Dinosaur Judges: Conservative Experts in a Changing Society*

Kim-Sau Chung
HKBU

Yujing Xu
HKU

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Abstract

Modern societies thrive on the advices of experts in a garden variety of areas. How do we identify these experts? In circumstances where an expert's track record cannot be easily assessed by the general public, our society relies on peer reviews from "known" experts to identify new experts. This gives rise to an aristocratic expert class that is inevitably conservative. Young scholars, in order to earn the approval of old "known" experts, have incentives to study old subjects or follow old schools of thought at the expenses of new subjects and new schools of thought that would have better served a changing society. Our society tradeoffs conservatism against competence in its endeavor to identify experts, but the optimal tradeoff may not be achieved due to time-inconsistency. We formalize this problem with a model described in terms of legal experts such as lawyers and judges, and use it to shed light on noise voters and anti-intellectualism in the Trumpian era.

Keywords: experts, conservatism, noise voters, anti-intellectualism

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1 Introduction

Modern societies thrive on the advices of experts in a garden variety of areas. How do we identify these experts? In certain circumstances, experts are people who have good track records that can be easily assessed by the general public. For example, when the general public see an architect who has built buildings that survived past earthquakes, they can tell right away that he is an expert who can be entrusted with the construction of new buildings that survive future earthquakes. Unfortunately, more often than not, an expert's track record cannot be easily assessed by the general public. For example, when our society seeks advices from some expert in economics, they will find that evaluating an economist's past advices is as difficult as evaluating any economic policy, thanks to the identification problems arising from the unobservability of counterfactuals. To overcome these identification problems, one requires sophisticated econometric techniques, which, ahem, cannot be understood by many.

In such situations, our society relies on the method of peer reviews to identify experts. But this method runs the risk of being circular. A group of charlatans with each member asserting that each other is an expert may generate a bogus area of expertise. Academic hoaxes such as the so-called "Sokal affair" are testimonies that many academic researchers believe in the existence of (and take it upon themselves to expose) self-congratulating groups of bogus experts who take advantage of this circularity problem.

To mitigate this circularity problem, our society gives heavy weights to reviews made by "known" experts. "Known" experts are not experts identified contemporarily, but rather experts from an earlier generation, identified in some previous rounds of peer reviews, which in turn gave heavy weights to reviews made by an even earlier generation's "known" experts, so on and so forth. While such an overlapping-generations peer-review process is less vulnerable to the circularity problem, it also gives rise to an aristocratic expert class which we shall argue is inevitably conservative. The reason is that young scholars, in order to earn the approval of old "known" experts, have incentives to study old subjects or follow old schools of thought at the expenses of new subjects and new schools of thought that would have better served a changing society.

It means that there are at least two dimensions in the quality of an expert. We shall call the first dimension his competence, and the second his conservatism. While an overlapping-generations peer-review process helps identify the more competent ones as experts, it also generates perverse incentives for everyone (including those who are subsequently identified as experts) to be more conservative. Both dimensions of quality can be important for the society. Advices from either an incompetent or a conservative expert can be equally unhelpful to the society, even if for different reasons. A good expert is an expert who is both competent and not conservative.

Our society hence has to tradeoff conservatism against competence in its endeavor to identify experts, and the overlapping-generations peer-review process needs not achieve the best balance between these two. The optimal balance sometimes is achieved by throwing noise into this process, meaning that the society needs to commit to ignore the "known" experts' reviews with certain probability. But it can be difficult for the society to make such a commitment, due to a natural time-inconsistency problem. By the time selections are made, how conservative the young scholars (i.e., the candidates up for selection) are is already determined, and competence becomes the only dimension of quality that remains relevant. The society would hence select whoever the "known" experts regard as more competent. Such deference to "known" experts' opinions arises endogenously, and regardless of whether or not the society formally delegate to the "known" experts the task of selecting new experts.

The resulting expert-selection process is in general not optimal, in the sense that experts selected by such a process are in general not as good as they can be for the society—in particular, they are too conservative. The society can benefit from having "selectors" who are not always deferential to "known" experts' opinions. These non-deferential "selectors" fit all conventional descriptions of a noise voter: they are anti-elite, anti-intellectual, and mistrust "known" experts' recommendations. Their existence throws the necessary noise into the expert-selection process, and has the potential of improving the quality of the selected experts by tilting their competence-conservatism mix.

We shall provide a stylized model to formalize this string of reasonings. Our model is described in terms of a specific kind of experts—namely legal experts such as judges. This choice is mainly for convenience. In the Online Appendix, we present an alternative model that is closer to experts in academic research, and our main messages carry over easily to that alternative model. Our model of judicial experts hence should be interpreted more liberally, and describes a phenomenon common across those expertises where the society has no independent means in distinguishing a true expert from a charlatan, and hence has to seek help from an overlapping-generations peer review process.

The plan of this paper is as follows. The rest of this Section reviews the related literature. Section 2 outlines our model, which is described in terms of legal experts such as judges. Section 3 relates our model to the term "dinosaur judges" in legal studies. Section 4 describes the steady-state equilibrium of our model. Section 5 looks for the optimal expert-selection process. Section 6 explains why the optimal expert-selection process may not be achievable due to the time-inconsistency problem, and as a result experts are in general too conservative. It also sheds light on why having anti-elite, anti-intellectual noise voters can sometimes add value to democracy. Section 7 concludes.

1.1 Related Literature

The starting point of our paper is the observation that the society often has no independent means to distinguish a true expert from a charlatan, and hence has to rely on true experts to help make such distinctions, which gives rise to the infinite regress problem of how to identify the true experts to help make these distinctions in the first place. This makes our paper naturally related to the literature of calibration and expert testing.[1] This literature, starting with Foster and Vohra (1998), presents many surprising results where natural statistical tests of experts, while can be easily passed by true experts, can often be passed by strategic charlatans as well. Although there are also some positive results, such as Dekel and Feinberg (2006), the literature in general lends support to our premise that, as a first-degree approximation, it is in general difficult for the society to tell apart true experts and charlatans, and an overlapping-generations peer review process, appropriately contaminated, is needed to do the job.[2]

In our paper, the sub-optimality of an overlapping-generations peer review process is driven by the perverse incentives such a process generates for young scholars (and hence for future experts). Our paper is hence related to the literature on how experts may have misaligned incentives. Providers of credence products, for example, may have

[1]See Olszewski (2015) for a survey of this literature.

[2]In the typically setting of this literature, true experts knows the true data generating process, while the society and charlatans do not. In such a setting, a true expert has more instruments than the society has in distinguishing a true expert from a charlatan. He can, for example, directly ask the candidate what the true data generating process is. This lays down the foundation of why peer review processes, appropriately designed, can help the society distinguish a true expert from a charlatan.

inadequate incentives to collect information on the appropriateness of their products.[3] Physicians with different skill sets may also have distorted incentives when it comes to referring their patients to other physicians.[4] In strategic-information-transmission games, informed senders either have incentives to manipulate the messages they send to uninformed receivers,[5] or have incentives to hide evidences from the latters.[6] In all of the studies in this literature, however, the identities of true experts are never in doubt, and the only question is whether they have adequate incentives to do the right things. Our paper differs in not assuming that the identities of true experts are self-evident, and distortions in incentives arise from the very process of identifying them.

Our paper is also related to literature on educational standards.[7] In these studies, our society sets educational standards to screen, to sort, and to motivate students. This literature is related to our paper because a student earning the credential of having passed a certain educational standard is reminiscent to a young scholar earning the status of being an expert. However, there are important differences between this literature and our paper. In this literature, the quality of students passing any given educational standard is solely determined by the standard itself, and does not depend on the quality of seniors who set this standard. In contrast, our paper studies situations where, for example, the quality of young scholars who manage to publish on *Econometrica* depends on the quality of the journal's editors, who were in these influential positions because they managed to publish on *Econometrica* earlier, and hence their very own quality depends on the quality of an even earlier generation of editors, so on and so forth. This kind of intergenerational linkage, while being essential in our paper, does not arise in the literature on educational standards.

Our paper is also related to the literature on citation indexes.[8] These studies investigate how we should count citations—a kind of peer review data—in order to rank different scholars. The implicit presumption is that something good will come out from ranking

[3]See, for example, Pesendorfer and Wolinsky (2003). See also Dulleck and Kerschbamer (2006) for a survey of the literature on credence products.

[4]See, for example, Shumsky and Pinker (2003), Garicano and Santos (2004), Godager *et al.* (2015), Park (2015), Grassi and Ma (2016), and Liu *et al.* (2018).

[5]See, for example, cheap-talk games studied by Crawford and Sobel (1982), Gilligan and Krehbiel (1989), Krishna and Morgan (2001), Battaglini (2002), and Chakraborty and Harbaugh (2007).

[6]See, for example, Milgrom and Roberts (1986) and Shin (1998). See also Sobel (2013) for a survey of the literature on strategic information transmission.

[7]See, for example, Stiglitz (1975), Weiss (1983), and Costrell (1994).

[8]See, for example, Chambers and Miller (2014) and Perry and Reny (2016).

scholars using these peer review data, and the key question is how to make the best use of these data. The focus of our paper, instead, is on why our society tends to over-use these peer review data, generating scholars who tend to be too conservative.

Our paper is also related to Sobel's studies of dynamic evolution of standards (Sobel, 2000 and 2001). Sobel studies models that resemble how the Econometric Society elects its fellows. To decide whether a particular candidate qualities, a judge compares the candidate with existing fellows. Judges' decisions are then aggregated using some voting rule. Sobel asks when the average quality of fellows will increase or decrease over time. His studies are related to our paper because the pool of existing fellows can be thought of as "known" experts as well—they form the reference group that helps judges to divide candidates into qualified and unqualified ones. However, in our paper, the evolution of quality (which in our paper is a competence-conservatism mix) is of second-order importance. This is because a unique steady state always exists, and, depending on the initial state, average quality can either converge upward or downward to the steady state. Of first-order importance is, instead, the steady-state itself, which depends on how much noise we throw into the expert-selection process, and whether our dynamic-inconsistency allows us to throw in such noise.

Finally, our paper is related to Akerlof and Michalillat (2017 and 2018; hereafter AM), who show that when there are two scientific paradigms, with one describing the world better than the other, the worse paradigm may nevertheless prevail if tenured scientists have homophilous bias; i.e., they prefer to grant tenure to young scientists who adhere to their own paradigms. This is of course bad news for the society. But AM is silent on whether there exists any better expert-selection process, or whether the one they study is already the best given certain information friction. Our paper, in contrast, tries to explain why the over-lapping peer review process arises endogenously as the society's choice of the expert-selection process, and how the existence of anti-elite, anti-intellectual noise voters may allow us to have an even better process.

2 The Model

2.1 Setup

Consider an overlapping-generations society. Each generation lives for two periods (young and old), and has two unit masses of agents. Each agent is born with a competence type, $\theta \in [\theta_l, \theta_h] \subset \mathbb{R}_+$, which is not observable to anyone (including the agent himself). We assume that θ is iid across agents and generations, and has mean $\overline{\theta}$ and variance V.

Each period has two sub-periods. A young agent starts off as a law student in the first sub-period, and, after acquiring a certain body of knowledge, becomes a lawyer in the second sub-period. Half (i.e., one unit mass) of these lawyers will be selected as judges when they get old, while another half will retire. The selection process will be explained later.

In the second half of each period, (young) lawyers are randomly matched into pairs, and each pair is randomly matched with an (old) judge (recall that there is only one unit mass of (old) judges in any given period). Every such trio will be assigned to resolve a dispute by means of a litigation, with each of the two lawyers representing one side of it.

The nature of disputes that typically arise within the society varies from generation to generation. Disputes over privacy, for example, were much less prevalent in earlier, pre-big-data generations, and may become unimportant again in the future when no reasonable protection of privacy is possible, but take central stage right now in our current generation. In this paper, the society is changing exactly in the sense that the nature of disputes is changing. We can in a rather heuristic manner represent the nature of disputes prevalent in any period t by a point $z_t \in \mathbb{R}$, to be called the *zeitgeist* of the society in period t. The *zeitgeist* of the society keeps changing over time, and for simplicity let's assume it does so in a deterministic manner. For any period t,

$$z_t = z_{t-1} + \zeta;$$

that is, the *zeitgeist* of the society keeps moving rightward on the real line, and $\zeta > 0$ measures how fast or how large a step it moves.

