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Abstract

Why do groups of even well-educated individuals sometimes persistently believe in political myths and ideologies? We follow cognition psychology in its finding that individuals sometimes stick with intuitive but false propositions. We also follow Kahneman, however, in maintaining that they challenge their intuition when the consequences for their individual wealth are sufficiently high. We embed these propositions into a model that determines the conditions of a *myth equilibrium*, in which almost all individuals stick with ex-post rationalization to justify their initial intuition, or a *truth equilibrium* in which all individuals pursue ex-ante reasoning that aims to get as close to the truth as possible. We show why myths are clustered around certain groups and why groups are more likely to stick with political myths than individuals, thus disproving Condorcet's jury theorem.

JEL-Codes: D72; D83; D91
Keywords: Cognition; Ideology; Rational Ignorance

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1 Introduction

People sometimes believe in weird things, even if they are well educated and smart. Some people believe in bloodthirsty dictators to be their savior, some believe in hair-raising political ideas or ideologies. Some religious fundamentalists deny well-established research results like the theory of evolution; and groups like the "young-earth creationists" are even certain that the earth can't possibly be older than 10,000 years. Some parents whose children suffer from cancer forego modern medicine and opt for homeopathic treatments or alternative medicine. Many of these parents deny desperately needed medical assistance since they believe that "academic medicine" is the ultimate cause of their children's health problems. Similar, but a bit less clear-cut, are the many people who believe that protectionism and trade wars support the welfare of their country or that of some other countries or regions.

What most of these people have in common is a fundamental suspicion of relatively well-established results of academic research. And some of the most outspoken of these doubters have been remarkably successful in denouncing the "academic mainstream" as driven by ideology or conspiracy.

However, as long as we follow Karl Popper's (2005) verdict that even the most advanced wisdom rests on little more than academic guesses, nobody can be ultimately certain that it is not he who believes in weird things. At the same time, modern methodology has developed criteria to help distinguish propositions that do at least meet the standards of academic guesses in Popper's sense from those that do not. Moreover, if we have two or more different and mutually excluding propositions, then at least one must definitely be false, possibly all of them.

Far less pronounced than weird beliefs are the disputes between opposing

academic schools, like Keynesians and Monetarists between the 1960s and the 1980s, or, during the same time frame, those between the Harvard School and the Chicago School in the theory of competition. There are indeed numerous cases where even particularly well-educated people and academics form groups based only on a shared belief in certain concepts, ideas, or simply the admiration of a presumably seminal contribution by the respective school's intellectual founding father.

Many scholars from political sciences, political economy and political philosophy have found public decision-making to be particularly prone to political myths due to a poorly informed public. But while it is one thing for individual participants in public decisions to be poorly informed, it is another thing to claim that these decisions are systematically biased toward some political or economic myth. Indeed, a bias in decision making requires more than just poor information.

Given the universe's infinite scope of mysteries on the one hand and human's finite knowledge on the other, we should not be surprised that individuals sometimes come up with ideas that appear hardly comprehensible to others. To a certain extent, these weird ideas are even essential, as some eventually turn out to be ground-breaking innovations. What is puzzling, however, are two things. First, some ideas that have been long debunked by any serious methodological standard still tend to persist among at least some groups of individuals, and frequently against all evidence. Some examples are the idea that any vaccination weakens the human body's defenses, that globules—and hence water—heal the human body, that the earth is only 10,000 years old, that humans never landed on the moon, or that trade cannot possibly improve the welfare of all participating countries, particularly so if one country is rich and the other poor. Second, and perhaps even more astounding, is

that we frequently observe some of these ideas to cluster around groups, and, sometimes particularly so, in academic circles. If errors in reasoning could simply be explained by a lack of information, possibly combined with some individual characteristics of those who stick with a certain idea, then we should find these ideas to be randomly distributed across the relevant population but not clustered by regions, peer groups, or schools.

In this paper, we aim to help explain two puzzles: We first explain why, once they are established, political myths tend to be persistent over time, sometimes among well-educated and smart people, even against striking evidence. Second, we explain why political myths are clustered around geographical regions, peer groups, or academic circles. Although we assume human beings to be capable of rational ex-ante reasoning, at least to a certain extent, we concede that they are in some circumstances susceptible to systematic reasoning errors as have been described in cognition psychology. These errors might, then, be the starting point of certain political myths. We also adopt the insight that human beings tend to take these induced false intuitions at face value and, henceforth, invest their brainpower into justifying an unquestioned intuition rather than challenging it with the aim of finding the "truth".

We then present experimental evidence on Wason's (1960) famous "selection-task problem" which suggests that individuals, while being prone to systematic reasoning errors, have nevertheless a certain capacity to deliberately allocate scarce time into either justifying a given intuition or challenging it in order to come closer to the truth. Our main hypothesis, then, is that the underlying time-allocation decision is subject to incentives to which individuals respond in a rather rational way. On this basis, we build a model that captures the dynamics of interactions among groups of individuals character-

ized in the described fashion. The implications of these dynamics explain, in our view, both the persistence of political myths and the clustering of those individuals that believe in them. Finally, we demonstrate that we should expect public decisions to be more vulnerable to being driven by persistent political myths than purely private decisions, which is an important implication for public policy.

2 A Brief Overview of the Literature

Our theory is related to different subsets of literature. The literature on information cascades assumes that individuals generate information through the mutual observation of their respective decisions or judgements. The ensuing dynamics can result in different group cultures, but also large-scale collective action like the protests against the Eastern German regime in summer and fall 1989 (Lohmann 1993, 1994). As explained by Bikhchandani, Hirshleifer, and Welch (1992), information cascades can explain "fads, fashion, custom, and cultural change". In this context, Banerjee (1992) presents a model of herd behavior, in that rational individuals observe the decisions of previous decision makers and exploit them as informative signals. Note, though, that information cascades do not need to result in political myths; rather, they may also serve as an instrument for disseminating true but not broadly perceived facts. A somewhat different approach is taken by Saint-Paul (2010). He analyzes the dynamic of self-selection into public employment for the inter-generational survival of anti-market prejudices within a population.

