a very strong reversing anti-democratic dynamics of opinion although made quite democratically.

To be more quantitative in above self-blinding dynamics let us consider above ratio setting with an initial  $P_+(t) = 0.80$  at time  $t$ . The associated series in time is  $P_+(t+1) = 0.78$ ,  $P_+(t+2) = 0.77$ ,  $P_+(t+3) = 0.73$ ,  $P_+(t+4) = 0.69$ ,  $P_+(t+5) = 0.63$ ,  $P_+(t+6) = 0.54$ ,  $P_+(t+7) = 0.41$ ,

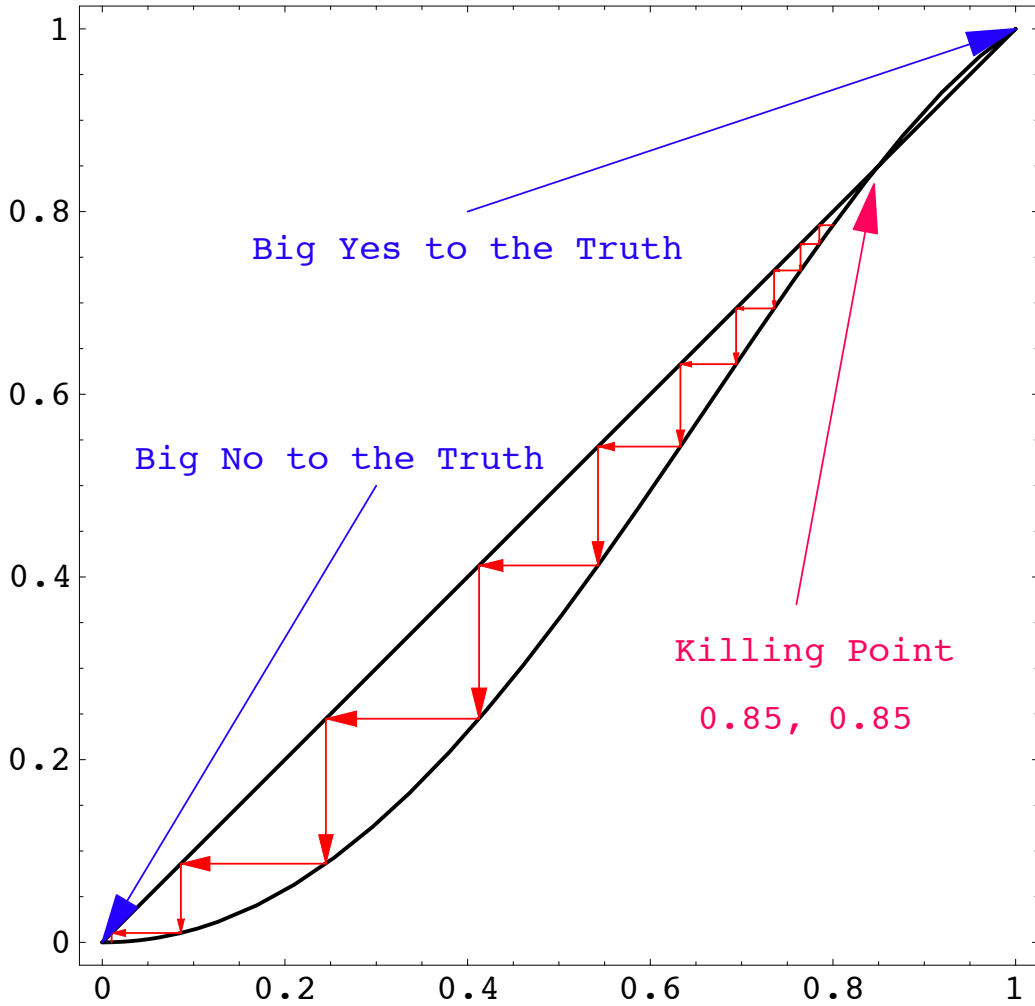


Figure 2: Variation of  $P_+(t+1)$  as function of  $P_+(t)$  for the set  $a_1 = 0$ ,  $a_2 = a_3 = a_4 = \frac{1}{3}$  and  $a_5 = \dots = a_L = 0$ . There  $P_K = 0.847$ . Arrows show the direction of the flow.

$P_+(t+8) = 0.25$ ,  $P_+(t+9) = 0.09$ ,  $P_+(t+10) = 0.01$  and eventually  $P_+(t+11) = 0.00$ . Eleven cycles of social local discussions have been enough to turn an initial 80% of the population supporting the truth, toward an adhesion to the untruth. They just merge quietly and freely with the initial 20% of people who first believed to the untruth. Taking a basis of one discussion a day on average, less than two weeks are enough to a total crystallization of the lie against the obvious truth. Moreover a majority favoring the lie is obtained already within six days.

Changing a bit the parameters will change both the Killing Point value and the number of discussion cycles but yet preserving the basic asymmetry and velocity of the process. Figure 3 shows the number of required discussion cycles to get an initial 30% of layers to turn along their lie the 70% of the population who first was convinced of the truth.

