

# Using the Law to Change the Custom

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## Abstract

The custom often acts as a powerful hindrance to equity-increasing changes. In this paper, we present a simple model of legal dualism in which a progressive legal reform may have the effect, under certain conditions, of shifting the conflicting custom in the direction intended by the legislator. Formal law then acts as a outside anchor that exerts a ‘magnet effect’ on the custom. We also characterize the conditions under which a moderate reform performs better than a radical one in improving the welfare of the weaker sections of the population. We illustrate our insights using examples on inheritance, marriage, and divorce issues in Sub-Saharan Africa and India.

Keywords: custom, statutory law, legal reform.

JEL codes: K40, O17, D74.

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# 1 Introduction

## 1.1 The Issue of Legal Pluralism

How the modern state deals with custom is a key issue in most developing countries. In its most general meaning, the concept of legal pluralism refers to a situation of coexistence of several law systems (Merry 1988, Griffiths 1986). In a more restrictive sense, it means the simultaneous existence of a formal legal system of statutory laws with customary principles or informal rules. The formal law may aim at either replacing or complementing the informal rule. In the latter case, legal pluralism is seen as a permanent situation and the different laws deal with separate matters: for example, the formal law regulates commercial, criminal, or constitutional aspects of human life, while civil and personal matters are governed by the local customary law. In the former case, where legal pluralism is considered as temporary, substituting the formal for the informal law may have two distinct rationales. According to the first rationale, the formal law serves the purpose of codifying and making uniform the existing customary rules and practices. In such circumstances, informal rules appear to be “the foundations on which formal rules are built” (Knight 1992: 172, North 1990). According to the second rationale, the formal law is intended to bring a change that the custom inhibits, and the two laws are thus in conflict.

Several problems arise when legal pluralism is intended to be temporary. First, there is an uncertainty about which legal system - the formal one or the custom - applies in a particular context. As pointed out by Knight (1992), the enactment of a new formal law alters the information about the equilibrium that the rule seeks to produce and lays down sanctions against behavior prescribed by the old rule. Whether the new formal law will replace the existing custom then depends on the ability of the new information and the sanctions to change the existing expectations. There are various reasons why actors might not believe that the formal law will be used. The expectations formed in the past may be too persistent to give way to new ones. The new rule may be ambiguous, being subject to multiple interpretations that are sorted out through the experience of time (Cooter 1991: 773). Finally, there is uncertainty as to whether sanctions under the new rule will actually be enforced (Knight 1992: 185-186, Fafchamps 2004: 29-30).

When change in expectations does not take place because of these reasons, customary rules tend to persist and formal laws destined to replace them remain ‘dead letter’. In the institutions-as-equilibria paradigm, the new law is not recognized as an institution because a certain representation becomes an institution only if the agents mutually believe in it. In other words, the new law must be a focal point in order to replace the prevailing custom (Aoki 2001: 13, Greif 2006: 3-53, Basu 2000: 111-15).<sup>1</sup> For instance, laws which have been enacted in Sub-Saharan Africa with the aim of preventing excessive fragmentation of rural landholdings—whether through inheritance or through land sale transactions—have never been enforced. This is caused not so much by people’s ignorance of the law as by their widespread belief that, since it runs counter to deeply entrenched customary principles (such as the rights of all male children to receive a portion of the family land), it is unlikely to be followed by others or backed by appropriate sanctions (André and Platteau

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<sup>1</sup>Note that the same type of problem may arise when a foreign statutory law is imported to replace an existing domestic legislation. As argued by Berkowitz et al. (2003), transplanting formal law imported from abroad will not, alone, alter the behavior of agents. The effects of legal transplants depend on their acceptance and internalization (see, e.g. Pistor and Wellons 1999, Pistor et al. 2003).

1998). In countries where the law forbids marriage payments (e.g., the Ivory Coast, Gabon, Central African Republic for brideprices, and India for dowries), or sets a minimum marriage age for girls, people continue to follow the custom thus ignoring the law (Ntampaka 2004: 128-30). In Peru, the new water law ("*ley del agua*") that prescribes fee payments by users of irrigation water meets fierce opposition from members of Andean communities. According to a deep-rooted custom, water is a communal good that should remain free.<sup>2</sup>

An alternative problem is that individuals enjoying an informational advantage may manoeuvre multiple legal frameworks for their own benefit (Moore 1978). A striking example of this manipulation concerns the application of laws providing for formal land rights or titles. Experience with land registration and titling schemes has shown that well-informed, powerful and educated individuals often succeed in manipulating the customary law to claim large tracts of land that they then hasten to register under the freehold system of tenure (Doornbos 1975: 60-73, Glazier 1985: 231, Barrows and Roth 1989: 8, Berry 1993, Platteau 2000: 165-68, Jacoby and Minten, 2007).

The general view that emerges from the literature on legal pluralism is thus rather pessimistic: except in cases where the statutory law is grounded in customary rules, legal pluralism tends to produce neutral or negative effects (Chanock 1985, Lund 1996, 1998, Lund and Hesselning 1999, Mackenzie 1996). In the present paper, we challenge this view and try to establish the conditions under which legal pluralism and reform in the formal law produce positive effects, focusing attention on situations in which the modern law competes with the custom. More precisely, the legislator aims at improving the welfare of vulnerable sections of the population whose interests are harmed by the custom (e.g. stranger farmers, members of lower castes in India, or women in patriarchal societies)<sup>3</sup>. In such a setting, we argue that legal pluralism is potentially beneficial because the enactment of the modern law might pull the informal rule into the desired direction. We assume that the statutory law is perfectly known to all individuals and is enforceable. A third party can enforce the statutory law but only if a plaintiff brings a violation of the law to its attention. Yet a plaintiff may hesitate to do that for fear of being meted out an informal punishment.

A major implication is that from the observation that a state legislation is not uniformly applied, one may not infer that it has little influence on people's behavior and welfare. Legal pluralism may persist despite the legislator's intention of displacing informal rules and customs. Because the custom adapts under the constraint of a new legal framework -the modern law acts as an outside anchor that exerts a 'magnet effect' on the custom- legal pluralism plays a progressive role. Our setting applies to all matters related to land allocation decisions, marriage, divorce, inheritance, etc.

This analytical perspective enables us to account for an observation frequently made by social scientists outside economics: customary rules, far from being the static and rigid outcomes that economists tend to depict as stable (Nash) equilibria, are continuously evolving. Moreover, several scholars have stressed that the transformation of customs may partly occur as a result of the existence of statutory laws which have the

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<sup>2</sup>Examples can be extended to non-state agencies as well. When non-government organisations (NGOs) prescribe rules according to which land plots which they have improved for irrigation should be earmarked for women, invariably a significant portion of this land ends up being used by men.