Regarding public decision-making, the topics of political myths and systematic information bias have been discussed even from the early contributions

by Duncan Black (1948). Anthony Downs (1957a, 1957b) noticed that voters have no incentive to become informed because a single voter's decision has almost no chance of being pivotal. But as early as in the 18th century, Condorcet (1785) demonstrated that lack of information is not necessarily a problem. In his famous jury theorem, he demonstrated that even the collective choice of poorly informed voters can, under certain circumstances, be expected to converge to the outcome of a collective choice by perfectly informed voters. More recently, Converse (1990) as well as Hong, Page, et al. (2001) presented models that come to the same result on somewhat different assumptions (see also Surowiecki 2004). Ladha (1992) demonstrates that Condorcet's jury theorem holds at least in large groups under relatively general conditions.

As far as the jury theorem or similar approaches do indeed hold, rational ignorance alone cannot explain public decisions based on irrational political myths; thus, when political myths are apparent, there must be some further causes of information bias. Numerous authors have tried to identify such causes.[1] Kliemt (1986) first used the term of a "veil of insignificance", which describes that voters have an incentive to abstract from their private interest in an environment where their votes are unlikely to matter. The veil of insignificance shifts voters' attention away from their private interest, since the low probability of casting a pivotal vote leaves them with literally no hope that their vote could translate into any political change. This general idea goes back further, however, from a paper by Tullock (1971), who hypothesizes that the insignificance of an individual vote changes the main argument in the utility function. As a result, voting loses its instrumental character and turns into an expressive act in which a voter aims to demonstrate his values rather than to seriously impact policy outcomes. When voters shift to

1. See Brennan (2016) for an extensive overview.

expressive rather than instrumental voting, Kirchgässner (1992) and Brennan and Lomasky (1993) tend to see a welfare-enhancing potential, but Tullock (1971) and Hillman (2010) are skeptical that welfare effects dominate.

However, if one were to evaluate this on normative grounds, one aspect of importance is that the veil of insignificance alone does not give voters false beliefs but merely shifts the motivation behind their vote and hence the point of view they express in public. What an individual believes is a different question still. In contrast to this sentiment, Caplan (2007) hypothesizes that voters do indeed change their beliefs in an environment of insignificant individual votes. This hypothesis rests on a presumed "demand for irrationality" in the form of some myth that fits one's personal values and is insofar superior to competing propositions that might be closer to reality but are presumably more remote from their values. Since voters deliberately demand irrational conceptions, Caplan refers to this behavior as "rational irrationality". Based on the assumption of a demand for irrationality, Bénabou (2008, 2013) and Bénabou and Tirole (2016) have developed models that offer a rich set of empirical implications.

Theories that assume actors rationally choose among partly irrational options aim to reconcile rational choice with the irrationality of the chosen options. In doing so, however, they must assume that actors are aware of the irrationality of some choice. In Hillman's (2010) and Tullock's (1971) assessment, the actors' motivation is simply opportunism: They publicly and visibly choose an irrational policy option that they believe their fellow citizens view as ethically superior. In Caplan's (2007) and Benabou's (2013) theories, by contrast, the actors do not just pretend to wish an irrational policy option to be realized, but they really want it.

As the latter is not entirely convincing, we follow a slightly different path

in our model. We assume that there exists some "minimum irrationality" of actors, based on the observation that human beings are at times subject to systematic errors in reasoning. But, we leave it as a minimum of irrationality, since we assume the actors to be both capable of and willing to reduce the extent of such reasoning errors if there is a sufficiently strong incentive to do so. In this regard, our theory is close to that by Schnellenbach (2004, 2005), who bases his theory on two assumptions, namely satisficing behavior and the existence of information costs.

We start with the *selection-task problem* as it arises in the canonical four-card experiment by cognition psychologist Peter C. Wason (1966). We then base our analysis on the distinction between two types of cognition processes similar to those suggested by Wason and Evans (1974) as well as by Stanovich (2011) and Kahneman (2011).[2] We use this distinction to construct a model of mass behavior in the tradition of those introduced by Granovetter (1978) and Schelling (1978) and refined to the theory of preference falsification by Kuran (1989, 1997).

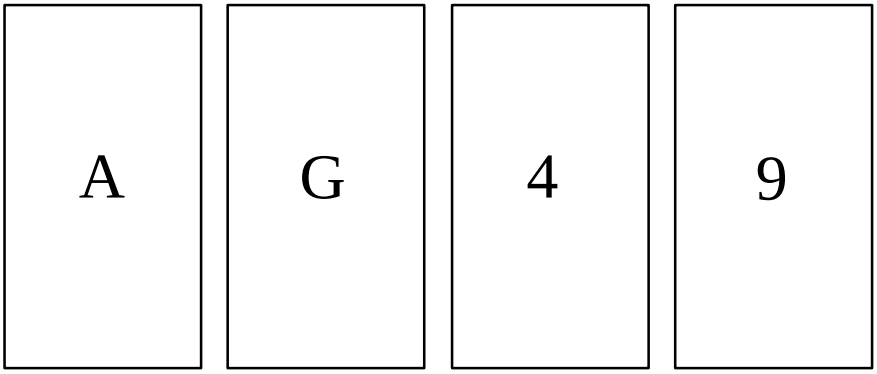
3 Dual Reasoning and Time Allocation

In one of the numerous variants of Wason's selection-task problem, four cards are presented to participants, who are informed that each card shows a letter on one side and a number on the other. An example is given in Figure 1.