In the first half of each period, before becoming a lawyer, every (young) law student i has a once-a-lifetime chance to freely choose a body of knowledge, k_i, also represented in a rather heuristic manner by a point on the same real line. This choice is unobservable to anyone else. Symmetrically, a law student's choice also cannot be contingent on other (past, current, and future) law students' choices. (In equilibrium, of course he knows the equilibrium choices of the others.) If the law student is selected as a judge in the next period, say period t, then k_i will also be his body of knowledge as a judge, and the distance,

$$c_i = z_t - k_i,$$

will measure how conservative he will be as a period-t judge. His conservatism, c_i, needs not be positive. If $c_i < 0$, we say that as a judge he is "ahead of his time".

When law student i becomes a lawyer in the second half of the period, the judge presiding at his assigned litigation similarly would have his own body of knowledge, k_J, acquired in the last period when this judge was still a law student. The absolute distance,

$$|k_i - k_J|,$$

will determine how (in)effective lawyer i is in arguing in front of this judge. The larger is this absolute distance, the less effective he will be, because he speaks a language that the judge is less able to comprehend. To give a concrete example of this phenomenon, imagine that the dispute in question is whether a particular business practice is "unfair" and hence illegal under the US FTC Act.[9] A lawyer who studied economics as a law student may find himself in disadvantage in arguing effectively in front of a judge who studied Kantian ethics in this litigation.[10]

We do not explicitly model the act of arguing in a litigation. We, instead, take a reduced-form approach to model the probability for any particular lawyer to win his assigned litigation. We postulate that this probability is increasing in his, and decreasing in his opponent-lawyer's, competence.[11] We also postulate that this probability is increasing in the lawyer's, and decreasing in his opponent-lawyer's, effectiveness in arguing in front of the judge.

[9]The US FTC Act famously declares that "unfair" methods of competition are illegal without defining what "fairness" means.

[10]See White (2007) for an example of advocates who favor trying antitrust cases using Kantian ethics instead of economics.

[11]Winning a litigation hence signals that a lawyer is more competent, which in turn makes him a more valuable future judge. See also Footnote 12.

More precisely, we assume that the probability for any lawyer i to win his assigned litigation is:

$$L = \frac{1}{2} + \alpha\theta_i - \alpha\theta_j + \delta \exp\left(-\lambda|k_i - k_J|\right) - \delta \exp\left(-\lambda|k_j - k_J|\right), \quad (1)$$

where

- θ_i and θ_j are, respectively, lawyer i's and his opponent-lawyer's competence;
- k_i and k_j are, respectively, lawyer i's and his opponent-lawyer's bodies of knowledge; and
- α, δ, and λ are positive parameters that satisfy $\alpha(\theta_h - \theta_l) + \delta < 1/2$, which in turn guarantees that L is strictly between 0 and 1 and hence is a legitimate probability.

A law student prefers to be selected as a next-period judge for two reasons. The first is that as a judge he will receive a positive perk, which we normalize as 1. The second reason is that as a judge he gets to write an opinion which, if written intelligently, will set a good precedent and enlighten the society, and he enjoys enlightening the society.

We do not explicitly model the act of writing such an opinion. We, instead, take a reduced-form approach to model how enlightening a judge's opinion will be. We postulate that his opinion will be more enlightening if he is more competent.[12] We also postulate that his opinion will be more enlightening if his body of knowledge is closer to the zeitgeist. Conversely, if his body of knowledge is either too much on the left (i.e., he is too conservative) or too much on the right (i.e., he is too ahead of his time), he does not have a good grasp of the nature of dispute at hand, and hence cannot opine intelligently.

More precisely, we assume that the extent to which a period-t judge's opinion enlightens the society is:

$$W = \beta\theta_J - \sigma(z_t - k_J)^2, \quad (2)$$

where θ_J and k_J are, respectively, the period-t judge's competence and body of knowledge, and β and σ are positive parameters. Note that W can be negative, especially if the judge's body of knowledge is too inappropriate for the nature of the dispute at hand.

Given our reduced-form approach to model litigations and opinion writing, the only strategic choice any agent i makes throughout his lifetime is his body of knowledge, k_i,

[12] This explains why a competent lawyer is a more valuable future judge. See also Footnote 11.

chosen when he is a (young) law student. His lifetime payoff is then

$$U = P \times (1 + \Delta W), \tag{3}$$

where P is his probability of being selected as a judge,[13] W is how enlightening his opinion will be, and $\Delta \geq 0$ is the weight he places on enlightening the society relative to that on perk.

Our measure of social welfare in any given period is the integration of W across (or, equivalently, the expectation over) all judges in that period, denoted by $\mathbb{E}W$. We assume that, while the society is noticeably better off when more of the opinions are enlightening, it cannot tell how enlightening each individual opinion is, and hence cannot reward good ones and punish bad ones. This captures what we believe is a core feature of soft sciences such as legal studies and economics. While the society thrives on the advices of good experts (for example, judges, as in our model), it does not have an independent means to test whether any particular expert is good or bad. It relies on known experts from an earlier generation to help select new experts.[14] How good are these known experts, and how good are the new experts they help select, depend on the selection process, which we turn to now.

On one extreme, we can conceive of a purely aristocratic process, where retiring judges, instead of the general public, are to select future judges. Since we have not specified retiring judges' preferences over who to select, the benchmark model in this Section is not adequate to discuss what would happen under such a process. But let's simply postulate that, in a purely aristocratic process, exactly those lawyers who win litigations will be selected as future judges. We shall fill in the micro-foundation of this postulation later in Section 6, but the idea roughly goes as follows. Suppose retiring judges cares about the next period's social welfare, and would like to select as future judges those who will write more enlightening opinions. Since individual lawyers' competence and bodies of knowledge are not observable, selection can only be based on litigation results. If all lawyers are expected to have acquired the same body of knowledge (which is indeed true in equilibrium), then the ones who win their assigned litigation will have higher expected

[13] P should not be confused with L, which in turn is his probability of winning his assigned litigation.

[14] This sets soft sciences apart from, for example, civil engineering, where independent means to test whether a particular expert is good or bad is more available to the public.

competence, and hence will be selected by retiring judges as future judges.

We can also conceive of more democratic processes, where the general public also participate. If the general public, being aware of their own ignorance, are always deferential to retiring judges' recommendations, then more democratic elements would not change the selection results. But we can also conceive of that, in reality, the general public include many noise voters, who either do not pay attention to retiring judges' recommendations, or are not deferential to them even if they do pay attention. With the existence of these noise voters, a more democratic process, compared to the purely aristocratic process, contains more noise when it comes to selecting future judges.

In a reduced form, we can represent any selection process as some mixture between a purely aristocratic process and pure noise. That is, we can represent any selection process by a parameter $a \in [0, 1]$ such that, with probability a, whether a lawyer will be selected as a future judge will depend on whether he wins his assigned litigation, and with probability $1 - a$, it will depend on a random coin flip. That is, for any given lawyer, his probabilities of being selected as a future judge is

$$P = (1 - a)/2 + aL.$$

The parameter a measures how aristocratic this process is, running from being purely aristocratic ($a = 1$) to pure noise ($a = 0$). For the moment, we treat a as exogenous. We will discuss to what extent a can be chosen by the society in Section 6.

2.2 Solution Concept

Our basic solution concept is the standard perfect Bayesian equilibrium, where every law student chooses his body of knowledge to maximize his expected payoff, given the equilibrium choices of all other law students (in the past, in the same period, and in the future).

We further restrict our attention to symmetric perfect Bayesian equilibria—which we shall simply refer to as *equilibria*—where all law students in the same generation choose the same body of knowledge. We can hence speak of the equilibrium body of knowledge, k_t, acquired by all period-t law students.

To ease the discussion in later sections, let's first state a sufficient condition under which a law student has a unique optimal best response against his belief about other agents' strategies, and that best response can be characterized by the first order condition.

Lemma 1 *Fix all parameters except for λ. Suppose $\Delta > 0$. Consider a law student who has a degenerate belief about his presiding judge's body of knowledge at k_J. Then there exists $\overline{\lambda}$ such that, as long as $\lambda < \overline{\lambda}$, regardless of the student's belief about his opponent-lawyers' strategies, he always has a unique best response, which can be characterized by the first order condition.*

The proof of Lemma 1, like other omitted proofs, are relegated to the Appendix. It involves showing that the law student's payoff function U in (3) is strictly concave over a *relevant range*. Suppose a law student i has a degenerate belief about his presiding judge's body of knowledge at k_J, and the future *zeitgeist* is z, and that $k_J < z$. Then he apparently will choose k_i only from the interval $[k_J, z]$. Choosing any $k_i < k_J$ or $k_i > z$ would reduce the probability of winning his assigned litigation and the quality of his future opinion at the same time—i.e., would reduce L and W at the same time—and hence is dominated. Therefore, $[k_J, z]$ is his relevant range.

His payoff function U, however, is not always concave in k_i over this relevant range, because P is not concave in k_i.[15] What Lemma 1 observes is that, if λ is sufficiently small, then P would be sufficiently "flat" in k_i, and the shape of U will be dominated by the shape of $1 + \Delta W$, which is strictly concave in the relevant range.

In the rest of this paper, we shall maintain the assumption that λ is sufficiently small—specifically, $\lambda < \overline{\lambda}$, with the threshold $\overline{\lambda}$ defined in Lemma 1. By the definition of an equilibrium, all law students in the same generation share the same belief about their presiding judges' and opponent-lawyers' strategies. If their presiding judges all have the same body of knowledge, say k_J, then they must have the same unique best response under this maintained assumption. Moreover, strict concavity means that the first-order condition is both necessary and sufficient for characterizing this common best response.

In the rest of this paper, we shall also ignore the case of $a = \Delta = 0$, which is an uninteresting case because a law student is completely indifferent among all choices of his body of knowledge: his body of knowledge does not affect the probability of being selected, as $a = 0$, and it does not affect his payoff after being selected either, as $\Delta = 0$.

[15] P is not concave in k_i because L is not. This problem is not due to the specific functional form we chose for L. It is easy to see that if L is to stay between 0 and 1, it cannot be globally concave in k_i.

2.3 Discussion of the Model

In building a stylized model of conservative experts, we have made several simplifying assumptions for the sake of tractability. In order for the reader to better evaluate these assumptions, we briefly discuss the key ones here.

In our model, the society changes exogenously. A high speed of change carries no connotation of progress, nor a low speed stagnation. Change is just a part of our lives, and the society has to cope with it. In an alternative model, possibly one based on other kinds of experts such as academic researchers instead of judges, social change can be a result of a successful expert selection process. In other words, the speed of social change would carry the connotation of progress. In such an alternative model, the speed of social change can affect the performance of the expert selection process, which in turn feeds back to the speed of social change. By starting with a model based on legal experts such as judges, we abstract away from this interesting feedback effect. In the Online Appendix, however, we sketch an alternative model based on academic researchers, and we show that our qualitative analysis carries over to that alternative model without problem.

Another assumption in our model is that the society changes in a deterministic manner. It goes without saying that changes of a society are usually random and unpredictable. In the Online Appendix, we extend our model to incorporate stochastic *zeitgeist*. We show that our qualitative analysis carries over to this case without problem.

Finally, our model also assumes that an agent acquires new knowledge only at the very beginning of his life. This is merely a simplifying assumption. As long as acquiring new knowledge becomes more expensive as one gets old (due to higher time costs for example), the same results would continue to hold qualitatively. To build the most parsimonious model, we assume that such adjustment is impossible.

3 Dinosaur Judges

The phrase "dinosaur judge" probably originated from Martin Davey's illustration "Dinosaur Judge in UK Court of Law",[16] which, according to the artist, "shows a typical judge [. . .] [who] is blind, covered in cobwebs and doesn't know what century it is, and is basically a dinosaur." The phrase gained currency in other parts of the world, and refers

[16] http://martindaveyillustration.blogspot.hk/2014/02/dinosaur-judge-in-uk-court-of-law.html

to a judge whose "decision is not consistent with the public's expectations, primarily as a result of his or her deviation from contemporary social values or widely held beliefs", with the implication that "the judge's thinking has not evolved from the dinosaur era and therefore has lacked a sensitivity to social changes or needs" (Lowe and Das, 2017, p.xxvi).[17]

Let's formalize the notion of dinosaur judges by considering the extreme case where $\Delta = 0$. When $\Delta = 0$, law students do not care about social welfare. When they choose which body of knowledge to acquire, they hence have no incentives to learn anything close to the *zeitgeist* of the society at the expense of effective argument in front of the sitting judges. As a result, if Kantian ethics is what old antitrust judges have learned, it is also what young law students will choose to learn in order to be able to speak a language that the old judges can best comprehend, and will also be what they can comprehend the best in the future when they become next generation's antitrust judges, so on and so forth. Economic reasoning will never seep into an antitrust court. The legal community will increasingly look like a dinosaur, out of sync with the *zeitgeist*, yet its every move can wreak havoc on the society.