<sup>3</sup>Thus, in Ghana, stranger farmers easily confess their distrust in informal arbitration because "chiefs will be partial" (Crook 2004: 14)

effect of conferring a stronger bargaining position on particular section(s) of the population. For instance, we are told that “local landholding systems are not the expression of an unchanging ‘traditional law’, but the fruit of a process of social change, which incorporates the effects of national legislation” (Lavigne Delville 2000: 114), or that legal support effectively adds authority to women’s voice since their land claims are thereby strengthened even though they do not necessarily resort to the formal court (Rao 2007: 312; see also Quisumbing et al., 2001; Davis, 2009). Studying the effects of Operation Barga, a program designed to implement and enforce the long-dormant agricultural tenancy laws that regulated the rights of sharecroppers in India, Banerjee et al. (2002) have found that a moderate reform of the legal contract succeeded in improving the situation of the tenants. By empowering tenants without giving them full ownership of the land, Operation Barga has opened a real way out of the status quo and enabled them to get a higher share of the additional output resulting from investment. The enhanced bargaining power of the tenants has come with the new ‘outside option’ provided as a result of the reform of the legal contract.

Scholars concerned with micro-institutional problems in poor countries in which the custom is strong often point out that solutions imposed by legislative fiat tend to have dismal results because they inevitably create misunderstandings, uncertainty and disputes. Reforming customary rules by allowing them to evolve and modernize themselves through the common law process – so that the law assimilates custom through court decisions rather than through acts of the Parliament – appears as a much more effective path of institutional change (Cooter 1991).<sup>4</sup> The central argument underlying our analysis implies an agreement with the idea that imposing rules by fiat in societies traditionally ruled by the custom is often counter-productive. Yet, at the same time, it allows for the possibility of new statutory laws that, albeit optional, compete with customs deemed to be inappropriate or inequitable. Therefore, unlike the common law approach where the modern law evolves from the adaptation of the custom within the framework of new institutions devised by the state (e.g., land courts), the “magnet effect” approach aims at compelling the custom to change under the threat of appeals to the modern court by plaintiffs belonging to marginalized groups. In this new perspective, the question arises as to how radical the modern law should be to best promote the interests of marginal groups. Thus revisiting the debate opposing reformists to revolutionaries in situations calling for social change, we show that a moderate law may be the optimal solution.

## 1.2 Review of the Literature and Structure of the Paper

Apart from the social science literature cited above, some questions related to ours have been studied by law economists. However, the existing literature of the economic analysis of law (see Posner 1998 and Cooter and Ulen 2004 for reviews) has so far not devoted much attention to the evolution of customary law induced

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<sup>4</sup>Thus, in the case of Papua New Guinea, Robert Cooter explains, the Land Disputes Settlement Act has provided a legal ground and a system of mediators and courts to resolve disputes involving land under customary ownership. The crucial point is that the land courts are bound only by the above act and custom. What Cooter argues is that the evolution of court-made property law is driven by this system because “land disputes requiring the refinement of property rights reach the courts with sufficient frequency to support the common law process”. One of the most challenging tasks facing the land courts is to find general principles behind the diversity of local customary practice and usage, and to make explicit authoritative statements on that basis (Cooter 1991: 781-799). In other words, a key problem is not only that the common law process may be quite slow, but also that there is no guarantee that it will converge toward these general principles.

by the introduction of, or changes in the formal law.<sup>5</sup> On the one hand, the current economic analysis of customary law (see Parisi 1998 for an excellent brief survey) has not studied the behavior of customary judges, concentrating more on the question of the emergence of customary norms and of the adherence of economic agents to these norms (*opinio iuris*). On the other hand, the study of custom in the shadow of existing formal law (Epstein 1998) has been conducted mainly from the normative perspective, addressing the social desirability of preserving customary practices. In contrast, this paper studies - from a positive perspective - the mechanics of evolution of customary law by explicitly modelling the behavior of customary judges and the evolution of their incentives as the formal law gets introduced or changed.

Nevertheless, insofar as we model the customary judge as a rational agent who maximizes his utility, we remain in the tradition of the economic analysis of law. We also assume that this utility arises from prestige motives (Posner 1998: 582), and from the desire to write a decision that is close to his preferences (Miceli and Cosgel 1994, Rasmusen 1994). Furthermore, as in these latter two papers, the judge faces the trade-off between writing his preferred decision and its potential reversal if one of the parties makes recourse to the formal law.

A strand of the law and economics literature that bears some resemblance to our inquiry is the analysis of alternative dispute resolution mechanisms (ADR), such as arbitration or mediation (see Mnookin 1998 for a brief survey). In this literature, the contending parties can (or sometimes must) use arbitration before appealing to a court, so as to avoid a lengthy legal process. A key assumption is that the parties can choose among several potential arbitrators (which are typically experts closely familiar with the issues involved in the dispute).<sup>6</sup>

The reality of developing countries, however, severely limits the applicability of the existing analysis of ADR. First, developed countries have achieved a high level of legal integration, and the usefulness of arbitration procedures arises from the need for less cumbersome and more private dispute settlement mechanisms. In developing countries, genuine situations of legal pluralism exist owing to the relatively recent emergence of statutory law. It is in this specific context where informal law already exists that our inquiry about the effect of the introduction of formal law makes sense. Second, contending parties cannot choose the customary judge among several alternatives. In a small village setting, there is usually a single judge, and the only alternative to him is the formal court. This implies that the competition mechanism studied by Ashenfelter (1987) cannot be easily translated into the context of developing countries.

The remainder of the paper is organized as follows. In Section 2, we present a model of legal dualism with two normative systems: the statutory law and the custom. The possibility of the former influencing the latter through threats of appeal by members of disadvantaged groups is studied in a dynamic framework. In Section 3, we consider the question of the optimal legal reform from the viewpoint of the marginalized section

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<sup>5</sup>There are analyses of the evolution of the formal common law. Gennaioli and Shleifer (2007) study how the evolution of the lawmaking by policy-motivated judges leads, because of the "washing away" of their biases, to the efficient outcome. There are no similar studies, to our best knowledge, concerning the informal rules.

<sup>6</sup>One fundamental result is the arbitrator exchangeability (Ashenfelter 1987), meaning that the arbitrators' equilibrium decisions tend to vary in an unpredictable way (i.e., such decisions are statistically exchangeable). This is because of the competitive pressure caused by the fact that both contending parties can rule out an arbitrator whose decision they expect to be unfavorable for their interests. Shavell (1995) studies the incentive effects arising when ADR is added to the formal litigation process. He shows that pre-dispute agreements to resort to ADR increases the expected utility of the parties and increases social welfare.

of the population, asking whether the most radical law is always the most favourable to its interests. Section 4 highlights a number of ways in which our model could be usefully extended. Section 5 presents and discusses a number of examples illustrating how changes in various key parameters of the model affect the manner in which conflicts are resolved in customary setups. These examples are drawn from the literature on women's rights and land tenure, particularly in the context of Sub-Saharan Africa and India. Section 6 concludes.