The participants are then informed that the letters and numbers printed on the cards follow this rule: If a vowel is one side of the card, then an even number is on the other side. The participants' task is to name those and

2. For an overview of dual-process theories, see Frankish (2010).

Figure 1: Wason's Four Cards



only those cards that must be turned in order to prove the rule. In the case of figure 1, the correct answer is that card "A" and card "9" must be turned over and no others. In general terms, the correct solution to the selection-task problem is derived as follows: Consider two states P and Q. Then a statement "if P then Q" implies a second statement which goes "if $\neg Q$ then $\neg P$". From the first statement it follows that card "A" must be turned, since A is a vowel and if there is a vowel on one side there must be an even number on the other—otherwise the general rule would be violated. The second statement requires card "9" to be turned, since this card does *not* show an even number, and if there is *not* an even number on one side, there must *not* be a vowel on the other side. For the remaining two cards "G" and "4", the two sentences are irrelevant, hence they must not be turned.

In a large number of experiments that have been conducted for numerous variants of the problem, the results are consistent and stable: Only around 10 to 12 percent of the participants find the correct answer, which implies that some 90 percent fail to do so (Wason 1968, 1969; Johnson-Laird and

Wason 1977). The two logical errors are to derive "if $\neg P$ then $\neg Q$" from "if P then Q", which is called "denial of the antecedent fallacy"; or to derive "if Q then P" from "if P then Q", which is referred to as the "affirmation of the consequent fallacy" (Wason 1968). The latter occurs more frequently than the former, and this is of particular interest. In abstract terms, individuals tend to believe that the statement "if P then Q" implies the statement "if Q then P", which is wrong. But they would never conclude that the statement "all monkeys are animals" implies "all animals are monkey" although both pairs of statements are logically identical. Political decisions, and perhaps particularly those in public economics, are sometimes quite abstract, so that their potential for trapping individuals in false beliefs is obviously substantial.

Note that both fallacies occur in a systematic manner and, as such, represent some sort of a "hardware error" of the human brain—at least from economists' point of view who are used to working with rational-choice models. The selection-task problem along with numerous other experiments shows, however, that human beings fail in logical reasoning on a more or less regular basis. If so, they usually follow some first intuition that systematically misleads them and presumably diverts them from optimal decisions.

Evans and Wason (1976) suggest two kinds of interrelated thought processes. The "Type 1" process underlies the selection of potentially relevant information and it leads to the choice among options in a given situation—e.g. what cards shall I turn? The authors claim that the Type-1 process runs on a rather subconscious level that is hardly accessible to introspection. The Type-2 process, by contrast, functions as a conscious thought process of rationalizing what was chosen in the Type-1 process. A number of experiments demonstrate that individuals invest considerable effort in the Type-2 process

of ex-post rationalizing the outcome of the much less conscious Type-1 process (Johnson-Laird and Wason 1977; Wason and Evans 1974). As Margolis (1987, 21) put it: "Subjects giving illogical reasons which seemed to justify the (unknown to them) illogical responses were just as confident of their reasoning as subjects giving the right reasons for the right responses (...) [H]uman beings produce rationales they believe account for their judgments. But the rationales (on this argument) are only ex post rationalizations."

These findings have proven to be very robust and are hence established in cognition psychology (Haidt 2012), especially the findings on the Type-2 process of ex-post rationalization. The Type-1 process, however, leaves some room for questions, and for a simple reason: Human beings have proven to be capable not only of rationalizing ex-post, but also—at least to some extent—of understanding the structure of a given problem ex-ante. An obvious example is analyzing the four-card problem with the help of formal logic, as shown above. Humans even discovered that time and space are not fixed but rather a function of the speed of some observer relative to some other one; and, this is entirely against any intuition our brain provides. Hence, there is at least some potential for ex-ante reasoning, and to the extent that this is true, one might ask whether the amount of effort the individual invests in such reasoning is responsive to incentives.

In particular, what if an individual faces a problem as tricky as Wason's four-card problem, but where a wrong answer poses a serious threat to her individual wealth or income? Or, are there any differences in an individual's public and private decision, where both decisions have serious consequences for wealth or income?

These questions were addressed in an experiment performed by Müller and Apolte (2018). In this experiment, four treatment groups of a total of 1031

students in different fields were asked to solve Wason's four-card problem. Depending on the respective group, different levels and structures of rewards were offered for coming up with the correct answer: Members of the first group (called the *control group*) were offered no rewards; including this group was meant to replicate the standard structure of the test as it had been performed by cognition psychologists. Members of the second group (called *individual-low*) were offered a low individual reward of 10 Euro, and those of the third group (called *individual-high*) were offered a high individual reward of 100 Euro. Finally, members of the fourth group (called *diluted*) were informed that they belonged to a group made up of about one-fourth of the total number of study participants and that each member would get an individual reward of 100 Euro if two-thirds of the group members gave the correct answer.

The incentive structure of the fourth group simulated the positive externalities of collective decision-making processes like polls or elections, since a share of two-thirds[3] was necessary for having each individual member rewarded with 100 Euro, no matter whether that particular member of the group gave a correct answer or a wrong answer. Hence, each individual's answer had only a negligible effect on the collective outcome[4] so that members of the fourth group faced an incentive to remain rationally ignorant.

Table 1 gives the results that are of interest here. In the control group, 12.5 percent answered correctly, which matches the outcomes in cognition psychology. Offering a low individual incentive had no influence on the results, as 11.39 percent of participants answered correctly, which was slightly but

3. Two-thirds instead of one-half was taken for mere technical reasons without changing the logic of the incentive structure.

4. In particular, the expected value of the individual effect was as high as the probability of an individual answer to shift the share of correct answers above or below the critical share of two-thirds.

not significantly lower than that of the control group. But, a high incentive of 100 Euro had both a considerable and a statistically significant influence: More than 21 percent of the members of the group "individual-high" solved the problem correctly.

Table 1: Incentives and the Selection Task Problem

treatment group	correct answers in percent
Control	12.50
Individual-Low	11.39
Individual-High	21.31
Diluted	8.46

Source: Müller and Apolte (2018).