Formally, we have the following proposition. The proof is straightforward and hence is omitted.

Proposition 1 *When $\Delta = 0$, all equilibria features $k_t = k$ for all t. Conversely, when $\Delta = 0$, for every $k \in \mathbb{R}$, it is an equilibrium that $k_t = k$ for all t.*

In a sense, when $\Delta = 0$, agents are "selfish" because they have no intrinsic motivation to "do the right thing". One of the deepest insights in economics is that good-heartedness is not necessary for a society to thrive, and markets can motivate good deeds (even when we are selfish) by rewarding them according to their social values. However, good deeds can be rewarded only to the extent that how good these deeds are can be easily assessed by the general public. The starting point of this study is precisely that the social value of an expert's service often cannot be easily assessed by the general public. Instead, an expert is rewarded at the moment he is selected, perhaps with the recommendation of known experts, and cannot be rewarded again according to the quality of his service. In such a situation, Proposition 1 says that our society cannot thrive without good-heartedness.

[17] See Huang and Lin (2013) for an example of how the phrase is used in legal studies.

4 Steady-State Equilibrium Conservatism

Suppose, instead, $\Delta > 0$. Then the situation is not as dire. Maintain the assumption that λ is sufficiently small. From the perspective of a period-t law student i, there is no uncertainty about the body of knowledge of his presiding judge—it must be k_{t-1}, the common body of knowledge chosen by all law students in the last period. When he chooses his own body of knowledge, k_i, he will try to strike a balance between more effective argument in front of his presiding judge, and a higher ability to write an enlightening opinion as a future judge. The former calls for choosing k_i closer to k_{t-1}, whereas the latter calls for choosing k_i closer to tomorrow's *zeitgeist*, z_{t+1}. In the end how close this choice is to z_{t+1} will determine how conservative he will be as a future judge. Intuitively, he will be more conservative as a future judge if the selection process is more aristocratic, and less conservative if he cares more about social welfare.

Apparently, how conservative a given generation's judges are will affect how conservative the next generation's judges will be, and so on and so forth. If we focus on steady-state equilibria, where every generation's judges are equally conservative, we can obtain the steady-state equilibrium conservatism as a function of exogenous parameters. As we shall see, this steady-state equilibrium conservatism is more severe if the selection process is more aristocratic, and less severe if the society changes faster.

Formally, let c_t be the measure of how conservative period-t judges are; i.e., $c_t := z_t - k_{t-1}$ (recall that period-t judges acquired their bodies of knowledge in period $t-1$). A *steady-state equilibrium* is an equilibrium where the degree of conservatism is constant over time; i.e., $c_t = c^*$ for all t. Since the *zeitgeist* of the society keeps moving rightward with step size ζ on the real line, in order for c_t to stay constant, it must be that k_t keeps moving rightward with step size ζ on the real line as well. That is, in a steady-state equilibrium, the "generation gap" between a judge's and a lawyer's bodies of knowledge is always ζ.

While we allow for the possibility that $c^* < 0$, this however will never happen in a steady-state equilibrium. To see that, recall that k_t must lie between k_{t-1} and z_{t+1}. If a law student is to choose $k_i = k_t = k_{t-1} + \zeta > k_{t-1}$, it must be because $k_{t-1} < k_t \leq z_{t+1}$. But this implies $c^* = z_{t+1} - k_t \geq 0$. Therefore, in a steady-state equilibrium, judges are always conservative, and are never "ahead of their time".

Note that conservatism arises in a steady-state equilibrium *not* because of any assumption that catching up with a changing society is inherently costly. Indeed, in our model, we deliberately assume away differential costs of acquiring different bodies of knowledge. Specifically, acquiring a body of knowledge closer to the future *zeitgeist* is no more costly than acquiring a body of knowledge further away. The reason why conservatism necessarily arises in a steady-state equilibrium is that our society relies on old experts to identify new experts.

To solve for the steady-state equilibrium conservatism, consider a typical period-t law student i. His problem is to pick k_i to maximize (3), taking into account that, in his assigned litigation, the presiding judge's body of knowledge will be $k_{t-1} = z_t - c^*$, and his opponent-lawyer's body of knowledge will be $k_t = k_{t-1} + \zeta = z_t - c^* + \zeta$. That is, his problem is to pick $k_i \in [k_{t-1}, z_{t+1}]$ to maximize

$$\begin{aligned}
&\mathbb{E}_{\theta_i}\mathbb{E}_{\theta_j} P \times (1 + \Delta W) \\
&= \mathbb{E}_{\theta_i}\left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\overline{\theta} + \delta\exp(-\lambda|k_i - k_{t-1}|) - \delta\exp(-\lambda\zeta)\right]\right)\left(1 + \Delta\left[\beta\theta_i - \sigma\left(z_{t+1} - k_i\right)^2\right]\right). \quad (4)
\end{aligned}$$

The first derivative of (4) at his steady-state equilibrium choice, $k_i = k_t$, is:

$$\begin{aligned}
&\mathbb{E}_{\theta_i}\left[\left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\overline{\theta} + \delta\exp(-\lambda\zeta) - \delta\exp(-\lambda\zeta)\right]\right)(2\Delta\sigma c^*) - a\delta\lambda\exp(-\lambda\zeta)\left(1 + \Delta\left[\beta\theta_i - \sigma c^{*2}\right]\right)\right] \\
&= \Delta\sigma c^* - a\delta\lambda\exp(-\lambda\zeta)\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c^{*2}\right]\right). \quad (5)
\end{aligned}$$

Denote the last expression of the first derivative in (5) by $\Omega(c^*)$. The Kuhn-Tucker condition must be satisfied at the steady-state equilibrium choice $k_i = k_t = k_{t-1} + \zeta > k_{t-1}$; i.e.,

$$\begin{aligned}
&\Omega(c^*) \geq 0, \quad \text{and} \\
&\Omega(c^*) = 0 \quad \text{if } k_t < z_{t+1}, \quad \text{or, equivalently, if } c^* > 0. \quad (6)
\end{aligned}$$

Note that $\Omega(x)$ is increasing strictly and without bound in x. Therefore, there exists a unique c^* that satisfy the Kuhn-Tucker condition. When $a = 0$, we have $\Omega(0) = 0$, and hence $c^* = 0$. When $a > 0$, we have $\Omega(0) = -a\delta\lambda\exp(-\lambda\zeta)\left(1 + \Delta\beta\overline{\theta}\right) < 0$, and hence $c^* > 0$, which can be solved from $\Omega(c^*) = 0$ as

$$c^* = \frac{-\sigma + \sqrt{\sigma^2 + 4\left(a\delta\lambda e^{-\lambda\zeta}\right)^2\sigma\left(1/\Delta + \beta\overline{\theta}\right)}}{2a\delta\sigma\lambda e^{-\lambda\zeta}}. \quad (7)$$

Under the maintained assumption that λ is sufficiently small, the law student's payoff function is strictly concave, and hence the Kuhn-Tucker condition is also sufficient for optimality. We hence have the following proposition.

Proposition 2 *Suppose $\Delta > 0$. Then a steady-state equilibrium exists and is unique. The equilibrium conservatism, c^*, is 0 if $a = 0$, and is given by* (7) *if $a > 0$. It increases in β, $\overline{\theta}$, a, and δ, and decreases in σ, Δ, and ζ.*

When $a = 0$, the selection of judges does not depend on litigation results. Law students therefore have no incentives to boost their chances of winning litigations by choosing a body of knowledge closer to that of presiding judges. Instead, they try to maximize the quality of their future opinions by choosing a body of knowledge exactly equal to the future *zeitgeist*. Equilibrium conservatism is hence zero. When $a > 0$, however, there will be strictly positive equilibrium conservatism, because law students start to pull back their k_i's from the future *zeitgeist* in order to increase their chances of winning litigations and hence their chances of being selected as future judges. At zero conservatism, pulling back k_i from the future *zeitgeist* has only second-order effects on the quality of their future opinions, but has first-order effects on their chances of being selected as future judges.

To understand how different parameters affect equilibrium conservatism, recall that a law student i is to maximize $P \times (1 + \Delta W)$. Pulling back k_i (and hence increasing his conservatism c_i) increases P but decreases W. The optimal k_i strikes a balance in this tradeoff. An increase in $\beta\overline{\theta}$ increases W for every choice of k_i, making it more appealing to boost P, and hence increases equilibrium conservatism.

Similarly, if pulling back k_i can more effectively boost P, the law student will pull back k_i more, increasing equilibrium conservatism. This will be the case when the selection process is more aristocratic (a larger), or when the probability of winning a litigation is more sensitive to the "knowledge gap" (δ larger).

On the other hand, an increase in σ makes the quality of his future opinion more sensitive to conservatism, and hence discourages the law student from pulling back k_i, which in turn decreases conservatism.

An increase in Δ means the law student cares more about social welfare relative to his own perk. This discourages him from pulling back k_i, and hence decreases equilibrium conservatism.

Finally, when the society changes faster (ζ larger), the "knowledge gap" between a judge and a lawyer must be larger in the steady-state equilibrium, making it more ineffective for any lawyer to argue in front of his presiding judge. When arguing in front of the presiding judge is already very ineffective, there is little room to further reduce this effectiveness. This reduces the cost for a law student of choosing a k_i that is closer to the future *zeitgeist*. As a result, equilibrium conservatism decreases.

This last result also suggests that a fast changing society is also one with higher social welfare, which we shall confirm in Proposition 3 in the next section. Note that, in our model, a larger ζ carries no connotation of progress, and does not contribute to social welfare directly. It, however, contributes to social welfare *indirectly* by resulting in lower equilibrium conservatism. In a sense, a fast changing society lifts the baggage of our past off our shoulders. It gives us a reason not to turn back and appease the old guards. This analysis of course overlooks many costs, psychological and material, that the society has to incur when coping with changes. But we believe it points to a benefit of social change that has not been pointed out before.

Note that Proposition 2 applies only when $\zeta > 0$. As $\zeta \searrow 0$, c^* increases to a limit, say c^{**}, that is strictly positive. However, when $\zeta = 0$, there is a continuum of steady-state equilibria. Specifically, for every $c^* \in [-c^{**}, c^{**}]$, there is a steady-state equilibrium with equilibrium conservatism c^*. In particular, $c^* = 0$ is also a steady-state equilibrium in a society with no social change. This seems to suggest that, contrary to the previous paragraph, having no social change is good for the society after all, as we can then have zero equilibrium conservatism. However, among all the steady-state equilibria prevailing in a society with $\zeta = 0$, a small perturbation in ζ will "select" the one with the largest equilibrium conservatism, namely c^{**}, making that the most robust prediction in a society free of social change.

As a thought experiment, imagine that the *zeitgeist* does not change before period 0, and starts to drift very slowly to the right from period 1 onward; i.e., $z_0 = z_{-1} = z_{-2} = \cdots = 0$, and $z_{t+1} = z_t + \zeta$ for $t \geq 0$, with ζ positive but very close to 0. For any $t < 0$, if $k_{t-1} = 0$, then it is optimal for period-t law students to pick $k_i = 0$ as well. The society hence does not suffer from conservatism before period 0. However, even after time passes period 0, as long as z_t remains below c^{**}, generation after generation of law students will continue to find it optimal to pick $k_i = 0$, simply because their presiding judges did so. In other words, when they pick their k_i from the interval $[k_{t-1}, z_{t+1}]$, they opt for the corner solution of k_{t-1}, because the temptation to appease old guards overwhelms their concerns for social welfare. As the society slowly changes, the judges' bodies of knowledge do not, and conservatism increases. Only after many generations, when z_t finally surpasses c^{**}, would law students start to pick k_i that is different from their presiding judges' bodies of knowledge. The society then settles down in a new steady state, with equilibrium conservatism approximately c^{**}.

For more on the off-steady-state equilibrium dynamics, we refer the interested reader to our Online Appendix.

5 Optimal Selection Process for Judges

Proposition 2 in the previous Section says that a more aristocratic selection process (larger a) would result in more equilibrium conservatism. This highlights the principal cost of an aristocratic selection process. We now turn to its principal benefit, namely that it helps the society in selecting more competent future judges.