## 2 A Model of Legal Dualism

### 2.1 Basic assumptions

We consider a heterogeneous community in which conflicts are arbitrated by a customary authority and, possibly, by a formal judge. The former lives in the community and has, in each case, a preferred judgement which represents the community's dominant custom at the present time. In other words, the custom is modeled as a fairness standard that has come to prevail following a long term evolution that we do not try to explain. It typically aims at maintaining peace and social cohesion while upholding patriarchal norms of respectability, which explains why it is often bent towards the interests of the old elite (see, e.g., Davis, 2009). Note that the informal judge is not necessarily a single individual but may be a council composed of influential members of the community (e.g., elders, lineage heads), such as the so-called *shalish* in Bangladesh (see Davis, 2009). The community is assumed to be comprised of two groups of people, the elite and the commoners. Whereas the interests of the elite are well protected by the custom, those of the commoners tend to be ignored by it. In case of conflict between members of these two groups, the final resolution is informal - it takes place in the community - or formal - it takes place in the court. The formal judge who operates in the latter framework bases his judgement on the written law. In order to focus our analysis on the "magnet effect" of the statutory law, we also assume that people have perfect information about its content and sufficient trust in its enforceability.

Finally, villagers derive positive benefit from belonging to the local community: they participate in the production of a community-level public good, the value of which increases with the size of the group. The public good does not exclusively consist of village-level facilities but also includes a social game in which members interact with each other and enjoy positive utility from these interactions: informal mechanisms of social protection, religious celebrations, village meetings and feasts, social events and ceremonies on the occasion of births, marriages, funerals, circumcisions, etc. We assume that members who decide to leave the community stop benefiting from the community-level public good. In return, they obtain an outside option that not only varies from one individual to another but also changes with the state of the economy. In the event of a conflict, an individual who has left the community may not anymore have his case settled by the customary authority. The modern court is then the only legal framework available for dispute settlement. This assumption is fully consistent with the observation by Crook (2004) and Gedzi (2009) that, in Ghana, urban residents seek resolution of litigation cases in the formal courts only, unlike rural residents who are more likely to use indigenous forums such as chiefs or elders' courts first, before accessing the formal courts.

## 2.2 Setup of the model

Imagine a community composed of two groups of individuals labelled A (the elite) and B (the commoner). The two groups have opposing interests and are unequally represented by the custom. At each point in time, an individual becomes involved in a dispute with a member of the other group with probability  $\delta$ . For simplicity, we assume that the probability of becoming embroiled in two disputes simultaneously is negligibly small. Whenever a dispute occurs, it is first taken for mediation to a local authority whom we refer to as the ‘informal judge’, ‘mediator’ or ‘customary authority’. After the mediator has made his ruling, either party may appeal the verdict in a formal court of law. If the dispute reaches the formal court, then its ruling overrides that of the local authority. However, as attested by own field observations in rural West Africa (Senegal and Mali, in particular) or by Fenrich and Higgins (2001: 334) and Uwazie (2000: 19) in Ghana, the individual who appeals to the formal court is being meted out an informal punishment that may consist of a temporary exclusion from the benefit of community activities. The sanction is justified on the ground that airing family or community disputes in public stains the image of the family or community, thereby jeopardising the ongoing relationships and undermining the group’s cohesion (Gedzi 2009: 25). We therefore believe that the chosen game structure and timing realistically describe the situations commonly encountered in developing countries with dual legal systems, particularly in Sub-Saharan Africa.

Formally, we define a game consisting of a customary authority M and a population of a continuum of individuals represented by the set  $\mathcal{I}$  (which includes individuals from both groups A and B in the population). We denote by  $\mathcal{I}_C(t)$  the subset of individuals who remain within the community in period  $t$ . We normalise the population to a size of 1. The game is infinitely repeated, and the timing of events within each period of the game is as follows:

- (i) a stochastic variable  $\sigma_t$  is realised;  $\sigma_t$  captures the current state of the economy, which affects the outside options of community members in a manner to be defined below;
- (ii) the customary authority declares a custom  $v_t^M \in [0, 1]$ ; given that his reputation is at stake, the customary authority is able to *commit* to providing judgement in actual cases consistent with his declared position;
- (iii) each individual  $i \in \mathcal{I}_C(t-1)$  decides whether to exit or remain within the community in period  $t$ ; the decision is represented by  $e_t^i \in \{0, 1\}$ , with  $e_t^i = 1$  denoting exit;
- (iv) a binary random variable  $d_t^i$  for each  $i \in \mathcal{I}$  is realised, indicating whether an individual  $i$  is faced with a dispute (involving an individual from the other group) in period  $t$ ;
- (v) the customary authority provides arbitration for all the disputes that arise within the community in line with his previously declared position; all disputes that involve individuals outside of the community are resolved within the formal legal system;
- (vi) for each community member who becomes involved in a dispute in period  $t$  (i.e. for each  $i \in \mathcal{I}_C(t) \cap \mathcal{D}(t)$ , where  $\mathcal{D}(t) = \{i \in \mathcal{I} : d_t^i = 1\}$ ), individuals decide whether to accept the customary judgement or appeal to the formal legal system; the decision is represented by  $a_t^i \in \{0, 1\}$ , with  $a_t^i = 1$  denoting appeal of the informal or customary verdict;
- (vii) if a case is taken to the formal court, the customary authority punishes the detractor by imposing

an exogenously determined level of punishment  $p$ .

We represent the range of possible outcomes of a case by the interval  $[0, 1]$ , where an outcome of 0 is most favourable to  $A$  and 1 is most favourable to  $B$ . This interval is also the set of possible values for the custom chosen by the informal judge at stage (i) and for the verdicts given at stage (v) within each period.

Each individual has an outside option that can be taken up if he or she leaves the community. The value of the outside option to individual  $i$  in period  $t$  equals  $\sigma_t + \varepsilon^i$  where  $\sigma_t$  is public information, and  $\varepsilon^i$  is known only to individual  $i$ . We shall assume that the epsilon-values in the population are uniformly distributed between 0 and 1:

**Assumption 1:**  $\varepsilon^i \sim U[0, 1]$

In each period  $t$ , being part of the community yields a utility of  $y(n_t)$  to each participant, where  $n_t$  is the size of the community in period  $t$ . We assume that the individual benefit derived from the community level public good is increasing in the number of participants:

**Assumption 2:**  $y'(n) > 0$  and  $y''(n) < 0$  for all  $n$ .

We impose a further condition on  $y(\cdot)$  to ensure that the subgame in which community members decide whether to exit the community or remain within it for another period has a unique equilibrium (the precise role of this assumption will become clear in the subsequent subsection):

**Assumption 3:**  $y'(n) < 1$  for all  $n$ .<sup>7</sup>

We denote by  $\gamma_t^i$  the (inverse of) severity of the dispute in which person  $i$  is involved in period  $t$  (if person  $i$  is not involved in any dispute in period  $t$ , i.e.  $d_t^i = 0$ , then we set  $\frac{1}{\gamma_t^i} = 0$ )<sup>8</sup>. The severity of the dispute is unknown before it actually occurs; but the ex-ante distribution of the severity is the same for each individual and publicly known. Specifically, we make the following assumption about the distribution of  $\gamma_t^i$ :

**Assumption 4:**  $\gamma_t^i \sim U[\gamma_{\min}, \gamma_{\max}]$  for each  $i \in \mathcal{D}(t)$ , and  $E(\frac{1}{\gamma_t^i}) = 1$ .