Finally, the group that faced diluted collective incentives due to positive externalities performed worst among all groups, even though the individuals could, in principle, each get a reward of 100 Euro. The share of correct answers in this group was only 8.46 percent. This percentage is not significantly different from the control group, where group members were given no incentives. By contrast, the percentage of correct answers in the high-incentive group was more than 2.5 times higher than that of the diluted-incentives group. In brief: High individual incentives raise an individual's effort to find correct answers, but high collective incentives do not.

Note that 100 Euro is still low when it comes to simulating serious implications for individual wealth of a correct or false decision. What is more, although the participants were given as much time as they needed, they took about 20 minutes to perform the entire experiment—and with no outside assistance whatsoever. Thus, we feel safe to assume that for decisions with grave individual consequences to wealth and where individuals have the time and resources to find correct answers, the percentage of correct answers in the high-incentive group should be even more pronounced than what we have

reported here.

These findings are somehow at odds with Evan and Wason's (1974) two-type model of cognition, since that model only allows for (1) a subconscious process of selecting the presumably correct solution and (2) the ex-post rationalization of the selected solution. However, our findings fit better in the definition of dual processes suggested by Stanovich (2011) and Kahneman (2011). These authors distinguish between two systems of cognition: System 1 (or Type 1) runs both intuitively and effortlessly, but it is susceptible to systematic errors (Tversky and Kahneman 1974). By contrast, System 2 (Type 2) is based on some sort of rational deliberation; it requires effort but it is less prone to systematic errors.

As Kahneman (2011, 24) puts it: "When System 1 runs into difficulty, it calls on System 2 to support more detailed and specific processing that may solve the problem of the moment." But since System 2 requires effort, the default is always System 1: "[C]ontinuous vigilance is not necessarily good, and it is certainly impractical. Constantly questioning our own thinking would be impossibly tedious. [...] The best we can do is a compromise: learn to recognize situations in which mistakes are likely and try harder to avoid significant mistakes when the stakes are high." (28).

Note that both Evan and Wason's Type 1 process and Kahneman's System 1 are nothing an individual would need to economize on, since they run effortlessly. This is why we do not explicitly model them in the remainder of this paper. Rather, we distinguish between a process of *ex-ante reasoning* and a process of *ex-post rationalizing*. Ex-ante reasoning is akin to Kahneman's System 2, while ex-post rationalizing is akin to Evan and Wason's Type 2 process of reasoning. Both of these processes require effort. Given limited resources, individuals thus need to decide whether they want to rely on Sys-

tem 1 or, for that matter, Type 1 and invest a given amount of time in a process of ex-post rationalizing; or whether they want to rely on System 2 and invest time in a process of ex-ante reasoning.

Two pieces of evidence from the referred studies are of particular relevance for our purposes:

- Individuals are doubtlessly subject to systematic cognitive fallacies. But it appears that they are—at least to a certain extent—capable of detecting potentially tricky structures of problems that might trap them in expensive incorrect decisions. Upon having detected such a structure, they are—again at least to a certain extent—capable of deliberately allocating time and brainpower to the process of ex-ante reasoning rather than into ex-post rationalizing.
- We have striking evidence that the incentives to allocate time and effort into ex-ante reasoning rather than become diluted by way of collective decision-making.

In the following section, we look at the implications of our findings by analyzing the interaction between individuals who allocate scarce resources into either ex-ante reasoning or ex-post rationalizing.

4 The Model

Consider a population of individuals $i \in \{1, 2, ..., N\}$. The individuals are not generally identical, but they share an identical and time-invariant preference order over a particular policy outcome. In each period $t \in \{0, 1, 2, ...\}$, a more or less public (or more or less private) decision over a set $\kappa_t \in \{0, 1\}$ of policy options is due. The policy options are subject to public debate

in each period t, no matter how public or private the individuals' decisions over the options are. Each individual participates in the debates. Of the policy options, one and only one is optimal in the sense that it maximizes the utility of the individuals, given their common preference order. We refer to the optimal policy option as the time-invariant "true value" $\bar{\kappa}$.

Each individual i chooses—in public discussions, polls or simply for herself—a policy option from a set $\kappa_i^t \in \{0, 1\}$ of policy options at each time t. The true value $\bar{\kappa}$ is not *per se* known to any individual, so that no individual can be sure whether the chosen κ_i^t is "true" in the sense that $\kappa_i^t = \bar{\kappa}$.

Initially, each individual forms an opinion on the perceived optimal policy choice κ_I^t based on his intuition. This opinion is effortlessly generated by Kahneman's System 1 and then maintained unless the individual has a reason to challenge the intuition by activating System 2. In any case, the intuitive opinion is identical over all individuals. Since intuition is sometimes correct and sometimes flawed, following one's intuition will in some cases imply $\kappa_I^t = \bar{\kappa}$ and in some other cases $\kappa_I^t = \neg\bar{\kappa}$. The more interesting case for us, of course, is the latter. To that end, we focus on the case $\kappa_I^t \neq \bar{\kappa}$. Note, however, that the individuals have no indication of whether $\kappa_I^t = \bar{\kappa}$ or $\kappa_I^t \neq \bar{\kappa}$ applies.

We now embed the two processes of cognition into our model by considering:

- a process of ex-ante reasoning, defined as maximizing the probability of picking $\kappa_i^t = \bar{\kappa}$ by individual i;
- a process of ex-post rationalizing, defined as constructing justifications for an intuition-based choice $\kappa_i^t = \kappa_I^t$ by individual i.

In each period t, individuals have a certain time budget reserved for investing

in either ex-ante reasoning or ex-post rationalizing. This time budget is normalized to unity. A share s^t of the population allocates its entire time into ex-ante reasoning, and a share $1-s^t$ allocates its entire time into ex-post rationalizing. Allocating time into ex-ante reasoning raises the probability that an individual will pick the correct option $\kappa_i^t = \bar{\kappa}$. We refer to that probability as K_i^t for each individual i at time t. For reasons of simplicity, we assume full depreciation of knowledge within one period.

Depending on individually variable characteristics, K_i^t creates "reasoning utility" because a higher probability of gaining the truth enables an individual to make a better decision but also because having more and more reliable information may have some intrinsic value. Both apply to a different extent to different individuals in different situations.