In the unique steady-state equilibrium, social welfare is

$$\mathbb{E}W = \beta \mathbb{E}\theta_J - \sigma c^{*2}.$$

To calculate $\mathbb{E}\theta_J$, recall from (1) that a type-θ lawyer will be selected as a future judge with probability

$$\begin{aligned} &\frac{1}{2} + a\left[\alpha\theta - \alpha\overline{\theta} + \delta\exp(-\lambda\zeta) - \delta\exp(-\lambda\zeta)\right] \\ =&\frac{1}{2} + a\alpha\left[\theta - \overline{\theta}\right]. \end{aligned}$$

Therefore,

$$\mathbb{E}\theta_J = \frac{\int_\theta \theta\left(\frac{1}{2} + a\alpha\left[\theta - \overline{\theta}\right]\right)\Pr(d\theta)}{\int_\theta \left(\frac{1}{2} + a\alpha\left[\theta - \overline{\theta}\right]\right)\Pr(d\theta)} = \frac{\int_\theta \theta\left(\frac{1}{2} + a\alpha\left[\theta - \overline{\theta}\right]\right)\Pr(d\theta)}{1/2} = \overline{\theta} + 2a\alpha V, \tag{8}$$

where we recall that V is the variance of θ.

By (8), the steady-state equilibrium welfare is hence

$$\mathbb{E}W = \beta\left(\overline{\theta} + 2a\alpha V\right) - \sigma c^{*2}. \tag{9}$$

Proposition 3 *In the unique steady-state equilibrium, social welfare is given by* (9)*. It is increasing in αV, Δ, ζ, σ, β, and $\overline{\theta}$, and is decreasing in δ.*

To understand these comparative statics results, note that there are two channels through which a parameter can increase social welfare. The first is through raising the average competence of judges. Parameters α and V affects social welfare solely through this channel. When the result of a litigation is more sensitive to lawyers' competence (α larger), or when lawyers have more heterogeneous competence (V larger), a selection process with some aristocratic element (i.e., with $a > 0$) can be more effective in terms of selecting more competent future judges, and hence social welfare is higher.

The second channel is through reducing equilibrium conservatism. Parameters Δ, ζ, δ, and σ affect social welfare solely through this channel. Since, according to Proposition 2, equilibrium conservatism decreases in Δ and ζ, and increases in δ, we hence have social welfare increases in Δ and ζ, and decreases in δ.

The case of σ is a bit tricky. It directly increases the cost of conservatism, but also indirectly reduces it by reducing equilibrium conservatism. For the specific functional form we use, it turns out that the indirect effect dominates. This result may not hold for other functional form specifications.

Note that β and $\overline{\theta}$ affect social welfare through both the first and the second channels. They increase the average competence of judges, but also increase equilibrium conservatism (Proposition 2). However, the first effect must dominate. After all, the whole mechanism through which an increase in β increases conservatism is exactly that it increases social welfare, and since law students care about social welfare ($\Delta > 0$), they become more motivated in winning litigations, which ultimately leads to an increase in conservatism. Had the second effect dominated and social welfare decreased, we would have had a contradiction. Similar argument applies to an increase in $\overline{\theta}$ as well.

Proposition 3 is silent on how a affects social welfare. It turns out that social welfare needs not be monotone in a, and hence the optimal a, denoted by a^*, can lie strictly between 0 and 1. This is crucial to our discussion in Section 6. Intuitively, a more aristocratic selection process raises the average competence of judges, but induces more equilibrium conservatism. The overall effect of an increase in a is hence ambiguous.

Proposition 4 *Let a^* denote the (generically unique) maximizer of the equilibrium social welfare in (9). Then $a^* > 0$. It is interior (i.e., $a^* \in (0, 1)$) when αV is small.*

According to Proposition 4, pure noise is never optimal ($a^* > 0$). When $a = 0$, equilibrium conservatism $c^* = 0$ (Proposition 2), as appeasing old guards does not help one to get selected as a future judge, and hence every law student chooses k_i exactly equal to the future *zeitgeist*. A small increase in a would raise c^* slightly above 0, but such an increase has only second-order effect on the quality of judges' opinions. But a small increase in a brings a first-order benefit in terms of improving the average competence of judges. As a result, it is always socially desirable to raise a slightly above 0.

The result that pure noise is never optimal is robust to alternative models where a small increase in c^* above 0 has *first-* instead of only second-order effect on the quality of judges' opinions.[18] In such models (not reported here), law students would willingly choose k_i exactly equal to the future *zeitgeist* as long as a is sufficiently small, thanks to the first-order cost of small conservatism. As a result, equilibrium conservatism c^* will hit 0 as long as a is sufficiently small. Once again, pure noise is not optimal, because increasing a slightly above 0 has no effect on equilibrium conservatism, but helps raise the average competence of judges.

If a pure aristocratic selection process ($a = 1$) is also not optimal, then a^* will be interior. Intuitively, a pure aristocratic selection process is not optimal if selecting competent judges is not important. This in turn will be the case if there is little heterogeneity in competence to start with (V small), or if winning a litigation is a poor signal of competence because competence is not important at all for winning litigations (α small).

In the Online Appendix, we also present some comparative statics results regarding how different parameters affect a^*.

[18]One possible way to introduce such a first-order effect is to postulate that W takes the alternative functional form of

$$W = \beta\theta_J - \sigma(z_t - k_J)^2 - \gamma|z_t - k_J|,$$

with $\gamma > 0$.

6 Time Inconsistency and the Role of Noise Voters

Up to the last section, we have been treating a as exogenous. Yet we somehow asked the reader to think of the $a = 1$ case as a pure aristocratic selection process, and claimed that it will be the resulting selection process if retiring judges care also about future social welfare, and are asked to select future judges. In this Section, we shall provide a micro-foundation for this claim. In particular, we shall explain why, even when retiring judges care also about future social welfare, they may still ignore the possibility that $a^* < 1$ (see Proposition 4 for such possibility) and insist in implementing $a = 1$.

Let's extend our benchmark model in two ways. First, at the end of each period, each retiring judge is to select one of the two lawyers in his courtroom as a future judge. We shall maintain the assumption that a retiring judge cannot observe either lawyer's competence and body of knowledge, and hence can only base his selection on the litigation result. Second, we extend the retiring judge's preference so that he is not indifferent in who to select. Specifically, we replace an agent's payoff function U in (3) with a lexicographic preference: he prefers a higher U, and conditional on achieving the same U, he prefers a higher W', where W' is the quality of the opinion written by the future judge he selects. In particular, at the time when the agent is a retiring judge, he selects a future judge to maximize W'.

Assume $\Delta > 0$, and let's once again focus on steady-state equilibria.[19] The proof of the following proposition should be obvious and hence is omitted.

Proposition 5 *In the extended game where selection of future judges is endogenized, a steady-state equilibrium exists and is unique. In the unique steady-state equilibrium, each retiring judge selects the lawyer who wins the litigation. Equilibrium conservatism is the same as the equilibrium conservatism c^* in Proposition 2 with $a = 1$.*

The intuition behind Proposition 5 is simple. By the time when a retiring judge is to select a future judge, the two lawyers in his courtroom have already chosen their bodies of knowledge. If they are believed to have chosen the same body of knowledge—which is true in an equilibrium—then only competence matters for W', and the retiring judge

[19] A perfect Bayesian equilibrium is defined in a similar fashion as before. An equilibrium is a symmetric perfect Bayesian equilibrium where law students in the same generation choose the same body of knowledge. A steady-state equilibrium is an equilibrium where conservatism stays constant across generations.

should select the one who has higher expected competence. Since winning a litigation is a signal for higher competence, the retiring judge must select the one who wins the litigation in any equilibrium. The steady-state equilibrium of this extended game then is exactly the same as the steady-state equilibrium in the original game with $a = 1$.

In the case of $a^* < 1$, these retiring judges fail to implement the socially optimal selection process, even though they do care about future social welfare. This phenomenon is robust to many variants of the extended model. For example, suppose we further modify an agent's payoff function so that, at the time he is a retiring judge, he maximizes $\mathbb{E}W'$ instead of W'. Retiring judges in the same generation hence have perfectly aligned interest in who to select as future judges. Suppose furthermore that they as a collective are not required to select one and only one lawyer from each litigation, but can instead select any subset of the lawyers as future judges, as long as that subset has measure 1. The result in Proposition 5 will continue to hold.

Similarly, the result in Proposition 5 continues to hold even if it is the public, or some politicians representing the public, instead of retiring judges, who are to select future judges, as long as these "selectors" care about future social welfare, and select future judges at the end of a period. What is driving the result is a time-inconsistency problem. Unless the "selectors" can commit to throw noise into the selection process *ex post*, and that such commitment is made before law students choose their bodies of knowledge, otherwise $a^* < 1$ cannot be implemented.

This leads us to a new appreciation of noise voters. Noise voters are usually considered as a major reason why democracy cannot achieve its full potential. They do not have the expertises to make informed policy decisions. Yet they do not pay attention to recommendations from those who do have such expertises, either because they do not have the stamina to listen, or because they are too easily distracted by payoff-irrelevant factors such as a presidential candidate's hairdo. Even when they do pay attention, they often are not deferential to these experts. They mistrust scientists' warnings about climate change, biologists' theory of evolution, economists' explanations of why free trade is good, and even the "establishment" of their own political parties regarding which nominees stand the highest chances in winning the general elections. Their sentiments are usually characterized as anti-intellectual, anti-elite, and anti-establishment. All these properties fit perfectly the description of "selectors" who can commit to implement some $a < 1$.

To make this slightly more formal, suppose we further extend our model as follows. Suppose there is a continuum of districts. In each period, there is exactly one litigation taking place in each district, with two lawyers randomly assigned to it. At the end of each period, the citizens in the district are to elect (through a majority vote) one of these lawyers as its future judge. Among these citizens, some are rational voters who pay attention to the litigation result and vote with the purpose of maximizing W',[20] while the others are noise voters whose voting behavior is driven by a common, payoff-irrelevant random factor such as the sunspot or the judicial candidates' hairdo. With probability $\bar{a} < 1$, the rational voters are the majority, and with the complementary probability the noise voters are. These probabilities are identical and independent across districts and across generations. The identity of the majority in any given district in any given period will not be known until the election at the end of that period.

Proposition 6 *In the extended game with noise voters, a steady-state equilibrium exists and is unique. In the unique steady-state equilibrium, each rational voter votes for the lawyer who wins the litigation in his district. Equilibrium conservatism is the same as the equilibrium conservatism c^* in Proposition 2 with $a = \bar{a}$.*

In the case of $a^* < 1$, a democracy with noise voters hence can potentially out-perform one without. Proposition 6, however, does not say that noise voters always help. The probability that noise voters dominate an election may be too large (i.e., $\bar{a} \ll a^* < 1$), so much so that $\mathbb{E}W$ is still higher at $a = 1$ than at $a = \bar{a}$. It also goes without saying that anti-intellectualism has many social costs that are not captured in this simple model.

7 Conclusion

In this paper, we study a simple model of how the society selects good experts. Good experts are experts whose advices bring higher social welfare. Although the general public fare better when more experts are good, they cannot tell which individual expert is good and which is bad, and *a fortiori* also cannot reward good ones and punish bad ones. They have to rely on "known" experts to help select a new generation of (hopefully

[20] As usual in any voting game, a rational voter may not vote sincerely if he believes that his vote will never be pivotal. Here we assume away such complication by brute force.

good) experts. “Known” experts are experts selected earlier by an even earlier generation of “known” experts, and so on and so forth. “Known” experts’ information, however, is imperfect. In particular, a young scholar who studies too new a subject may have a difficult time communicating with these “known” experts, and hence may be confused as someone less competent. As a result, young scholars have incentives to study old subjects or follow old schools of thought at the expenses of new subjects and new schools of thought that would have better served a changing society. Experts selected in such a process are naturally conservative. Indeed, they are in general too conservative, in the sense that they are not as good as they can be for the society. The problem arises from a fundamental time-inconsistency problem, where too much deference to known experts generates suboptimal incentives for young scholars. Anti-intellectualism can potentially help by damaging such deference somewhat.