For simplicity, we assume in this section that the formal law is applied in a consistent manner, and the judgement to be received from the formal legal system is known in advance with full certainty. Therefore,  $v_{i,t}^F = f$  for each  $i$  and  $t$ . We discuss in the next section the implications of introducing uncertainty within the formal legal system.

We assume that the stochastic variable  $\sigma_t$ , which represents the current state of the economy, follows a Markov process; i.e. all known information at time  $t$  about the future distribution of  $\sigma$  is contained within  $\sigma_t$ . Specifically, we have

**Assumption 5:**  $\sigma_t \sim Q(\sigma)$ , where  $Q(\sigma)$  is a distribution function parameterised by  $\sigma$ .

Note that, in defining stage (vii) above, we have assumed implicitly that the punishment imposed by the informal judge for appealing to the formal court is specific to the period in which this challenge to his authority occurs. In other words, punishments do not involve permanent exclusion from the community, although it can involve temporary loss of access to the community public good. An individual may choose

<sup>7</sup>The condition  $y'(n) < 1$  for all  $n$  also ensures that exit from the community is gradual. If we had assumed instead that  $y'(n) > 1$  then, starting at an equilibrium point, any improvement in outside option would cause the community to unravel immediately.

<sup>8</sup>The definition of the severity of dispute as the inverse of  $\gamma$  rather than  $\gamma$  itself is adopted for the sake of commodity. Indeed, the proof of Proposition 2 below would be more difficult with the second definition because the first derivative of the threshold value  $\bar{\gamma}$  (see infra) with respect to  $v_t^M$  would be non linear.

to leave the community in *anticipation* of future punishments but he cannot avoid a punishment that is already his due by doing so. This punishment structure has been adopted primarily for ease of analysis. If punishments were to include permanent exclusion from the community, then the composition of community members would depend not only on their outside options but also on who has previously been involved in a dispute. This can potentially make the model untractable. Although our specific modelling assumptions regarding punishments may not accurately reflect the actual practice in traditional communities, it should not affect the main insights from the analysis.

**Payoffs:** The payoffs in the game are as follows. For each person who belongs to the community, i.e. for each  $i \in \mathcal{I}_C(t)$ , the per-period utility is given by

$$u_t^i = y(n_t) + d_t^i \left\{ a_t^i \left( \frac{v_{i,t}^F - 1}{\gamma_t^i} - p \right) + (1 - a_t^i) \left( \frac{v_t^M - 1}{\gamma_t^i} \right) \right\} \quad (1)$$

The first term on the right-hand side of (1) represents the utility derived from the community public good. The term within the curly brackets represents the disutility of being involved in a dispute in period  $t$ . This disutility depends on whether or not the individual decides to appeal to the formal court. If no appeal is made, the individual receives an additional payoff of  $\left( \frac{v_t^M - 1}{\gamma_t^i} \right)$ , depending on the declared position of the customary authority on the issue (note that the numerator in this expression varies between -1 and 0, so that the best outcome from a dispute is not to incur any loss). If an appeal is made to the formal court, the individual receives  $\left( \frac{v_{i,t}^F - 1}{\gamma_t^i} - p \right)$ , which depends on the judgement received within the formal legal system, and the punishment imposed by the customary authority on the individual for seeking out this judgement.

For each person who has exited the community, i.e. for each  $i \notin \mathcal{I}_C(t)$ , the per-period utility is given by

$$u_t^i = \sigma_t + \varepsilon^i + d_t^i \left( \frac{v_{i,t}^F - 1}{\gamma_t^i} \right) \quad (2)$$

The first two terms capture the value of person  $i$ 's outside option in period  $t$ . The remaining terms are as previously explained.

The payoff of the customary authority is given by

$$u_t^M = y(n_t) + X(1 - \alpha_t) - g(v_t^M - I) \quad (3)$$

where  $\alpha_t$  represents the proportion of community members who challenge the verdict of the customary authority by seeking recourse to the formal legal system. The function  $X(\cdot)$  captures the 'prestige' of the formal judge, which is decreasing in the extent to which his authority within the community is challenged. We make the following assumptions about the shape of the prestige function:

**Assumption 6:**  $X' > 0$  and  $X'' < 0$ .

The term  $I \in [0, 1]$  represents the preferred custom of the customary authority. If his declared position and actual judgements differ from his preferred custom, he incurs a disutility equal to  $g(v_t^M - I)$ . We make the following assumptions about the function  $g(\cdot)$ :

**Assumption 7:**  $g(0) = 0$  and  $g(x) > 0$  for  $x \leq 0$ ; and  $g'' > 0$ .

The assumption of convexity for the function  $g(\cdot)$  means that his marginal disutility of deviating from his preferred custom is increasing in the distance he has already moved away from this preferred point. For ease

of exposition (and without substantial loss of generality), we assume hereafter that the preferences of the informal judge are perfectly aligned with those of individuals in group  $A$ ; i.e.  $I = 0$ . This assumption implies that only individuals within group  $B$ , who belong to socially marginal categories of the population, would have an incentive to contest the decision of the informal judge in the formal court following any dispute.

To ensure that the game has a unique equilibrium, we impose an additional condition on the model as follows:

**Assumption 8:**  $-\delta^2 y_\alpha [\ln \gamma_{\max} + \ln p]^2 - \frac{\delta}{\gamma_{\min}} \frac{1}{p} \geq 0$  where  $y_\alpha = \max_{\varepsilon \in [0,1]} y''(\varepsilon)$ .

Assumption 8 ensures that the welfare of marginalised community members does not become more sensitive to changes in the custom as the custom becomes more favourable to them.<sup>9</sup> Note that if the function  $y(\cdot)$  is strictly concave, then Assumption 8 is necessarily satisfied for some  $p$  sufficiently large.

### 2.3 Strategic Choices by Community Members and the Customary Authority

To solve for the behaviour of community members and the customary authority, we focus on Markov strategies. That is, we assume that the choices made by each depend only on parameters that describe the current state of the world, and not on the past history of actions or the time period in which the choice is being made. To be precise, the customary authority takes his position regarding the custom in the current period according to the values  $\sigma_t, n_t$  and  $f$ . As for community members, they decide whether or not to remain in the community, and whether or not to challenge a ruling made by the customary authority in period  $t$ , according to values of  $\sigma_t, n_t, f$  and the declared position of the customary authority in the current period,  $v_t^M$ . Note that individuals who have already left the community have no strategic decision to make, as they cannot re-enter the community, and their disputes can only be settled in the formal court.

We shall assume for the main analysis that community members decide whether or not to exit the community myopically, taking into consideration the benefits and costs of their choice in the current period only. (We show in Appendix B that, in a growing economy, the same strategies would constitute an equilibrium when community members are forward-looking).