By contrast, allocating time into ex-post rationalizing creates empirical facts and theoretical rationales that ostensibly support the intuition κ_I^t. This generates "confirmation utility" L_i^t. Confirmation utility also applies to a different extent to different individuals. Investing scarce time into finding theoretical as well as empirical support for a given intuition rather than investing scarce time into challenging the intuition might enhance one's personal reputation within a peer group of individuals that chose the same policy option. Moreover, it may—in a similar way—be supportive to one's career; and it may even be related to some collective morale to not question a certain intuition, particularly so if some further rules of conduct are directly derived from the acceptance of a prevailing intuition if that intuition is the basis of a conduct-coordinating myth.

Note that investing in confirmation utility does *not* mean that an individual denies a known truth in favor of some "alternative facts" which they know to be most probably or even certainly wrong. This distinguishes our approach

from Caplan's (2007) as well as from the theory of ideology by Bénabou (2008, 2013) who explicitly follows Caplan's assumptions (Bénabou 2008, 327). Rather, individuals in our approach sometimes follow a given intuition that presumably explains the issue or phenomenon at hand. Indeed, we all follow a more or less huge number of given intuitions, simply because scarce time resources make it impossible to thoroughly inspect each of them. Hence, time scarcity forces each of us to pick but a limited number of intuitions to inspect more closely (Kahneman 2011). As long as there exists positive confirmation utility, individuals must decide how to allocate scarce time either to finding supportive facts for an intuition that we do not inspect any further; or, alternatively, to challenging the intuition with the aim of finding an explanation that outperforms the given intuition in terms of its probability of being the truth.

As a result, our individuals are not purely rational, since we concede that they are vulnerable to falling victim to typical cognition errors like that of the selection-task problem. But they are still rational in that they economize on their scarce time and hence challenge only those intuitions for which a closer inspection promises sufficiently high rewards. Doing so can encourage the individual to rationally stick with an intuition and use their scarce time resources to construct a life around it, or it can just as well encourage the individual to challenge the intuition. Whichever decision is optimal for an individual depends both on the respective individual's preferences and on the respective personal, professional and institutional circumstances around the individual.[5]

In this sense, we now define the following additive separable utility function of individual i:

5. Similar ideas have been introduced by Schnellenbach (2004, 2005) and Facchini (2016).

$$U_i^t = K_i^t + \gamma_i L_i^t. \tag{1}$$

The following constraint on their time budget applies in each period t and for each individual i:

$$\tau_{Ki}^t + \tau_{Li}^t = 1, \tag{2}$$

where τ_{Ki}^t is time designated for ex-ante reasoning and τ_{Li}^t time designated for ex-post rationalizing. The coefficient γ_i is an individual-specific measure of the extent to which an investment into ex-ante rationalization adds to total utility relative to an investment into ex-ante reasoning.

We need to delve slightly deeper into the process of ex-post reasoning. As such, we assume that a certain stock of expert knowledge $\bar{\kappa}_E$ exists. We indicate the publicly perceived quality of this expert knowledge by the probability $\bar{K}_E^t \in (0, 1)$ of $\kappa_E = \bar{\kappa}$. We might think of the expert knowledge as the academic state of the art in the respective field. The expert knowledge is initially not known by the individuals i, nor does it influence any public decisions unless it is activated by an individual through investment into ex-ante reasoning.

However, the utility of ex-ante reasoning can be associated with considerable positive externalities, particularly in the case of public decision making. In the case of polls or elections, each individual that allocates time into ex-ante reasoning enhances the probability of a "correct" decision to the extent of her probability to be the pivotal voter—which is usually quite low. Polls and elections are thus the most clear-cut cases of the positive externalities in a process of ex-ante reasoning. However, interactions between individuals, for

example in terms of discussions on public policy and the like, imply positive externalities as well. We capture the externality by a variable $\alpha \in (0,1)$ and combine the prevailing expert knowledge with the externality to the following description of the process of ex-ante reasoning:

$$K_i^t(\tau_{Ki}^t) = (\alpha\tau_{Ki}^t + (1-\alpha)\tau_{Kj\neq i}^t)\bar{K}_E^t. \tag{3}$$

Finally, remember that investment in ex-post rationalizing a prevailing intuition yields utility mainly for reasons of reputation and, hence, need to be observed by members of the investor's peer group. As long as we do not divide the entire population into groups, our peer group consists of all N members of the population. We hence assume that reputation utility from investing in L_i^t yields the more utility the higher the share of individuals in the population that also stick with the intuition. For that matter, we assume a commonly held perception $1 - s^{t*}$ of how many people are of the intuitive opinion. Utility from ex-post rationalizing is hence described by:

$$L_i^t(\tau_{Li}^t) = (1 - s^{t*})\tau_{Li}^t \qquad . \tag{4}$$

Inserting equations 3 and 4 into equation 1 yields:

$$U_i^t = (\alpha\tau_{Ki}^t + (1-\alpha)\tau_{Kj\neq i}^t)\bar{K}_E^t + (1 - s^{t*})\gamma_i\tau_{Li}^t. \tag{5}$$

The individual maximizes U_i^t subject to the time-budget restriction 2 and finds the optimal time allocation $(\tau_{Ki}^{t*}; \tau_{Li}^{t*})$ given by:

$$\tau_{Ki}^{t*} = \begin{cases} 0 \;\; if \;\; \alpha \bar{K}_E^t \leqslant (1 - s^{t*})\gamma_i; \\ 1 \;\; if \;\; \alpha \bar{K}_E^t > (1 - s^{t*})\gamma_i; \end{cases} \quad and : \tau_{Li}^{t*} = 1 - \tau_{Ki}^{t*}. \tag{6}$$

Two determinants are key: the degree α of the externality and the expected share s^{t*} of fellow citizens that invest time in process 2. Note that the externality rises as the value of α drops. Hence, the likelihood of an individual to invest in ex-ante reasoning rises as the externality drops and as the perceived share of individuals that stick with the intuition drops. Hence, the more "public" a policy issue is and the more people are expected to follow the prevailing intuition rather than trying to challenge it by a process of ex-ante reasoning, the more likely it is that an individual invests in ex-post rationalization.