Although our simple model is described in terms of a specific kind of experts, namely legal experts such as judges, we think it sheds light on other kinds of experts as well. For example, politicians can also be considered as a particular kind of experts, namely experts in governing. One admittedly elitist justification for an aristocratic political system goes as follows: Incumbent politicians (known experts) are better informed than the general public when it comes to selecting the next crop of politicians, and hence should be given a disproportional say in this selection process. Democracy can be at most as good as an aristocratic political system, and is often worse due to the existence of noise voters. Even in mature democracies such as the U.S., many subtle details of their political institutions were put into places with the purpose of lending elites a hand to contain or reverse potential damages inflicted by these noise voters.[21] Our theory, however, shows that these ill-informed, non-deferential noise voters can cut both ways. While they make worse selections *ex post*, their presence “shakes things up”, so much so that political elites do not become too out of sync with the general public.

Appendix A: Proof of Lemma 1

Fix all parameters except for λ. Suppose $\Delta > 0$. Consider a period-t law student i who has a degenerate belief about his presiding judge’s body of knowledge at k_J. We want

[21] For example, in the U.S., in a presidential election, an elector representing a particular state does not need to vote for the candidate who wins that state. In the Democratic Party, party elites are also designated as super-delegates, and wield special voting power in the Democratic National Convention.

to show that there exist $\overline{\lambda}$ such that, as long as $\lambda < \overline{\lambda}$, a period-$t$ law student i's payoff function is strictly concave in k_i over a *relevant range*, regardless of his competence, θ_i, and his opponent-lawyer's competence and body of knowledge, θ_j and k_j. Strict concavity over this relevant range will then be preserved after taking expectation over $(\theta_i, \theta_j, k_j)$ with respect to his belief.

Suppose $k_J < z_{t+1}$ (the case for $k_J > z_{t+1}$ is symmetric, and the case for $k_J = z_{t+1}$ is trivial, and hence both will be omitted). Then, as argued in the main text, the law student would choose k_i only from the interval $[k_J, z_{t+1}]$, and hence this interval is his relevant range.

Fix $(\theta_i, \theta_j, k_j)$. The law student's payoff function is

$$\begin{aligned}
U &= P \times (1 + \Delta W) \\
&= \left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\theta_j + \delta \exp\left(-\lambda(k_i - k_J)\right) - \delta \exp\left(-\lambda|k_j - k_J|\right)\right]\right) \\
&\quad \times \left(1 + \Delta\left[\beta\theta_i - \sigma\left(z_{t+1} - k_i\right)^2\right]\right).
\end{aligned}$$

Differentiating U twice, we have:

$$\begin{aligned}
\frac{dU}{dk_i} &= \left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\theta_j + \delta \exp\left(-\lambda(k_i - k_J)\right) - \delta \exp\left(-\lambda|k_j - k_J|\right)\right]\right) \times 2\Delta\sigma(z_{t+1} - k_i) \\
&\quad - a\delta\lambda \exp\left(-\lambda(k_i - k_J)\right) \times \left(1 + \Delta\left[\beta\theta_i - \sigma\left(z_{t+1} - k_i\right)^2\right]\right)
\end{aligned}$$

and

$$\begin{aligned}
\frac{d^2U}{dk_i^2} &= a\delta\lambda^2 \exp\left(-\lambda(k_i - k_J)\right) \times \left(1 + \Delta\left[\beta\theta_i - \sigma\left(z_{t+1} - k_i\right)^2\right]\right) \\
&\quad - 4a\delta\lambda \exp\left(-\lambda(k_i - k_J)\right) \Delta\sigma(z_{t+1} - k_i) \\
&\quad - \left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\theta_j + \delta \exp\left(-\lambda(k_i - k_J)\right) - \delta \exp\left(-\lambda|k_j - k_J|\right)\right]\right) \times 2\Delta\sigma \\
&< a\delta\lambda^2 \times (1 + \Delta\beta\theta_h) \\
&\quad - 0 - \left(\frac{1}{2} - a\left[\alpha(\theta_h - \theta_l) + \delta\right]\right) \times 2\Delta\sigma. \qquad (10)
\end{aligned}$$

Note that, given our maintained assumption that $\delta + \alpha(\theta_h - \theta_l) < 1/2$, the last term in

(10) is strictly negative. Therefore, $d^2U/dk_i^2 < 0$ as long as

$$\lambda < \overline{\lambda} := \sqrt{\frac{\left(\frac{1}{2} - a\left[\alpha(\theta_h - \theta_l) + \delta\right]\right) \times 2\Delta\sigma}{a\delta \times (1 + \Delta\beta\theta_h)}}.$$

Since the threshold $\overline{\lambda}$ is independent of $(\theta_i, \theta_j, k_j)$, strict concavity is preserved after taking expectation over $(\theta_i, \theta_j, k_j)$.

Appendix B: Proof of Proposition 2

The first half of the Proposition has been proved in the main text. Here we prove the comparative statics results.

Rewrite (7) as

$$c^* = \frac{-\sigma + \sqrt{A}}{2a\delta\sigma\lambda e^{-\lambda\zeta}},$$
$$\text{where} \quad A = \sigma^2 + 4\left(a\delta\lambda e^{-\lambda\zeta}\right)^2 \sigma\left(1/\Delta + \beta\overline{\theta}\right).$$

Note that β, $\overline{\theta}$, and Δ appear only in the numerator of (7). It is straightforward to see that c^* is increases in β and $\overline{\theta}$, and decreases in Δ. Here, we calculate $\partial c^*/\partial\beta$ and $\partial c^*/\partial\overline{\theta}$ for future reference:

$$\frac{\partial c^*}{\partial \beta} = \frac{a\delta\lambda e^{-\lambda\zeta}}{\sqrt{A}} \cdot \overline{\theta}, \tag{11}$$
$$\frac{\partial c^*}{\partial \overline{\theta}} = \frac{a\delta\lambda e^{-\lambda\zeta}}{\sqrt{A}} \cdot \beta. \tag{12}$$

Note that $A > \sigma^2$, and that $\partial A/\partial a = 2\left(A - \sigma^2\right)/a$. Therefore,

$$\frac{\partial c^*}{\partial a} = \frac{1}{2\delta\sigma\lambda e^{-\lambda\zeta}a^2}\left[\frac{A - \sigma^2}{\sqrt{A}} - \left(-\sigma + \sqrt{A}\right)\right]$$
$$= \frac{1}{2\delta\lambda e^{-\lambda\zeta}a^2}\left(1 - \frac{\sigma}{\sqrt{A}}\right) > 0. \tag{13}$$

Note that δ and ζ affect c^* in the opposite fashion. Therefore, it suffices to study only one of them. Using

$$
\begin{aligned}
\frac{\partial A}{\partial \zeta} =& 4\,(a\delta\lambda)^2\,\sigma\left(1/\Delta+\beta\overline{\theta}\right)2e^{-\lambda\zeta}(-\lambda)e^{-\lambda\zeta}\\
=& 4\left(a\delta\lambda e^{-\lambda\zeta}\right)^2\sigma\left(1/\Delta+\beta\overline{\theta}\right)(-2\lambda)\\
=& 2\lambda\left(\sigma^2-A\right),
\end{aligned}
$$

we obtain

$$
\begin{aligned}
\frac{\partial c^*}{\partial \zeta} &= \frac{1}{2a\delta\lambda\sigma\left(e^{-\lambda\zeta}\right)^2}\left[\frac{2\lambda\left(\sigma^2-A\right)e^{-\lambda\zeta}}{2\sqrt{A}}+\lambda e^{-\lambda\zeta}\left(-\sigma+\sqrt{A}\right)\right]\\
&= \frac{\sigma/\sqrt{A}-1}{2a\delta e^{-\lambda\zeta}}<0.
\end{aligned}
$$

Finally, note that $\partial A/\partial\sigma=(A+\sigma^2)/\sigma$. Therefore,

$$
\begin{aligned}
\frac{dc^*}{d\sigma} &= \frac{1}{2a\delta\lambda e^{-\lambda\zeta}\sigma^2}\left[\left(-1+\frac{\partial A/\partial\sigma}{2\sqrt{A}}\right)\sigma-\left(-\sigma+\sqrt{A}\right)\right]\\
&= \frac{1}{2a\delta\lambda e^{-\lambda\zeta}\sigma^2}\left[\frac{A+\sigma^2}{2\sqrt{A}}-\sqrt{A}\right]\\
&= \frac{1-\left(\sqrt{A}/\sigma\right)^2}{4a\delta\lambda e^{-\lambda\zeta}\sqrt{A}}<0.
\end{aligned}
\tag{14}
$$

Appendix C: Proof of Proposition 3

The comparative statics results regarding αV, Δ, ζ, and δ have been explained in the main text. Here we prove those regarding σ, β, and $\overline{\theta}$.

Using (11), (12), and (14), we have:

$$
\begin{aligned}
\frac{\partial \mathbb{E}W}{\partial \sigma} &= -(c^*)^2 - 2\sigma c^* \frac{\partial c^*}{\partial \sigma} \\
&\propto -\frac{-\sigma + \sqrt{A}}{2a\delta\sigma\lambda e^{-\lambda\zeta}} - 2\sigma \frac{1 - \left(\sqrt{A}/\sigma\right)^2}{4a\delta\lambda e^{-\lambda\zeta}\sqrt{A}} \\
&\propto 1 - \frac{\sigma}{\sqrt{A}} > 0; \\
\frac{\partial \mathbb{E}W}{\partial \beta} &= \overline{\theta} + 2a\alpha V - 2\sigma c^* \frac{\partial c^*}{\partial \beta} \\
&= \overline{\theta} + 2a\alpha V - \frac{-\sigma + \sqrt{A}}{\sqrt{A}} \cdot \overline{\theta} \\
&= \frac{\sigma\overline{\theta}}{\sqrt{A}} + 2a\alpha V > 0; \\
\text{and} \quad \frac{\partial \mathbb{E}W}{\partial \overline{\theta}} &= \beta - 2\sigma c^* \frac{\partial c^*}{\partial \overline{\theta}} \\
&= \beta - \frac{-\sigma + \sqrt{A}}{\sqrt{A}} \cdot \beta \\
&= \frac{\sigma\beta}{\sqrt{A}} > 0.
\end{aligned}
$$

Appendix D: Proof of Proposition 4

[to be completed]

From (9), we have

$$\frac{\partial \mathbb{E}W}{\partial a} = 2\beta\alpha V - \sigma \frac{\partial c^{*2}}{\partial a}.$$

Since $2\beta\alpha V > 0$, to prove that $a^* > 0$, it suffices to prove that

$$\lim_{a \searrow 0} \frac{\partial c^{*2}}{\partial a} = 0. \tag{15}$$

Since $\frac{\partial c^{*2}}{\partial a} = 2c^* \frac{\partial c^*}{\partial a}$ and $\lim_{a \searrow 0} c^* = 0$, to prove (15), it suffices to prove that $\lim_{a \searrow 0} \frac{\partial c^*}{\partial a} < \infty$.

Using $\partial A / \partial a = 2\left(A-\sigma^2\right)/a$, we have

$$
\begin{aligned}
\lim_{a \searrow 0} \frac{\partial c^*}{\partial a} &= \frac{1}{2\delta\lambda e^{\lambda\zeta}} \cdot \lim_{a \searrow 0} \frac{\sqrt{A}-\sigma}{a^2\sqrt{A}} \\
&= \frac{1}{2\delta\lambda e^{\lambda\zeta}} \cdot \frac{1}{\sigma} \cdot \lim_{a \searrow 0} \frac{\sqrt{A}-\sigma}{a^2} \\
&= \frac{1}{2\delta\lambda e^{\lambda\zeta}} \cdot \frac{1}{\sigma} \cdot \lim_{a \searrow 0} \frac{\partial\sqrt{A}/\partial a}{2a} \\
&= \frac{1}{2\delta\lambda e^{\lambda\zeta}} \cdot \frac{1}{\sigma} \cdot \lim_{a \searrow 0} \frac{2\left(A-\sigma^2\right)}{4a^2\sqrt{A}} \\
&= \frac{1}{2\delta\lambda e^{\lambda\zeta}} \cdot \frac{1}{\sigma} \cdot \frac{1}{2\sigma} \cdot 4\left(\delta\lambda e^{-\lambda\zeta}\right)^2 \sigma \left(1/\Delta + \beta\overline{\theta}\right) < \infty,
\end{aligned}
$$

where the third equality makes use of L'Hospital Rule.

Since c^* is strictly increasing in a, c^* at $a = 1$ is strictly larger than c^* at $a = 0$. Therefore, when αV is sufficiently small, $\mathbb{E}W$ at $a = 1$ is strictly smaller than $\mathbb{E}W$ at $a = 0$, and hence $a^* < 1$.