**Appeal:** First let us consider the decision by a community member whether or not to appeal a verdict given by the customary authority. If an individual  $i$  is involved in a dispute of intensity  $\frac{1}{\gamma_t^i}$ , then he or she makes an appeal to the formal court if and only if

$$\frac{1}{\gamma_t^i} (f - 1) - p > \frac{1}{\gamma_t^i} (v_t^M - 1) \quad (4)$$

This condition yields a threshold value for  $\gamma$  below which individuals appeal the customary verdict, and above which they don't:

$$\bar{\gamma}(f, v_t^M) = \begin{cases} \gamma_{\min} & \text{if } \frac{f - v_t^M}{p} < \gamma_{\min} \\ \gamma_{\max} & \text{if } \frac{f - v_t^M}{p} > \gamma_{\max} \\ \frac{f - v_t^M}{p} & \text{otherwise} \end{cases}$$

Thus, we have  $a_t^i(f, v_t^M) = 1$  if  $\gamma_t^i < \bar{\gamma}(f, v_t^M)$  and  $a_t^i(f, v_t^M) = 0$  otherwise. Letting  $\alpha(f, v^M) = \delta \frac{\bar{\gamma}(f, v^M) - \gamma_{\min}}{\gamma_{\max} - \gamma_{\min}}$ , we obtain, under Assumption 4, and the Law of Large Numbers,  $\alpha_t = \alpha(f, v_t^M)$ , where  $\alpha_t$

<sup>9</sup>More specifically, it ensures that the effect of the custom on the marginal value of the community public good dominates its marginal effect on the disutility of becoming involved in a dispute as a community member.

is the fraction of marginalised community members who challenge the customary authority by making an appeal to the formal court. Note that this fraction is independent of  $\sigma_t$  and  $n_t$ .

**Exit:** An individual would choose to leave the community after the customary authority has declared his position regarding the custom and the punishment in the current period if and only if

$$\sigma_t + \varepsilon^i + \delta(f - 1) > y \left( n_{t-1} - \int_{j \in \mathcal{I}_C(t-1), j \neq i} e_t^j \right) + \delta G(f, v_t^M) \quad (5)$$

where  $G(f, v_t^M) = \int_{\gamma_{\min}}^{\bar{\gamma}(f, v_t^M)} \left( \frac{v_t^M - 1}{\gamma} \right) d\gamma + \int_{\bar{\gamma}(f, v_t^M)}^{\gamma_{\max}} \left( \frac{f-1}{\gamma} - p \right) d\gamma$ . In words,  $G(f, v_t^M)$  represents the expected utility to a community member from the resolution of a dispute, bearing in mind that he or she appeals to the formal court if and only if the intensity of the dispute exceeds  $\frac{1}{\bar{\gamma}(f, v_t^M)}$ .

The left-hand side of (5) represents the utility from the individual's outside option plus the expected (dis)utility from being involved in a dispute that is settled in the formal court. The right-hand side represents the value of the public good that a community member enjoys plus the expected (dis)utility of being involved in a dispute that may be resolved in the formal or informal system depending on whether or not the individual challenges the verdict of the customary authority.<sup>10</sup>

It is evident from (5) that the greater the number of other people who choose to leave the community, the more attractive it becomes for person  $i$  to do so as well. This gives rise to the possibility of multiple equilibria in the subgame. However, under Assumption 3, there is a unique equilibrium in the exit decision, involving a threshold value for  $\varepsilon$  above which individuals exit the community, and below which they don't.

Note that, under Assumption 1, the threshold value, which we shall call  $\bar{\varepsilon}$ , also corresponds to the size of the community. The threshold  $\bar{\varepsilon}$  will take corner values under the following conditions:

$$\bar{\varepsilon} = 1 \text{ if } \sigma_t + 1 + \delta(f - 1) \leq y(1) + \delta G(f, v_t^M) \quad (6)$$

$$\bar{\varepsilon} = 0 \text{ if } \sigma_t + 0 + \delta(f - 1) > y(0) + \delta G(f, v_t^M) \quad (7)$$

Otherwise,  $\bar{\varepsilon}$  is given, implicitly, by the following equation:

$$\sigma_t + \bar{\varepsilon} + \delta(f - 1) = y(\bar{\varepsilon}) + \delta G(f, v_t^M) \quad (8)$$

Given  $f, \sigma_t$  and the declared position of the customary authority, as represented by  $v_t^M$ , an individual  $i \in \mathcal{I}_C(t-1)$  leaves the community in period  $t$  if and only if  $\varepsilon^i > \bar{\varepsilon}(f, \sigma_t, v_t^M)$ . We define  $m_e(f, \sigma_t, n_t, v_t^M)$  as the total number of exits that occurs during period  $t$ , assuming that  $f, \sigma_t, n_t$  and  $v_t^M$  correspond, respectively, to the formal law, the realised value of the known component of the outside option, the size of the community, and the declared custom, at the beginning of the period. Therefore, we have  $m_e(f, \sigma_t, n_t, v_t^M) = \max \{0, n_t - \bar{\varepsilon}(f, \sigma_t, v_t^M)\}$ .

**Custom:** The customary authority, when declaring a position on the custom, takes into consideration not only the effect of his declaration on the community today, but also its impact on the future (size) of the community. To analyse the decisions of the customary authority, we define  $U^M(n, \sigma)$  as the expected value of the utility stream attained by the informal judge in equilibrium, if the initial community size equals  $n$  and  $\sigma$  is the initial value of the common component of the outside option.

<sup>10</sup>Bear in mind that  $\delta$  is the expected value of  $d$ :  $\delta = E(d) = \delta * 1(d=1) + (1-\delta) * 0(d=0)$

In the following, we use the convention that  $n_t$  is the size of the community at the *beginning* of period  $t$  while  $\hat{n}_t$  is the community size in the same period *after* community members have made their decision regarding the choice of exit. Therefore,  $\hat{n}_t = n_t - m_e(f, \sigma_t, n_t, v_t^M)$ ,  $n_{t+1} = \hat{n}_t$  for  $t = 1, 2, \dots, \infty$  and  $\hat{n}_1 = n$ . We have.

$$U^M(n, \sigma) = \sum_{t=1}^{\infty} \beta^{t-1} [y(n_t) + X(1 - \alpha(f, v_t^M)) - g(v_t^M - I)] \quad (9)$$

where  $v_t^M = v^{M*}(f, \sigma_t, n_t)$  corresponds to the Markov equilibrium strategy of the customary authority;  $\beta$  is the discount factor,  $\sigma_1 = \sigma$  and  $\sigma_{t+1} \sim Q(\sigma_t)$  for  $t = 1, 2, \dots, \infty$  represents the stochastic evolution of the economy thereafter. The function  $U^M(n, \sigma)$  can be written recursively as follows:<sup>11</sup>

$$U^M(n, \sigma) = \max_{v^M} y(\hat{n}) + X(1 - \alpha(f, v^M)) - g(v^M - I) + \beta EU^M(\hat{n}, \hat{\sigma}) \quad (10)$$

where  $\hat{n} = n - m_e(f, \sigma, n, v^M)$  and  $\hat{\sigma} \sim Q(\sigma)$ . From (10), we can compute that the effect on the utility of the customary authority from a small increase in  $v^M$  as follows:

$$MU(f, \sigma, n, v^M) = -y'(\hat{n}) \frac{\partial m_e}{\partial v^M} - X'(1 - \alpha(f, v^M)) \frac{\partial \alpha}{\partial v^M} - g'(v^M - I) - \beta \frac{\partial EU^M}{\partial \hat{n}} \frac{\partial m_e}{\partial v^M} \quad (11)$$