In order to explore the dynamics of our model, we summarize the implications of the weighting factor γ_i. It represents the inter-individually varying effects on utility of:

- intrinsically motivated truth seeking;
- appropriate individual as well as collective choices;
- enhancing one's own reputation by contributing to the legitimization of a prevailing intuition.

Note that the first two aspects lower γ_i while the latter raises it. We assume γ_i to be normally distributed across the individuals in N as described by the following cumulative distribution function:

$$s(\gamma) = \frac{1}{1 + \frac{1}{e^{\sigma(\gamma - \bar{\gamma})}}}, \tag{7}$$

where $\bar{\gamma}$ is the mean of the individual γ-values and σ is their variance. Solving the distribution function 7 for γ and inserting the result into the utility function 5 yields:

$$U^t = (\alpha\tau^t_{Ki} + (1-\alpha)\tau^t_{Kj\neq j})\bar{K}^t_E + (1-s^*)\left[\frac{ln(\frac{s}{1-s})}{\sigma} + \bar{\gamma}\right](1-\tau^t_{Ki}). \quad (8)$$

By deriving this with respect to τ^t_{Ki}, we find the first-order condition for an optimal time allocation $(\tau^{t*}_{Ki}; \tau^{t*}_{Li})$. Solving this condition for s leads to the following "threshold function":

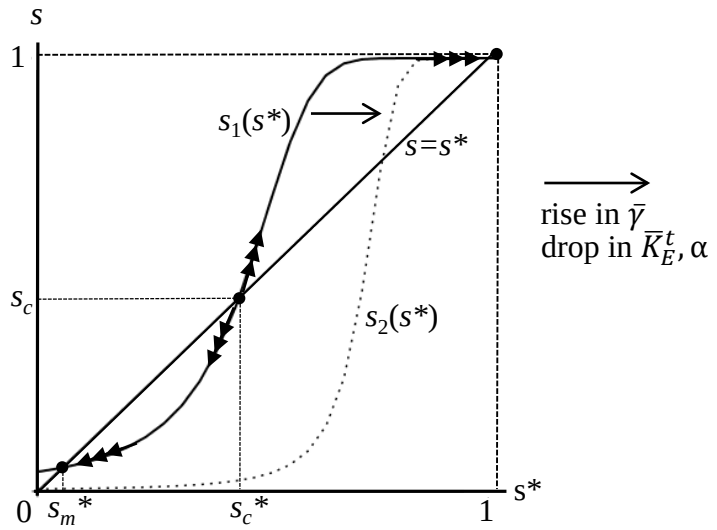
$$s(s^*) = \frac{e^x}{1+e^x} \quad with: \quad x := \frac{\sigma(\alpha\bar{K}^t_E - (1-s^*)\bar{\gamma})}{1-s^*}. \quad (9)$$

A steady-state equilibrium is defined by expectation consistency and hence by $s = s^* = s^e$. Intersections of the line $s_1(s^*)$ with the line $s = s^*$ in Figure 2 represent such steady-state equilibria. There are two dynamically stable equilibria: one at a point close to zero and another at $s = s^* = 1$. We refer to the former as the "myth equilibrium" and to the latter as the "truth equilibrium".[6] A third but dynamically unstable equilibrium is in between the myth equilibrium and the truth equilibrium.

The dynamic of the model is a variant of threshold models of mass behavior (Granovetter 1978; Kuran 1989; Marwell and Oliver 1993). The central characteristic of threshold models is a chain reaction of individual strategy change: Upon having reached a certain level of perception, one individual after another switches from her previous pattern of behavior to its antipode. In our case, when the perceived share of citizens that pursue a strategy of

6. Due to $s(s^* = 0) > 0$ as well as $s(s^* = 1) = 1$, the myth equilibrium is at a point $s = s^* > 0$ and hence close to zero, whereas the truth equilibrium is precisely at $s = s^* = 1$.

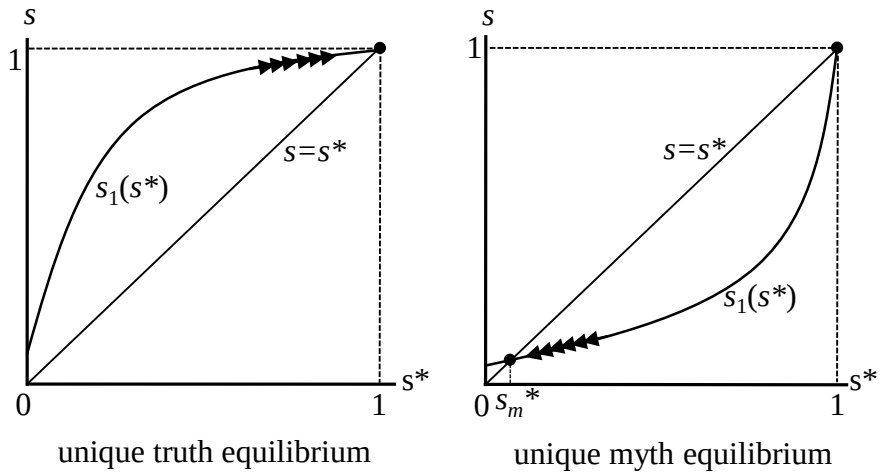
Figure 2: Multi Equilibrium



ex-ante reasoning is above the "critical level" s_c^* of s^*, this induces further citizens to switch from the strategy of ex-post rationalizing to ex-ante reasoning. This process continues until $s = s^* = 1$ is reached and the truth equilibrium is reached. By the same token, however, any share s below the critical share s_c^* will induce further citizens to switch from ex-ante reasoning to ex-post rationalizing until the myth equilibrium is reached at point s_m^*.