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Online Appendix A: Further Comparative Statics Results

In this Online Appendix, we report some further comparative statics results omitted in the main text.

Proposition 7 *Let a^* denote the (generically unique) maximizer of the equilibrium social welfare in (9). Then a^* increases in αV and Δ, and decreases in $\overline{\theta}$. When a^* is interior, it increases locally in σ and ζ, and decreases locally in δ.*

Proof: By (7) and (13),

$$\begin{aligned}\frac{\partial \mathbb{E}W}{\partial a} &= 2\beta\alpha V - 2\sigma c^* \frac{\partial c^*}{\partial a} \\ &= 2\beta\alpha V - 2\frac{\sqrt{A}\left(1-\sigma/\sqrt{A}\right)^2}{a\left(2a\delta\lambda e^{-\lambda\zeta}\right)^2}.\end{aligned} \tag{16}$$

That a^* increases in αV follows from the fact that $\partial \mathbb{E}W/\partial a$ increases in αV. Also note that A decreases in Δ and increases in $\overline{\theta}$, and that $\partial \mathbb{E}W/\partial a$ decreases in A. Therefore, a^* increases in Δ and decreases in $\overline{\theta}$.

When a^* is interior, $\mathbb{E}W$ must be locally concave in a at $a = a^*$. Partially differentiate (16) wrt a again:

$$\begin{aligned}\frac{\partial^2 \mathbb{E}W}{\partial a^2} &= \frac{\partial}{\partial a}\left\{2\beta\alpha V - 2\frac{\sqrt{A}\left(1-\sigma/\sqrt{A}\right)^2}{a\left(2a\delta\lambda e^{-\lambda\zeta}\right)^2}\right\} \\ &\propto 2 - 2\sigma/\sqrt{A} - \sigma^2/A \\ &= 2 - 2x - x^2,\end{aligned}$$

where $x = \sigma/\sqrt{A} \in (0,1)$. That $\mathbb{E}W$ is locally concave in a at $a = a^*$ means that $2-2x-x^2 \le 0$, or equivalently

$$x \geq \sqrt{3} - 1, \tag{17}$$

at $a = a^*$.

Partially differentiate (16) wrt σ, and using $\partial A/\partial\sigma = (A+\sigma^2)/\sigma$, we have:

$$\begin{aligned}
\frac{\partial}{\partial\sigma}\frac{\partial \mathbb{E}W}{\partial a} &= \frac{\partial}{\partial\sigma}\left\{2\beta\alpha V - 2\frac{\sqrt{A}\left(1-\sigma/\sqrt{A}\right)^2}{a\left(2a\delta\lambda e^{-\lambda\zeta}\right)^2}\right\} \\
&\propto -\frac{\partial}{\partial\sigma}\sqrt{A}\left(1-\frac{\sigma}{\sqrt{A}}\right)^2 \\
&= 2 - \frac{1}{2\sqrt{A}}\cdot\left(\frac{A+\sigma^2}{\sigma}\right) - \frac{1}{A}\left[2\sigma\sqrt{A} - \frac{\sigma^2}{2\sqrt{A}}\cdot\left(\frac{A+\sigma^2}{\sigma}\right)\right] \\
&\propto 2x - 2x^2 + \frac{x^4}{2} - \frac{1}{2} \\
&=: H(x).
\end{aligned}$$

To show that a^*, if interior, is locally increasing in σ, it suffices to show that $H(x) \geq 0$ for any x satisfying (17). Note that

$$\begin{aligned}
& H'(x) = 2 - 4x + 2x^3 \\
\text{and}\quad & H'''(x) = 12x.
\end{aligned}$$

In the range of $x > 0$, we have $H'(x) > 0$, and hence $H'(x)$ is strictly convex. Strict convexity implies strict quasi-convexity, and hence

$$\begin{aligned}
\forall x \in \left(\sqrt{3}-1, 1\right), \qquad H'(x) &< \max\left\{H'\left(\sqrt{3}-1\right), H(1)\right\} \\
&= \max\left\{8\sqrt{3}-14, 0\right\} = 0.
\end{aligned}$$

Therefore, $H(x)$ is decreasing at any $x \in \left(\sqrt{3}-1, 1\right)$. Together with $H\left(\sqrt{3}-1\right) = 7/2 - \sqrt{3} > 0$ and $H(1) = 0$, we conclude that $H(x) > 0$ for any $x \in \left[\sqrt{3}-1, 1\right)$. This completes the proof that a^*, if interior, is locally increasing in σ.

Finally, note that δ and ζ affect $\partial\mathbb{E}W/\partial a$ in (16) in the opposite fashion. Therefore, it suffices to study only one of them. Partially differentiate (16) wrt δ, and using $\partial A/\partial\delta =$

$2(A-\sigma^2)/\delta$, we have:

$$\begin{aligned}
\frac{\partial}{\partial\zeta}\frac{\partial \mathbb{E}W}{\partial a} &= \frac{\partial}{\partial\zeta}\left\{2\beta\alpha V - 2\frac{\sqrt{A}\left(1-\sigma/\sqrt{A}\right)^2}{a\left(2a\delta\lambda e^{-\lambda\zeta}\right)^2}\right\} \\
&\propto -\frac{\partial}{\partial\delta}\frac{\sqrt{A}\left(1-\sigma/\sqrt{A}\right)^2}{\delta^2} \\
&\propto 2\left(\sqrt{A}-2\sigma+\frac{\sigma^2}{\sqrt{A}}\right)-\frac{\delta}{2\sqrt{A}}\left(1-\frac{\sigma^2}{A}\right)\frac{2\left(A-\sigma^2\right)}{\delta} \\
&\propto -2x+2x^2-\frac{x^4}{2}+\frac{1}{2} \\
&= -H(x).
\end{aligned}$$

Therefore, by the earlier analysis, when a^* is interior, we must have a^* locally decreasing in δ and locally increasing in ζ. ∎

Online Appendix B: Off-Steady-State Equilibrium Dynamics

In this Online Appendix, we solve for the off-steady-state equilibrium dynamics. Such off-steady-state equilibrium dynamics can be described by the mapping $T : c_t \mapsto c_{t+1}$, where $c_t = z_t - k_{t-1}$ is the equilibrium conservatism of period-t judges. We focus on the interesting case of $a > 0$ and $\Delta > 0$.[22]

Consider a typical period-t law student i. His problem is to pick k_i to maximize (3), taking into account that, in his assigned litigation, the presiding judge's body of knowledge will be k_{t-1}, and his opponent-lawyer's body of knowledge will be k_t. That is, his problem is to pick k_i to maximize

$$\begin{aligned}
&\mathbb{E}_{\theta_i}\mathbb{E}_{\theta_j} P \times (1 + \Delta W) \\
= &\mathbb{E}_{\theta_i}\left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\overline{\theta} + \delta\exp(-\lambda|k_i - k_{t-1}|) - \delta\exp(-\lambda|k_t - k_{t-1}|)\right]\right) \\
&\times\left(1 + \Delta\left[\beta\theta_i - \sigma\left(z_{t+1} - k_i\right)^2\right]\right).
\end{aligned} \tag{18}$$

The first derivative of (18) at his equilibrium choice, $k_i = k_t$, is

$$\begin{aligned}
&\mathbb{E}_{\theta_i}\left[\left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\overline{\theta} + \delta\exp(-\lambda(k_i - k_{t-1})) - \delta\exp(-\lambda|k_t - k_{t-1}|)\right]\right)(2\Delta\sigma(z_{t+1} - k_i))\right. \\
&\left. -a\delta\lambda\exp(-\lambda(k_i - k_{t-1}))\left(1 + \Delta\left[\beta\theta_i - \sigma(z_{t+1} - k_i)^2\right]\right)\right] \\
= &\Delta\sigma(z_{t+1} - k_t) - a\delta\lambda\exp(-\lambda(k_t - k_{t-1}))\left(1 + \Delta\left[\beta\overline{\theta} - \sigma(z_{t+1} - k_t)^2\right]\right)
\end{aligned} \tag{19}$$

for the case of $k_{t-1} \leq k_t \leq z_{t+1}$, and is

$$\begin{aligned}
&\mathbb{E}_{\theta_i}\left[\left(\frac{1}{2} + a\left[\alpha\theta_i - \alpha\overline{\theta} + \delta\exp(\lambda(k_i - k_{t-1})) - \delta\exp(-\lambda|k_t - k_{t-1}|)\right]\right)(2\Delta\sigma(z_{t+1} - k_i))\right. \\
&\left. +a\delta\lambda\exp(\lambda(k_i - k_{t-1}))\left(1 + \Delta\left[\beta\theta_i - \sigma(z_{t+1} - k_i)^2\right]\right)\right] \\
= &\Delta\sigma(z_{t+1} - k_t) + a\delta\lambda\exp(\lambda(k_t - k_{t-1}))\left(1 + \Delta\left[\beta\overline{\theta} - \sigma(z_{t+1} - k_t)^2\right]\right)
\end{aligned} \tag{20}$$

for the case of $z_{t+1} \leq k_t \leq k_{t-1}$.[23]

[22] In the case of $a = 0$ and $\Delta > 0$, the unique equilibrium is $k_t = z_{t+1}$ for every t. In the case of $a > 0$ and $\Delta = 0$, all equilibria feature $k_t = k_{t-1}$ for every t.

[23] More precisely, if $k_t = k_{t-1}$, then (19) and (20) are the right and left derivatives, respectively, of (18) at $k_i = k_t$.

To characterize the mapping $T : c_t \mapsto c_{t+1}$, we can wlog restrict our attention to the sub-domain of $[-\bar{c}, \bar{c}]$, where $\bar{c} := \sqrt{\left(1 + \Delta\beta\overline{\theta}\right)/\Delta\sigma}$. To see this, note that the first derivative (19) will be strictly positive if $k_t < z_{t+1} - \bar{c}$, and hence such a k_t cannot arise in equilibrium. Similarly, the first derivative (20) will be strictly negative if $k_t > z_{t+1} + \bar{c}$, and hence such a k_t cannot arise in equilibrium either. Therefore, $T(c_t) \in [-\bar{c}, \bar{c}]$, and we can wlog restrict our attention to the sub-domain of $[-\bar{c}, \bar{c}]$.

It should be obvious that the mapping $T : c_t \mapsto c_{t+1}$ is "symmetric" around the point $c_t = -\zeta$, in the sense that $T(-\zeta + x) = -T(-\zeta - x)$. The reason is that, when period-t law students choose their bodies of knowledge, the only relevant information for them is whether k_{t-1} is on the left or on the right of z_{t+1}, and how far they are from each other. The case with k_{t-1} on the left of z_{t+1} corresponds to $c_t < -\zeta$, and that with k_{t-1} on the right of z_{t+1} corresponds to $c_t > -\zeta$. Equilibrium behavior of period-t law students is symmetric across these two cases.

Therefore, to characterize the mapping $T : c_t \mapsto c_{t+1}$, it suffices to consider only the case of $c_t > -\zeta$. In this case, we have $k_{t-1} \leq k_t \leq z_{t+1}$, and hence $T(c_t) = c_{t+1} \in [0, c_t + \zeta]$. Rewrite the first derivative (19) for this case in terms of c_t and c_{t+1}, and denote it by $\Omega\left(c_{t+1}|c_t\right)$; i.e.,

$$\Omega\left(c_{t+1}|c_t\right) := \Delta\sigma c_{t+1} - a\delta\lambda \exp(-\lambda(c_t - c_{t+1} + \zeta))(1 + \Delta[\beta\overline{\theta} - \sigma c_{t+1}^2]).$$

One can readily see that c_{t+1} cannot be at the "lower corner" of 0 because $\Omega\left(0|c_t\right) < 0$. On the other hand, c_{t+1} will be at the "upper corner" of $c_t + \zeta$ if $\Omega\left(c_t + \zeta|c_t\right) < 0$.

Since

$$\Omega\left(c_t + \zeta|c_t\right) = \Delta\sigma(c_t + \zeta) - a\delta\lambda(1 + \Delta[\beta\overline{\theta} - \sigma(c_t + \zeta)^2])$$

is strictly increasing in c_t, is strictly negative at $c_t = -\zeta$, and is strictly positive at $c_t = \bar{c}$, there exists $\tilde{c} \in (-\zeta, \bar{c})$, such that c_{t+1} is at the "upper corner" of $c_t + \zeta$ for any $c_t \in (-\zeta, \tilde{c}]$, and is "interior" for any $c_t \in (\tilde{c}, \bar{c}]$.