The first term  $-y'(\hat{n}) \frac{\partial m_e}{\partial v^M}$  represents the increase in the value of the community public good in the current period from reduced exits. The second term  $-X'(1 - \alpha(f, v^M)) \frac{\partial \alpha}{\partial v^M}$  represents the increase in prestige for the customary authority in the current period as a result of fewer challenges to his authority. By contrast, the third term  $-g'(v^M - I)$  represents the increase in (psychological) cost in opting for a custom that is further from his ideologically preferred point. Finally, the term  $-\beta \frac{\partial EU^M}{\partial \hat{n}} \frac{\partial m_e}{\partial v^M}$  represents the gain in future utility from fewer exits in the current period.

Note that if  $\bar{\varepsilon}(f, \sigma, v^M) = n$  for some  $v^M \in [0, 1]$ , then  $\frac{\partial m_e}{\partial v^M}$  is undefined for that value of  $v^M$ ; similarly, if  $\alpha(f, v^M) = 0$  for some  $v^M \in [0, 1]$ , then  $\frac{\partial \alpha}{\partial v^M}$  is undefined. Consequently,  $MU(f, \sigma, n, v^M)$  is undefined at such points. However, it is possible to show that, under Assumption 8,  $MU(f, \sigma, n, v^M)$  is strictly decreasing in  $v^M$  for each  $v^M \in [0, 1]$  except being undefined at a finite number of points (see Lemma 1 in Appendix A). Furthermore, since the functions  $y(\cdot)$ ,  $X(\cdot)$ ,  $g(\cdot)$ ,  $m_e(\cdot)$  and  $\alpha(\cdot)$  are continuous, so is the objective function of the customary authority. Therefore, if

$$MU(f, \sigma, n, v^M) = 0 \quad (12)$$

for some  $v^M \in [0, 1]$ , then this condition uniquely defines the optimal choice of custom for the informal authority,  $v^{M*}(f, \sigma, n)$ . If there is no  $v^M$  for which this condition is satisfied, then the optimal choice is given as follows:  $v^{M*}(f, \sigma, n) = 0$  if  $MU(f, \sigma, n, 0) < 0$  and  $v^{M*}(f, \sigma, n) = 1$  if  $MU(f, \sigma, n, 1) > 0$ ; otherwise,  $v^{M*}(f, \sigma, n)$  takes an interior value between 0 and 1 given by

$$v^{M*}(f, \sigma, n) = \sup \{v^M \in (0, 1) : MU(f, \sigma, n, v^M) > 0\} \quad (13)$$

If the solution is given by (13), it means that the custom is just progressive enough to prevent any exit from the community in the current period (therefore, we have  $\bar{\varepsilon}(f, \sigma, v^{M*}) = \bar{n}$ ) or just progressive enough to prevent any appeals to the formal court from community members (therefore, we have  $\frac{1}{p}(f - v^{M*}) = \gamma_{\max}$ ).

<sup>11</sup>The use of this recursive formulation requires that (10) satisfy Blackwell's sufficient conditions for a contraction (see Stokey and Lucas, 1989, Theorems 3.2 & 3.3). In the present instance, the conditions are easily satisfied as  $\beta < 1$  and the right-hand side of (10) is monotonic in  $U^M(\cdot)$ .

Thus, the practised custom may be defined by one of three different types of solutions which are related to one another as follows. For  $f$  and  $\sigma$  sufficiently small, all individuals would remain within the community, and the customary authority would make judgements in accordance with his preferred custom. If the formal law becomes more progressive, the customary authority may adapt the custom in the same direction to discourage community members from appealing to the formal court but, initially, the community should remain intact (here, the solution would be given by the first-order condition in (12)). If the formal law becomes sufficiently progressive, or outside options sufficiently attractive, the custom would adapt further, and just enough to dissuade exit by community members with the strongest outside options. At this stage, the solution will be described by (13). As exit becomes even more attractive, the customary authority will find it too costly to persuade all community members to remain. Those with the highest outside options will begin to leave. The solution, once again, will be given by the first order condition.

## 2.4 Comparative Statics

The characterisation of the solution in the previous section can be used to examine how the optimal strategy of the customary authority,  $v^{M*}(f, \sigma, n)$  responds to changes in various parameters.

First, it is evident that if the custom is given by a corner solution – i.e.  $v^{M*} = 0$  or  $v^{M*} = 1$  – then for small enough changes in  $f$ ,  $\sigma$  and  $n$ , the custom would not change. By contrast, if the solution is described by (12) or by (13), then a change in the formal law or in outside options would, in general, cause the customary authority to adapt. In particular, we have the following proposition:

**Proposition 1** : *Under Assumptions 1-8, we have  $\frac{\partial v^{M*}}{\partial f} \geq 0$  and  $\frac{\partial v^{M*}}{\partial \sigma} \geq 0$ .*

*Therefore, the declared custom,  $v^{M*}(f, \sigma, n)$ , is (i) (weakly) increasing in the verdict in the formal court,  $f$  and (ii) (weakly) increasing in the strength of the known component of the outside option,  $\sigma$ .*

Thus, the proposition says that the customary authority favours the commoner to a greater extent as the outside options improve, and as the formal law becomes more progressive. The intuition behind these results is as follows. As outside options improve, or the formal law becomes more progressive, the community members finds it more attractive to be outside of the community, where the formal system is their only recourse for settling disputes. As community members begin to leave because of either of these reasons, the customary authority, in order to preserve the value of the community public good, is more willing to pronounce a judgment that does not coincide with his preferred custom.<sup>12</sup>

In addition, as the formal law becomes more progressive, community members are more prone to challenge the traditional authority by appealing to the formal system. This has a direct impact on the ‘prestige’ of the customary authority. In particular, he becomes more sensitive to such appeals (a consequence of our assumption that the function  $X(\cdot)$  is concave) and, therefore, is willing to go to greater lengths – i.e. take a position on the custom that is further from his ideal – to discourage such behaviour.

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<sup>12</sup>Note that the comparative statics results discussed here depend on the assumption that the heterogeneous component of the outside option  $\varepsilon$  is uniformly distributed. Aldashev et al. (2009) shows that if the p.d.f. of the distribution is an increasing function, then the informal judge may respond to a modern law that is more favourable to the commoners by becoming more conservative in his interpretation of the custom.