Shifts in $\bar{\gamma}$, $\bar{K}_E^t$, or α shift the line $s(s^*)$ outwards or inwards, for example from $s_1(s^*)$ to $s_2(s^*)$ in Figure 2. Hence, the critical value s_c^* shifts too. There are two limiting cases. In one limiting case, s_c^* shifts all the way to $s_c^* = 1$, so that only the truth equilibrium survives. We refer to this limiting case as the *unique truth equilibrium*. In the other limiting case, s_c^* shifts all the way into the myth equilibrium at s_m^*. We refer to this equilibrium as the *unique myth equilibrium*. The left-hand side of Figure 3 depicts a unique truth equilibrium, whereas the right-hand side depicts a unique myth equilibrium.

Figure 3: Truth and Myth Equilibrium



Since any process of cognition starts with an intuition that might only later be subject to some critical evaluation, we always start in a myth equilibrium for any new policy issue for which no one has yet invested in ex-ante reasoning. Hence, only in the limiting case of a unique truth equilibrium will a society realize a truth equilibrium right away. In the opposite extreme case, a society will never be able to realize a truth equilibrium. Here, only very few people see any reason to challenge the intuition and, hence, to invest in ex-ante reasoning, so that the society remains trapped in a unique myth equilibrium.

Apart from these limiting cases, a society will stay in a stable myth equilibrium unless a share of at least s_c^* of the population is perceived to invest in ex-ante reasoning. Starting from a myth equilibrium, however, this will never happen unless we allow for some stochastic shock Δs^* that happens to be as large as $\Delta s^* > s_c^* - s_m^*$. As an example of such shocks, we may think of the sudden collapse of an ideological dictatorship, possibly caused by a lost war.

Let us allow for such a stochastic shock Δs^* that exceeds $s_c^* - s_m^*$ with probability ρ. Since the parameters $\bar{K}_E^t$, γ and α determine the critical value s_c^* from which the system switches from a myth equilibrium to a truth equilibrium, we have that ρ is a function $\rho(\bar{K}_E^t, \bar{\gamma}, \alpha)$ with $\rho'(\bar{K}_E^t, \bar{\gamma}) > 0$ and $\rho'(\alpha) < 0$. Note that $\rho = 1$ in a truth equilibrium and $\rho = 0$ in a myth equilibrium. With these definitions, we reach at two central findings of our model:

- While new insights into the public policy issue at hand—i.e. from social sciences or economics—raise the probability $\bar{K}_E^t$ of the scholarly state of the art to match the truth $\bar{\kappa}$, this may long remain unnoticed or refused in public policy discourses. New insights shift the critical value s_c^* but that does not challenge an existing myth equilibrium unless either the shift is associated with a stochastic shock $\Delta s^* > s_c^* - s_m^*$ or the shift is strong enough to establish a unique truth equilibrium. Note, however, that a shift to the unique truth equilibrium may never happen since it requires correspondingly high values of $\bar{\gamma}$ and α. This finding implies that policy measures based on new insights face considerable if not insurmountable degrees of inertia hindering their implementation. This is particularly true in the case of new insights that contradict some strong but misleading intuitions.

- A high-quality state of the art of insight into a particular public policy problem, indicated by a high probability $\bar{K}_E^t$, may remain unnoticed or subject to refusal in public policy discourse when strong externalities exist for ex-ante reasoning processes, resulting in low values of α. With low values of α, individual investments of time into ex-ante reasoning get dispersed to an extent that it makes them unreasonable for each individual no matter how reasonable they may be for the society as a

whole.

These results suggest that a once-established myth equilibrium is quite robust against changes in central parameters, which implies a theoretical rejection of Condorcet's jury theorem. Apart from the initial formation of misleading intuitions, though, this rejection neither requires pure irrationality, nor does it require "rational irrationality" as hypothesized by Caplan (2007). The reason is because in an established myth equilibrium, even the smartest and best-educated individuals simply see no reason for switching to truth-seeking investments. By contrast, they may see much reason for investing time and effort in ex-post rationalizing their given intuition and thus legitimizing its policy implications. They are indeed rationally ignorant, but Condorcet's jury theorem does not apply, resulting in inefficient policy choices. Not being aware that they are making inefficient policy choices, the individuals do the best they can to provide evidence for the "truth" of an option $\kappa_i^t = \neg\bar{\kappa}$; further, we have no reason to doubt that they will base their effort on considerable knowledge and brainpower. Although they are smart, well educated, and admirably articulate, they will have not even considered that their intuition κ_i^t is plain wrong.

5 Multiple Peer Groups

In the model presented, a population can either remain almost entirely trapped in some misleading intuition about the efficient policy option for a given issue, or it can challenge the intuition in favor of the policy option that is most probably efficient. We observe, however, that there are differences according to regions, subgroups of a population, and the like. Moreover, we observe that people stemming from different regions or belonging to different

groups believe in very different ideas over efficient policy options. We hence have diversity across regions and groups and we have diversity in the different ideas. We can account for this diversity by slightly extending the scope of our model.

Consider a number P of subgroups in the society's population, of which each group $p \in \{1, 2, ..., P\}$ comprises N_p members $i \in \{1, 2, ...N_P\}$. All N members of the entire population share the same preference order. Let there be two sets of policy options, namely: κ_r with $r \in \{1, 2, ..., R\}$ and κ_ω with $\omega \in \{1, 2, ..., \Omega\}$. Next, define κ_{ri} as the set of policy options that have intuitive appeal to individual i at time t. Likewise, $\kappa_{\omega i}$ is the set of policy options that have no intuitive appeal to individual i at time t. Hence, the first set consists of those policy options that are intuitively considered as potentially efficient or "true" by individual i at time t, while the second set is not. As in the previous section, policy option $\bar{\kappa}$ may or may not have intuitive appeal and hence be identical to either one element of the first or of the second set. However, we once again focus on the interesting case that $\bar{\kappa} \neq \kappa_{ri}^t \ \forall i, r$, of which, however, the individuals have no indication.