When c_{t+1} is "interior" (i.e., when $c_{t+1} \in (0, c_t + \zeta)$), c_{t+1} is characterized by the first order condition $\Omega\left(c_{t+1}|c_t\right) = 0$. The slope of T can hence be calculated using the Implicit Function Theorem as

$$T'(c_t) = -\frac{\partial\Omega/\partial c_t}{\partial\Omega/\partial c_{t+1}}.$$

Differentiating Ω wrt c_t and c_{t+1}, respectively, we have

$$\begin{aligned}\frac{\partial\Omega}{\partial c_t} &= a\delta\lambda^2\exp\left[-\lambda(c_t - c_{t+1} + \zeta)\right]\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c_{t+1}^2\right]\right) \\ &> 0\end{aligned} \tag{21}$$

and

$$\begin{aligned}\frac{\partial\Omega}{\partial c_{t+1}} &= \Delta\sigma - a\delta\lambda^2\exp\left[-\lambda\left(c_t - c_{t+1} + \zeta\right)\right]\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c_{t+1}^2\right]\right) \\ &\qquad + a\delta\lambda\exp\left[-\lambda\left(c_t - c_{t+1} + \zeta\right)\right]2\Delta\sigma c_{t+1} \\ &> \Delta\sigma - a\delta\lambda^2\left(1 + \Delta\beta\overline{\theta}\right) \\ &> \Delta\sigma - a\delta\overline{\lambda}^2\left(1 + \Delta\beta\overline{\theta}\right) \\ &= \Delta\sigma\left[1 - \frac{1 + \Delta\beta\overline{\theta}}{1 + \Delta\beta\theta_h}\left(1 - 2a\left[\alpha\left(\theta_h - \theta_l\right) + \delta\right]\right)\right] \\ &> \Delta\sigma\left[1 - \frac{1 + \Delta\beta\overline{\theta}}{1 + \Delta\beta\theta_h}\right] \\ &> 0,\end{aligned} \tag{22}$$

where the first inequality makes use of the fact that $c_{t+1} > 0$, the second inequality follows from the maintained assumption that $\lambda < \overline{\lambda}$, with $\overline{\lambda}$ defined in Lemma 1, and the third inequality follows from the maintained assumption that $\alpha\left(\theta_h - \theta_l\right) + \delta < 1/2$. Therefore, at any $c_t \in (\tilde{c}, \overline{c}]$, we have $T'(c_t) < 0$.

We now show that, for λ sufficiently small, $T'(c_t)$ is uniformly bounded above -1 at any $c_t \in (\tilde{c}, \overline{c}]$, which will guarantee convergence to the steady state.

Specifically, suppose

$$\lambda \leq \widehat{\lambda} := \sqrt{\frac{\Delta\sigma}{2a\delta\left(1 + \Delta\beta\overline{\theta}\right)}}.$$

Then we have

$$\begin{aligned}\Delta\sigma &\geq 2a\delta\lambda^2\left(1 + \Delta\beta\overline{\theta}\right) \\ &> 2a\delta\lambda^2\exp\left[-\lambda\left(c_t - c_{t+1} + \zeta\right)\right]\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c_{t+1}^2\right]\right).\end{aligned} \tag{23}$$

Therefore,

$$
\begin{aligned}
\frac{\partial \Omega}{\partial c_t} &= a\delta\lambda^2 \exp\left[-\lambda(c_t - c_{t+1} + \zeta)\right]\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c_{t+1}^2\right]\right) \\
&< \Delta\sigma - a\delta\lambda^2 \exp\left[-\lambda(c_t - c_{t+1} + \zeta)\right]\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c_{t+1}^2\right]\right) \\
&< \Delta\sigma - a\delta\lambda^2 \exp\left[-\lambda(c_t - c_{t+1} + \zeta)\right]\left(1 + \Delta\left[\beta\overline{\theta} - \sigma c_{t+1}^2\right]\right) \\
&\qquad + a\delta\lambda \exp\left[-\lambda(c_t - c_{t+1} + \zeta)\right] 2\Delta\sigma c_{t+1} \\
&= \frac{\partial \Omega}{\partial c_{t+1}},
\end{aligned}
$$

where the first equality follows from (21), the first inequality follows from (23), and the last equality follows from (22). This implies that, for λ sufficiently small, $T'(c_t) > -1$ at any $c_t \in (\tilde{c}, \bar{c}]$. That T' is uniformed bounded above -1 then follows from the continuity of T' and the compactness of $[\tilde{c}, \bar{c}]$.

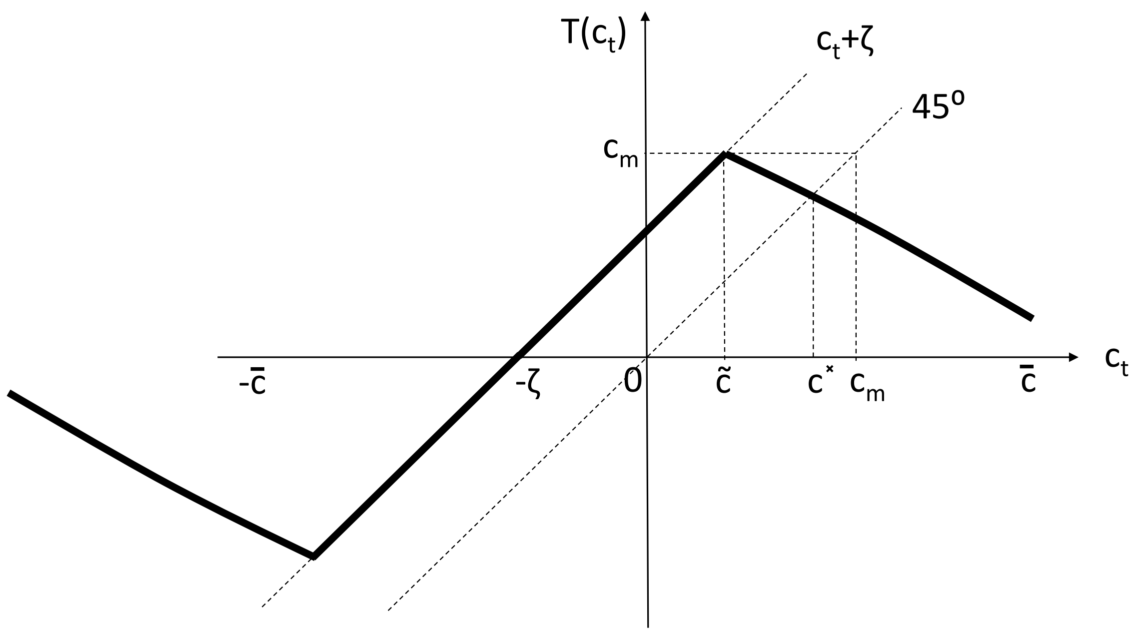

Figure 1: The mapping $T : c_t \mapsto c_{t+1}$ for $\zeta > 0$ and λ sufficiently small.

Figure 1 illustrates the mapping $T : c_t \mapsto c_{t+1}$ for $\zeta > 0$ and λ sufficiently small. For $c_t \in (-\zeta, \tilde{c}]$, $T(c_t) = c_t + \zeta$. For $c_t > \tilde{c}$, T is strictly decreasing, with T' uniformly bounded above -1. The maximum of T, denoted by c_m, is hence attained at $c_t = \tilde{c}$, which necessarily satisfies $c_m \leq \bar{c}$. Finally, we extend the mapping $T : c_t \mapsto c_{t+1}$ to the sub-domain of $c_t \leq -\zeta$

by recalling fact that T is "symmetric" around the point $c_t = -\zeta$.

Starting from any $c_0 \leq \tilde{c}$, we have $c_{t+1} \geq c_t + \zeta > c_t$. Therefore, equilibrium conservatism must eventually surpass $\tilde{c}$, but can never go above c_m. Afterward, equilibrium conservatism fluctuates around the steady-state level c^*. Convergence is guaranteed by the fact that T is a contraction mapping from $[\tilde{c}, \bar{c}]$ into itself.

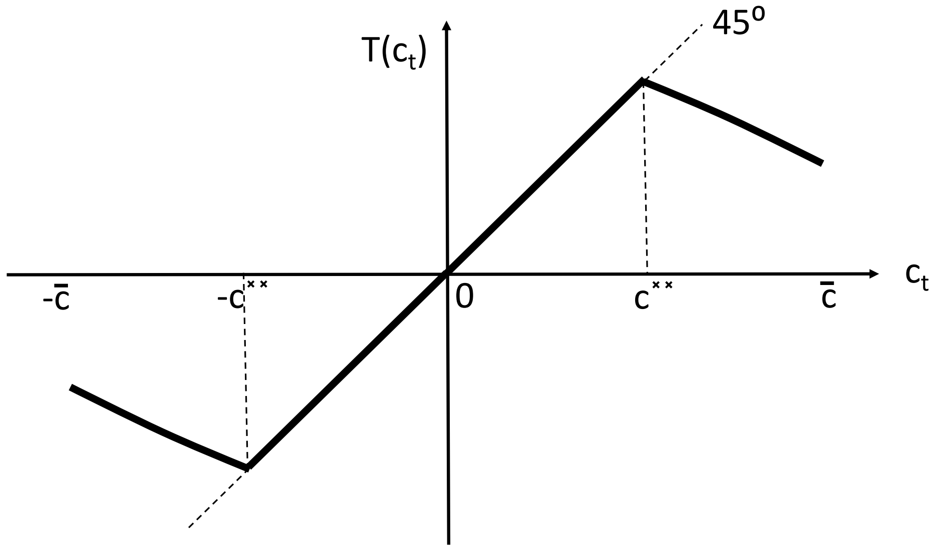

Figure 2: The mapping $T : c_t \mapsto c_{t+1}$ for $\zeta = 0$ and λ sufficiently small.

Figure 2 illustrates the mapping $T : c_t \mapsto c_{t+1}$ for $\zeta = 0$ and λ sufficiently small. For $c_t \in [-c^{**}, c^{**}]$, where $c^{**} = \lim_{\zeta \to 0} c^*$, we have $T(c_t) = c_t$. At any other c_t, T is strictly decreasing.

As shown in Figure 2, there is a continuum of steady states: starting from any $c_0 \in [-c^{**}, c^{**}]$, we have $c_t = c_0$ for every $t > 0$. On the other hand, starting from any $c_0 > c^{**}$, we have $c_1 \in (0, c^{**}]$ and $c_t = c_1$ for every $t > 1$, and hence convergence is finished in one period. Similarly for any $c_0 < -c^{**}$.

Online Appendix C: Stochastic Zeitgeist

In the main text, we assume that the *zeitgeist* changes in a deterministic manner. It goes without saying that the change of a society is usually random and unpredictable. In this appendix, we extend the model to incorporate stochastic *zeitgeist*. We will show that almost all our previous analysis carries over to this case without problem. To focus on non-trivial cases, we assume that $\Delta > 0$.

Suppose that the change in the *zeitgeist* in any given period is random. Specifically, suppose that, for any t,

$$z_{t+1} = z_t + \zeta_{t+1},$$

where ζ_{t+1} is a random shock realized at the beginning of period $t+1$; in particular, after the period-t law students have already chosen their bodies of knowledge. Given this timing, we can continue to focus on symmetric perfect Bayesian equilibria, where every period-t law student chooses the same body of knowledge k_t. For simplicity, we assume that ζ_t is i.i.d. across time, and has a positive mean $\overline{\zeta}$ and a finite variance V_ζ. We also assume that V_ζ is not too big. In particular, we assume that $V_\zeta < 1/\Delta\sigma$.