In Proposition 1, we have established that if a change in the formal legal system or in economic alternatives outside the community makes exit a more attractive option for community members, then the custom evolves in the direction of the formal law. This poses an important question: would the customary authority adapt his position sufficiently in response to a change in  $f$  or  $\sigma$  to ensure that his original community remains completely intact? In the following proposition, we show that, with one exception, this is never the case: in general, some individuals, those with the highest outside options, will leave the community in favour of the modern economy and the formal law.

The exception occurs when the initial choice of custom is given by (13). In this case, we may recall, the customary authority deviates from his preferred custom just enough to ensure that the community member with the highest outside option is persuaded to remain in the community; or just enough so that the community member involved in the most severe dispute is persuaded not to appeal to the formal court. For small changes in  $f$  or  $\sigma$ , he will adapt his position just enough to preserve the status quo.

**Proposition 2** *Under Assumptions 1-8,*

(i) *if the custom is initially defined by the first-order condition (12), then*

(a) *the customary authority responds to a change in the formal legal system by less than one-for-one:  $\frac{dv_t^M}{df} < 1$ ; consequently, increasing  $f$  leads to greater exit from the community and greater appeal to the formal legal system from within the community:  $\frac{dm_{e,t}}{df} > 0$  and  $\frac{d\alpha_t}{df} > 0$ ;*

(b) *increasing  $\sigma$  leads to greater exit from the community and less appeal to the formal legal system from within the community:  $\frac{dm_{e,t}}{d\sigma} > 0$  and  $\frac{d\alpha_t}{d\sigma} < 0$ ;*

(ii) *if the custom is initially defined by (13), then*

(a) *the customary authority adapts to a change in  $f$  one-for-one and the status quo is preserved;*

(b) *if the initial custom was chosen to prevent any exit, then the custom responds positively to a change in  $\sigma$  and there is a decline in appeals to the formal court; otherwise, a small change in  $\sigma$  does not affect the custom or the community in any way.*

The first part of Proposition 2 characterises the case where the customary authority is initially equating the marginal costs and benefits in his choice of the custom. Since the cost of deviating from the ideal verdict is assumed to be convex (Assumption 7), he never finds it worthwhile to adapt his position sufficiently to maintain the status quo as exit becomes more attractive for community members (either due to an expansion of the modern economy or a progressive reform in the formal law).

By contrast, the second part of Proposition 2 characterises the case where, at the initial point, the custom is just progressive enough to prevent any exit or appeals to the formal court. Therefore, for a small change in the formal law or in outside options, it is optimal for the customary authority to adapt just enough to preserve the status quo.

Proposition 2 also describes how appeal to the formal court is affected by a change in  $f$  or  $\sigma$ . Since the custom, in general, adapts less than proportionally to a change in the formal law, this means that the

distance between the two increases as the formal law becomes more favourable to the commoners. This leads to an *increase* in appeal to the formal court from within the community. By contrast, a change in  $\sigma$  brings the custom closer to the formal law and therefore reduces appeal to the formal court by community members.

### 3 Welfare Analysis and Public Intervention

#### 3.1 The analytical argument

From the comparative statics analysis, it is evident that one positive effect of a legal reform favourable to the commoners is that it causes the custom to move in the direction of the modern law. Such a legal reform also has a direct impact on the welfare of those who find themselves outside of the community, and on those within the community who are embroiled in disputes severe enough to prompt them to challenge the authority of the informal judge. These two effects would suggest that the marginalised section of the population would always benefit from a legal reform that renders the formal law more favourable to them. However, this reasoning ignores the additional fact that the reform encourages exit from the community, thus lowering the value of the community public good for those who remain behind.

In this section, we consider the question of the optimal legal reform from the point of view of the welfare of the marginalised section of the population. We assume that there is only one opportunity to carry out such a reform. The formal model will suggest that, if feasible, it is optimal to carry out such reforms at regular intervals. In practice, however, such a policy is unlikely to be feasible in most contexts given the costs involved. This is consistent with the observation by Roland (2004) that unlike informal institutions such as social norms, values and beliefs which can evolve gradually, changes to formal political institutions are sudden and infrequent. If there is only one opportunity to carry out a legal reform, the social planner is, in essence, choosing between alternative trajectories of the custom and the community.

For the following analysis, we denote by  $\mathcal{I}_B$  and  $\mathcal{I}_{B,C}(t)$  the population of commoners, and the subset of commoners who remain within the community in period  $t$ , respectively. We have  $\mathcal{I}_B \subset \mathcal{I}$  and  $\mathcal{I}_{B,C}(t) \subset \mathcal{I}_C(t)$ . To compute the optimal choice for a legal reform, we define a per-period welfare function which sums up the per-period utility levels of all commoners in the population:

$$w(n, \sigma, v^M, f) = \int_{i \notin \mathcal{I}_{B,C}} E(\sigma + \varepsilon^i + d^i f) + \int_{i \in \mathcal{I}_{B,C}} E \left[ y(n) + d^i \max \left\{ \frac{1}{\gamma_t^i} f - p, \frac{1}{\gamma_t^i} v^M \right\} \right] \quad (14)$$

The first integral represents the sum of expected utilities of individuals outside of the community, while the second integral depicts that of community members (for the sake of erfrlegibility, we have dropped the disutility of -1 of being involved in a dispute, since this has no effect on the analysis). Note that, in defining  $w(n, \sigma, v^M, f)$ , we have given equal weight to the ‘welfare’ of each individual. Later in this section, we discuss the implications of assigning different weights to different individuals in the population; in particular, of assigning greater weight to the welfare of those with the most limited options.

The social planner should aim to maximise the discounted sum of the utility stream across all periods.

Therefore, we introduce the aggregate welfare function as follows:

$$W(n_0, \sigma_0, f) = E \sum_{t=0}^{\infty} \beta^{t-1} w(n_t, \sigma_t, v_t^M, f) \quad (15)$$

where  $n_0$  is the initial size of the community, and  $\sigma_0$  the initial value of  $\sigma$ .

If the customary authority and members of the community choose their strategies according to the Markov perfect equilibrium previously computed, we have

$$v_t^M = v^{M*}(n_t, \sigma_t, f)$$

Let  $h_t$  denote the history of  $\sigma$ -shocks upto and including period  $t$ . Given the Markov strategies adopted by each player, we can compute the size of the community in period  $t$  as a function of the initial size  $n_0$ , the initial state of the economy  $\sigma_0$ , the verdict given out in the formal legal system,  $f$ , and the history  $h_t$ . In the same manner, we can also compute  $v_t^M$  on the basis of the initial parameters of the game and the history of  $\sigma$ -shocks  $h_t$ . Hence, we write

$$\begin{aligned} n_t &= \hat{n}_t(n_0, \sigma_0, f; h_t) \\ v_t^M &= \hat{v}_t^M(n_0, \sigma_0, f; h_t) \end{aligned}$$