In the case that an individual i chooses to ex-post rationalize a given intuition, it is not clear in advance which of the κ_r^t intuitions that would be. Hence, for those individuals that ex-post rationalize an intuition rather than pursue ex-ante reasoning, we have a share v_r of N_p for each intuition κ_r^t, implying $\sum_r v_r = 1$. As perceived values of the shares v_r, we have v_r^*. Upon following an intuition r in period t, an individual i invests time τ_{ri}^t into ex-post rationalizing that particular intuition. The time budget of each individual is thus:

$$1 = \tau_{Ki}^t + \tau_{ri}^t + \sum_{q \neq r} \tau_{qi}^t. \tag{10}$$

As in the previous section, each individual either invests her entire time into ex-ante reasoning or into one out of R different intuitions. Along with our additional assumptions in this section, we adjust the utility function 5 to:

$$U_i^t = (\alpha\tau_{Ki}^t + (1-\alpha)\tau_{Kj\neq i}^t)\bar{K}_E^t + (1-s^{t*})\gamma_i \sum_r v_r^* \tau_{ri}^t. \tag{11}$$

Maximizing utility function 11 subject to the time-budget constraint 10, we find the first-order condition for τ_{Ki}^t and for τ_{ri}^t to be:

$$\tau_{Ki}^{t*} = \begin{cases} 0 \;\; if \;\; \alpha\bar{K}_E^t \leqslant (1-s^{t*})\gamma_i; \\ 1 \;\; if \;\; \alpha\bar{K}_E^t > (1-s^{t*})\gamma_i. \end{cases} \tag{12}$$

and:

$$\tau_{ri}^{t*} = \begin{cases} 0 \;\; if \;\; \alpha\bar{K}_E^t > (1-s^{t*})\gamma_i; \\ 0 \;\; if \;\; \alpha\bar{K}_E^t > (1-s^{t*})\gamma_i \;\wedge\; v_r \leqslant v_q \;\; \forall q \neq r; \\ 1 \;\; if \;\; \alpha\bar{K}_E^t > (1-s^{t*})\gamma_i \;\wedge\; v_r > v_q \;\; \forall q \neq r. \end{cases} \tag{13}$$

We interpret these conditions as follows: Investing in ex-ante reasoning is a utility-maximizing strategy if and only if the generated utility $\alpha\bar{K}_E^t$ by this strategy exceeds the utility $(1-s^{t*})\gamma_i v_r$ that is generated by a strategy of ex-post rationalizing for even an intuition that is shared by all ex-post rationalizing members of the respective sub-population p, so that $v_r = 1$. Short of $\alpha\bar{K}_E^t > (1-s^{t*})\gamma_i$, hence, individual i will reach her utility maximum

by ex-post rationalizing one of the r different intuitions. Each intuition yields expected utility $(1 - s^{t*})\gamma_i v_r^*$. The intuition r for which $v_r^* > v_q^* \ \forall q^* \neq r^*$ will be the one which yields the highest utility from ex-post rationalizing. Hence, perceived size attracts real size so that the intuition with the highest perceived share of adherents attracts all ex-post rationalizing individuals up until, in a expectation-consistent equilibrium $r = r^*$, we end up at $v_r = 1$.

As a result, there is some natural monopoly for one myth per sub-population N_p. Of course, different sub-populations may end up with the same dominant myth, but this happens by accident, at least in our model. In reality, there might of course be spill-overs between neighboring sub-populations, where neighborhood can be defined along the lines of geography, culture, religion or any other characteristic.

The most important implication of this section is that there can be a multitude of different and even competing myths across countries, regions, and all sorts of peer groups, and for each of which there exists a stable myth equilibrium. Explaining the diversity and persistence of such myths does not require individuals to be irrational or "rationally irrational".

6 Conclusions

We have developed a theory that explains the persistence as well as the diversity of political myths across regions, countries, cultures, or other groups of individuals. We have assumed that individuals act rationally in principle but also that they are characterized by some "minimum irrationality" to the extent that they are sometimes subject to systematic cognition errors and intuitions. These errors lead them to persistently believe in false

explanations of real-world phenomena and policy issues unless they invest time and effort into challenging their first intuitions. Individuals, however, will rationally abstain from challenging their first intuitions unless they see a reason for acting otherwise. We have based this assumption on experimental evidence that suggests individuals invest time and effort into reviewing their first intuition in order to maximize the probability of gaining the truth if, for example, large individual wealth effects are at stake. If, by contrast, there is no such incentive, individuals will not challenge the first intuition and invest time and effort into ex-post rationalizing the intuition instead.

We have then integrated these aspects into a threshold model of mass behavior. This allowed us to isolate the conditions under which the members of a population coordinate on a strategy of ex-ante reasoning that aims at finding the truth or, alternatively, on a strategy of ex-post rationalizing a given and possibly false intuition. We found that false beliefs and political myths can, under certain conditions, survive a process of academic knowledge generation, but they will suddenly disappear when certain parameter values are exceeded or when some exogenous shock changes the perception of the behavior or group members. We also found that the probability that false beliefs will disappear is lower in cases of public decisions than in purely private decisions. Following this finding, we suggest that myths survive longer around public policy decisions than around private decisions; further, this disproves Condorcet's jury theorem. Finally, we have demonstrated that different sub-populations might coordinate on different political myths, thus explaining the diversity of political myths across regions, countries, cultures or other groups.

Although we have focused our attention on myths about appropriate policy measures, our approach can easily be extended to the persistence and

diversity of all sorts of myths, such as beliefs in possibly weird theories, conspiracies, healing practices or the like. The cognition errors that we started with as well as the decisions to allocate time between ex-post rationalization and ex-ante reasoning and the ensuing collective dynamic that we have exemplified by public policy issues all directly apply to all sorts of collective myths and beliefs. In brief, we can even claim that cognition and reasoning do not take place in the mind and psyche of isolated individuals; rather, it seems that they are deeply embedded in intricate social interaction processes.

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