Consider a typical period-t law student i. His problem is to pick k_i to maximize the following modified version of (3), taking into account that his presiding judge's body of knowledge will be k_{t-1}, and his opponent-lawyer's body of knowledge will be k_t:

$$\begin{aligned}
&\mathbb{E}_{\theta_i,\theta_j,\zeta_{t+1}} \left\{ \left(\frac{1}{2} + a \left[\alpha\theta_i - \alpha\theta_j + \delta \exp(-\lambda|k_i - k_{t-1}|) - \delta \exp(-\lambda|k_t - k_{t-1}|) \right] \right) \right. \\
&\qquad\qquad \left. \times \left(1 + \Delta \left[\beta\theta_i - \sigma \left(z_{t+1} - k_i \right)^2 \right] \right) \right\} \\
&= \mathbb{E}_{\theta_i,\theta_j} \left\{ \left(\frac{1}{2} + a \left[\alpha\theta_i - \alpha\theta_j + \delta \exp(-\lambda|k_i - k_{t-1}|) - \delta \exp(-\lambda|k_t - k_{t-1}|) \right] \right) \right. \\
&\qquad\qquad \left. \times \left(1 + \Delta \left[\beta\theta_i - \sigma \mathbb{E}_\zeta \left(k_{t-1} + c_t + \zeta_{t+1} - k_i \right)^2 \right] \right) \right\} \\
&= \mathbb{E}_{\theta_i,\theta_j} \left\{ \left(\frac{1}{2} + a \left[\alpha\theta_i - \alpha\theta_j + \delta \exp(-\lambda|k_i - k_{t-1}|) - \delta \exp(-\lambda|k_t - k_{t-1}|) \right] \right) \right. \\
&\qquad\qquad \left. \times \left(1 + \Delta \left[\beta\theta_i - \sigma \left(c_t + \overline{\zeta} - (k_i - k_{t-1}) \right)^2 - \sigma V_\zeta \right] \right) \right\} \\
&= \left(1 - \Delta\sigma V_\zeta \right) \mathbb{E}_{\theta_i,\theta_j} \left\{ \left(\frac{1}{2} + a \left[\alpha\theta_i - \alpha\theta_j + \delta \exp(-\lambda|k_i - k_{t-1}|) - \delta \exp(-\lambda|k_t - k_{t-1}|) \right] \right) \right. \\
&\qquad\qquad\qquad \left. \times \left(1 + \tilde{\Delta} \left[\beta\theta_i - \sigma \left(c_t + \overline{\zeta} - (k_i - k_{t-1}) \right)^2 \right] \right) \right\},
\end{aligned}$$

where $\tilde{\Delta} := \Delta / \left(1 - \Delta\sigma V_\zeta \right) > 0$ given our maintained assumption that $V_\zeta < 1/\Delta\sigma$.

Note that this objective function is essentially the same as (3) except for the positive multiplicative factor $(1 - \Delta\sigma V_{\zeta})$ (which does not affect incentives) and for the replacement of Δ and ζ with $\tilde{\Delta}$ and $\overline{\zeta}$, respectively. The equilibrium dynamics of this model can hence be characterized by exactly the same mapping $T : c_t \mapsto c_{t+1}$ (with Δ and ζ replaced by $\tilde{\Delta}$ and $\overline{\zeta}$, respectively) in Online Appendix B. The way we use the mapping T to characterize the equilibrium dynamics is as follows. In each period t, law students first observe the realized *zeitgeist* z_t, and infer the realized conservatism $c_t = z_t - k_{t-1}$ using their knowledge of the equilibrium k_{t-1}. They then choose their bodies of knowledge, which in equilibrium will all be identical and will equal to $k_t = z_t + \overline{\zeta} - T(c_t)$. Their own equilibrium conservatism $c_{t+1} = z_{t+1} - k_t$, however, will be random and will not be realized until the next period; i.e., until ζ_{t+1} and hence $z_{t+1} = z_t + \zeta_{t+1}$ are realized in period $t + 1$. Given the realization of c_{t+1}, period-$(t + 1)$ law students then choose their bodies of knowledge in a similar manner.

Online Appendix D: An Alternative Model with Endogenous Social Changes

In the main text, we discuss the issue of identifying experts in a judicial context, where the nature of disputes (i.e., the *zeitgeist*) changes exogenously, and such a change carries no connotation of progress. A society changing faster is one with higher social welfare (Proposition 3), not because changes are inherently good, but rather because they tend to reduce equilibrium conservatism (Proposition 2).

In other contexts, however, the speed of social change may be a result, instead of a cause, of a good expert-selection process. A case in point is experts in academic research. A good selection process helps the society identify good junior researchers. These identified few are then promoted into positions of influence, such as editors of influential journals, who in turn help identify the next generation of good junior researchers. The society listens to the advices of these identified few, simply because they were identified by the identified few of an earlier generation. A better selection process, among other things, encourages researchers to "push the envelope" further when they choose what to do research on, which in turn generates better advises for the society, fostering faster social changes.

This raises the question of how much of our analysis relies on our assumption that social changes are exogenous instead of endogenous. In this Online Appendix, we sketch an alternative model that is more in line with the above story of academic researchers. We shall argue that the most of our results readily carry over to this alternative model.

Admittedly, building a reasonably realistic model of the academic world is a heavy undertaking, and lies beyond the scope of this paper. Here, we take a very reduced-form approach, and shall instead summarize in a few equations what may happen in many realistic models. These few equations are deliberately made very similar to those in our original model for easy comparison.

Specifically, we consider an overlapping-generations model like the one in our original model. A continuum of junior researchers enter the academic world at the beginning of a period, whose measure is assumed to be two. One half of them will be promoted at the end of the period, and become senior researchers in the next period. Each junior researcher i is born with a random competence θ_i, which is i.i.d. across agents, with domain $[\theta_l, \theta_h] \subset \mathbb{R}$, zero mean, and finite variance V.

At the beginning of any period t, each junior researcher i chooses an expertise $k_i \in \mathbb{R}$, which is a point on the real line. Let $\bar{k}_t$ denote the average of these choices among period-t junior researchers.

We assume that a period-t junior researcher i's lifetime payoff is

$$U = P \times \Psi\left(k_i - \bar{k}_{t-1}\right) - C\left(k_i - \bar{k}_{t-1}\right),$$

where P is his probability of being promoted, Ψ is the utility of being promoted, and C is the cost of research.[24,25] We assume that both Ψ and C depend on how far i "pushes the envelope" relative to yesterday's average expertise $\bar{k}_{t-1}$. We further assume that (i) for any $x \leq 0$, $\Psi(x) = C(x) = 0$, (ii) $C'(0) = 0$, and (iii) for any $x > 0$, $\Psi'(x), C'(x) > 0$ and $\Psi''(x) < 0 < C''(x)$.

We assume that P takes the same functional form as in our original model; i.e.,

$$P = \frac{1}{2} + a\left[\alpha\theta_i + \delta\exp\left(-\lambda|k_i - \bar{k}_s|\right) - \delta\exp\left(-\lambda|\bar{k}_j - \bar{k}_s|\right)\right],$$

where $a \in [0, 1]$ is a parameter controlling how aristocratic the expert-selection process is, $\bar{k}_j$ is the average expertise of i's fellow junior researchers, $\bar{k}_s$ is the average expertise of the senior researchers, and α, δ, and λ are strictly positive parameters. The interpretation is very similar to that in our original model: having an expertise further away from those of one's seniors hurts one's chance of promotion, because the seniors may mistaken someone who is less comprehensible as someone who is less competent.

We do not attempt to give a micro-foundation for the above functional forms of U and P. We conjecture that many realistic models of the academic world will arrive at something more complicated, but we also believe that most of the extra complications are not essential.

[24]We add a cost function C here to make sure that the optimal k_i remain finite even when the expert-selection process is totally noisy; i.e., even when $a = 0$. Finiteness of the optimal k_i, however, is not essential for our subsequent discussion, and in this sense the cost function C is also not essential to this model.

[25]In our original model in the main text, we refrain from introducing a similar cost function, for two reasons. First, finiteness of the optimal k_i is guaranteed even without such a cost function. Second, and more importantly, introducing a cost function would have obscured the reasons why conservatism emerges in equilibrium. By eschewing a cost function, we can more convincingly argue that conservatism arises not because catching up with the ever-changing *zeitgeist* is intrinsically costly, but because of the juniors' desire to appeal to their seniors.

Assume that $\alpha(\theta_h - \theta_l) + \delta < 1/2$, so that P is always a legitimate probability. Also assume that λ is small enough, so that an analogy of Lemma 1 holds (i.e., a junior researcher holding degenerate beliefs has a unique best response, which can be characterized by the first order condition).[26] As in our original model, we focus on symmetric perfect Bayesian equilibria where all period-t junior researchers choose the same expertise k_t. In any of these equilibria, from the perspective of a period-t junior researcher, both $\bar{k}_{t-1}$ and $\bar{k}_s$ equal to k_{t-1}, and $\bar{k}_j$ equals to k_t.

Let $\rho_t := k_t - k_{t-1}$ denote how much generation-t junior researchers have "pushed the envelope" in equilibrium. In this alternative model, unlike in our original model, ρ_t does not depend on ρ_{t-1}, and hence there is a unique equilibrium, which is also a steady-state equilibrium with $\rho_t = \rho^*$ for all t (provided an analogy of Lemma 1 holds, which we assume). The following proposition about ρ^* is analogous to Proposition 2. Its proof is also very similar to that of Proposition 2, and hence is omitted.

Proposition 8 *A steady-state equilibrium exists and is unique, with the equilibrium ρ^* strictly decreasing in a.*

As in our original model, a more aristocratic expert-selection process comes with a natural cost of more conservatism. Here, conservatism takes the form of junior researchers being unwilling to "push the envelope".

However, a more aristocratic expert-selection process has the same benefit as in our original model, namely that the average competence of senior researchers is higher. Let $\mathbb{E}\theta_s$ denote the average competence of senior researchers. Then, as in our original model, we have

$$\mathbb{E}\theta_s = 2a\alpha V,$$

which is strictly increasing in a.

In Figure 3, we trace out the combinations of ρ^* and $\mathbb{E}\theta_s$ that can be achieved when we vary the parameter a between 0 and 1. The possibility frontier is downward slopping. A more aristocratic expert-selection process (i.e., higher a) depresses ρ^* but increases $\mathbb{E}\theta_s$, whereas adding noise to the process (i.e., lower a) does the opposite.

[26] While we do not go into the details, we should note that, in order to obtain an analogy of Lemma 1, it is not enough to merely assume that λ is small enough. We also need to assume that there exists some $r < 0$ such that $\Psi''(x)/\exp(-\lambda x) < r$ for every $x > 0$. In the sequel, we shall maintain these assumptions.

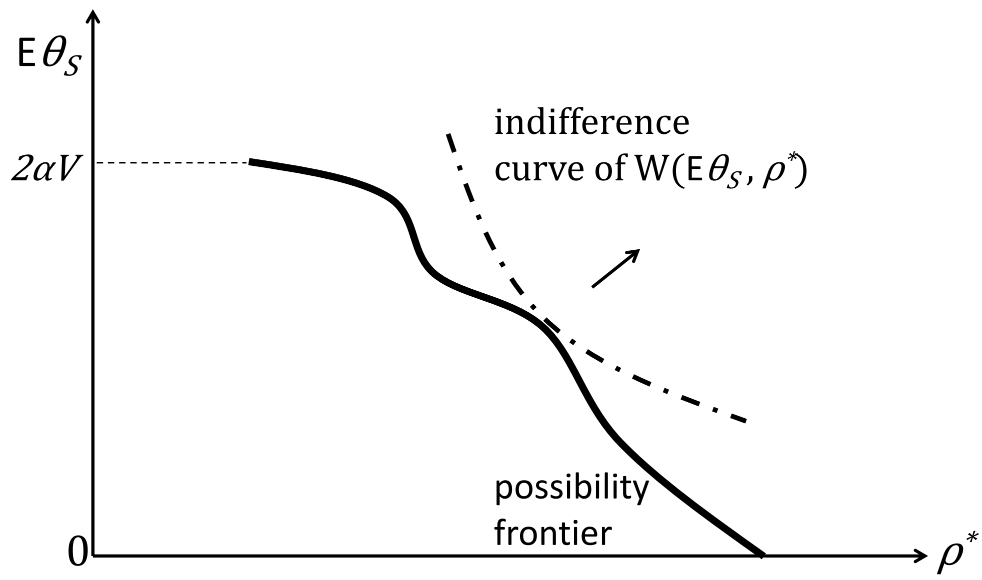

Figure 3: Optimal expert-selection process.

Imagine that both ρ^* and $\mathbb{E}\theta_s$ are important for the society, and hence social welfare, W, is an increasing function of both of them—an incompetent "expert" is as useless to the society as a competent one who does not break new ground. In Figure 3, we draw the indifference curve of an arbitrary social welfare function with such a property.

Figure 3 depicts a situation where the optimal combination of ρ^* and $\mathbb{E}\theta_s$ is one in the interior of the possibility frontier, corresponding to some interior $a^* < 1$. Whenever such a situation arises, the same time-inconsistency argument articulated in Section 6 would suggest that the society will have difficulty in implementing this optimal a^*.