## 5 Conclusion

At this stage it is worth to stress that in real life situations not every person is open to a mind change. Some fractions of the population will keep on their opinion whatever happens. Including this effect in the model will not change qualitatively the results. It will make the polarization process not total with the two stable fixed points shifted towards respectively larger and smaller values than zero and one.

It is also of interest to note that the doubting local state can yield on the opposite view. For instance in the case of England, with a reversed cultural skew towards America, it is the twenty percent of the lie supporters which would have join in the initial majority of truth supporters, if the debate would had been initiated.

Obviously, in reality, not every French person shares the skeptical American feeling we mentioned, and everyone does not change opinion with each social meeting. But at the same time, a rumor does not need to reach hundred percent of the population to become dangerous. In addition, other choices of ratios, for the proportions of the various sizes of the social meetings, would give other figures, but the tendency to self-propagation of the lie would remain the same as long as the initial minority exceeds a certain value threshold which is nevertheless always low in particular due to the existence of pair meetings.

We have revealed here tendencies in the dynamics of forming opinion,

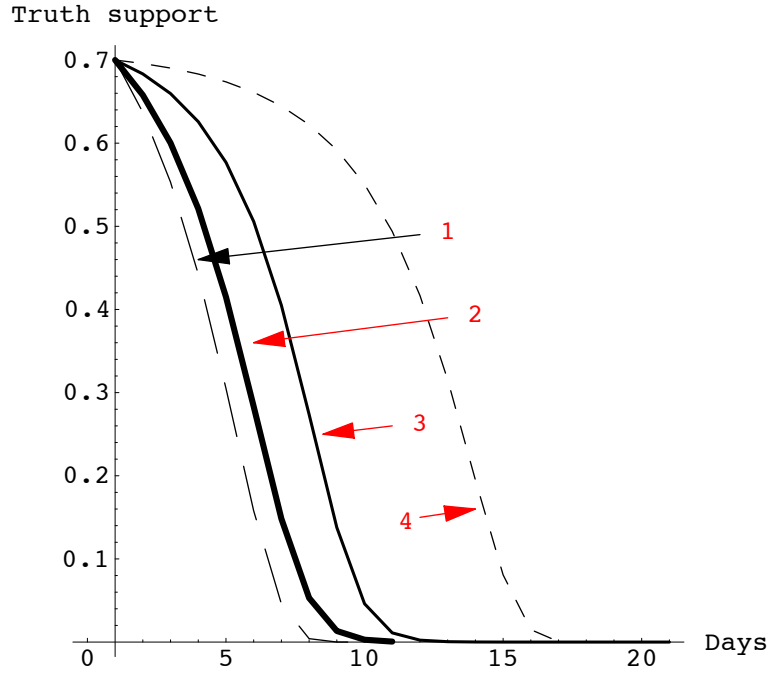


Figure 3: Variation  $P_+(t)$  as function of successive days with  $L = 6$ . The initial value at  $t = 1$  is  $P_+(1) = 0.70$ . Long dashed line (1):  $a_1 = 0$ ,  $a_2 = \frac{1}{2}$ ,  $a_3 = \frac{1}{2}$ ,  $a_4 = a_5 = a_6 = 0$  with  $P_K = 1$ . Heavy thick line (2):  $a_1 = 0.2$ ,  $a_2 = 0.3$ ,  $a_3 = 0.2$ ,  $a_4 = 0.2$ ,  $a_5 = 0.1$  and  $a_6 = 0$  with  $P_K = 0.85$ . Other line (3):  $a_1 = a_2 = a_3 = a_4 = 0.2$ ,  $a_5 = a_6 = 0.1$ . There  $P_K = 0.74$ . Dashed line (4):  $a_1 = 0$ ,  $a_2 = 0.3$ ,  $a_3 = 0.7$ ,  $a_4 = a_5 = a_6 = 0$  with  $P_K = 0.71$ .

and not an exact quantitative determination of any data. It is the phenomenon itself, which must challenge us, more than the figures themselves. We have shown how individual choices, hold from repeated open discussions with friends and colleagues make the collective public opinion to align rather quickly along some social paradigm hidden a priori commonly shared by the group.

It can be instrumental to note that once launched, such a rumor propagation can be stopped by non compromise institutional interventions. In the example we took, it has been the solid and firm intervention of most newspaper leader-editorialists, which put an end to the process of reversing an obvious truth. In the case of the Holocaust deniers, it is the law which made it.

In conclusion, when a rumor starts to develop, it shows the existence at a majority of people of a cultural skewed a priori in the direction that underlies the rumor. Therefore to avoid wrong and dangerous decisions, it is of a central importance to question the apparent good sense of the social democratic debate. In particular to keep in mind the illusionary character of an individual choice driven from open discussions, can reveal essential in preserving a country from collective misbehavior. The model may generalize to a large spectrum of past rumors which did happened in various countries in the world.

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