Therefore, the per-period level of social welfare can be written as

$$w_t = w(\hat{n}_t, \sigma_t, \hat{v}_t^M, f) \quad (16)$$

We are now in a position to determine the effect on aggregate welfare of a small change in  $f$ . Differentiating throughout (15) w.r.t.  $f$ , we obtain

$$\begin{aligned} \frac{\partial W}{\partial f} &= E \sum_{t=1}^{\infty} \beta^{t-1} \frac{dw}{df}(\hat{n}_t, \sigma_t, \hat{v}_t^M, f) \\ \implies \frac{\partial W}{\partial f} &= E \sum_{t=1}^{\infty} \beta^{t-1} \left[ \frac{\partial w_t}{\partial n_t} \frac{\partial \hat{n}_t}{\partial f} + \frac{\partial w_t}{\partial v_t^M} \frac{\partial \hat{v}_t^M}{\partial f} + \frac{\partial w_t}{\partial f} \right] \end{aligned} \quad (17)$$

The differential equation in (17) captures all the welfare-effects of a legal reform that renders the formal law more favourable to the marginalised section of the population. The first term within the square brackets on the right-hand side represents the effect on welfare of a smaller community. According to Proposition 2, any legal reform favourable to the commoners induces (weakly) some exit from the community, and this has a negative effect on the welfare of those who remain behind. Therefore, this term is weakly negative.

The second term on the right-hand side represents the effect on welfare of a custom that shifts in the direction of the formal law in response to the legal reform (Proposition 1(iii)). This effect is always positive. The third term is the direct effect on welfare of the legal reform. The direct effect is experienced by individuals involved in disputes who seek recourse in the formal legal system, whether they are situated outside of the community, or are community members, challenging the verdict of the customary authority. This effect is also positive.

Whether a ‘progressive’ shift in the formal legal system (that is, a shift favorable to the commoners) leads to improved welfare depends on the relative sizes of these three terms; and whether a radical reform is preferable to a moderate reform depends on the shapes of the functions  $X(\cdot)$ ,  $g(\cdot)$  and  $y(\cdot)$ . Nevertheless, we can establish two important facts about the social impact of a legal reform that generally hold true.

The first is that the social impact of a small increase in  $f$  is more likely to be positive in a more ‘modern’ economy, where ‘modern’ means that the value of  $\sigma$  is relatively high, such that individuals have relatively strong alternative options outside of the community. In this instance, indeed, a large fraction of the population will already have exited the community and the negative impact of a ‘progressive’ legal reform on the community public good will be felt by only a small number of individuals. Furthermore, the positive impact of a higher value of  $f$  will be felt by a large number of individuals who have joined the modern economy, and therefore resort to the formal legal system to resolve their disputes.

To see this effect formally, note that we obtain, from simplifying (14),

$$w(n_t, \sigma_t, v_t^M, f) = (1 - n_t) \left[ (\sigma_t + \delta f) + \frac{1}{2} (1 + n_t) \right] + n_t [y(n_t) + \delta G(f, v_t^M)] \quad (18)$$

Differentiating throughout (18) with respect to  $f$ , we obtain

$$\frac{\partial w}{\partial f} = (1 - n_t) \delta + n_t \left[ y'(n_t) \frac{dn_t}{df} + \delta \frac{dG}{df} \right] \quad (19)$$

For large  $\sigma_t$ , the community size  $n_t$  is small. Then, the positive effect of a change in  $f$  on individuals outside the community, as represented by the term  $(1 - n_t) \delta$ , will be large. If  $y'(\cdot)$  is bounded from above, as assumed in Assumption 3, then the net effect on community members – which may be positive or negative – will become less and less important as  $\sigma_t$  increases.

The second fact is that, even within the population of commoners, a ‘progressive’ legal reform will not affect all individuals in the same way. For those who are already in the modern economy, the effect is unambiguously positive because they benefit directly from the new, more ‘progressive’ law whereas they do not suffer from a possibly weakened community system. Those who switch to the modern economy in response to the legal reform are, in fact, exchanging the value of the community public good  $y(n_t)$  for their outside option  $\sigma_t + \varepsilon_t^i$ . Those with the highest values of  $\varepsilon_t^i$  (the heterogenous component of the outside option) within this group are, therefore, most likely to benefit from the switch. On the other hand, those who remain within the community benefit the least since they hold onto an option that has been rejected by the others. If the customary authority is reluctant to respond to the change in the formal law (behaviour which can be represented by a sharply increasing cost function  $g(\cdot)$ ), this last group of individuals may be adversely affected by the reform owing to reduced provision of the community public good that follows the others’ exit.

It follows from this discussion that, if the social planner assigns greater weight to the individuals who have the most limited options (as opposed to the equal-weight approach taken in the formal exposition above), a moderate reform may be superior to a radical reform. This is a direct implication of the fact that those individuals who have no realistic alternatives to the community benefit from a legal reform only to the extent

that the custom evolves in the same direction as the formal law, while they suffer a loss commensurate to the decrease in the provision of the community public good.

Since this last eventuality cannot be analytically proven in a fully rigorous way, it is worth exploring it with the help of the simulation technique.

### 3.2 Simulations

We make the following assumptions for the simulations. The customary authority has the prestige function  $X(n) = (2n - n^2)$  and the value of the community public good is described by  $Y(n) = \frac{1}{2}(2n - n^2)$ . To describe the disutility to the customary authority from adopting a custom that deviates from his preferred point, we consider two cases: (i)  $g_1(x) = \frac{1}{3}x^2$ , and (ii)  $g_2(x) = \frac{1}{3}x^2$  if  $x < 0.3$  and  $g(x) = 2x^2 - 0.15$  for  $x \geq 0.3$ . The second function captures the idea that the customary authority finds it very costly to deviate from his preferred point by more than 0.3 (with the range of possible verdicts represented by the unit interval  $[0, 1]$ ) and will be used to highlight a case where a radical ‘progressive’ reform can have seriously detrimental effects for community members.

The heterogeneous component of the outside option  $\varepsilon^i$  is uniformly distributed on the interval  $[-0.3, +0.3]$ . We also assume that  $\sigma$ , the known component of the outside option, is a discrete variable, taking a value from the set  $\{0.0, 0.1, 0.2, 0.3, 0.4\}$ . Moreover,  $\sigma$  retains its value from one period to the next with probability  $\frac{7}{10}$ , increases by 0.1 with probability  $\frac{2}{10}$  and declines by 0.1 with probability  $\frac{1}{10}$ ; except in the case  $\sigma = 0.1$  where it has zero probability of a decrease and retains its value with probability  $\frac{8}{10}$  and in the case  $\sigma = 0.5$  where it has zero probability of an increase and retains its value with probability  $\frac{9}{10}$ .

The customary authority has a discount factor of  $\beta = 0.8$ , and the value of the exogenous punishment, and the probability of being embroiled in a dispute, are given by  $p = 0.5$ , and  $\delta = 0.3$ , respectively.

The customary authority and the members of the community are assumed to follow the strategies described in section 2.3. The function  $U^M(n, \sigma)$  is computed using an iterative process based on the Contraction Mapping Theorem (Stokey, Lucas and Prescott, 1989; Theorem 3.2).

Figure 1 plots the evolution of the verdict in the informal court,  $v^M$ , and the size of the community following any exit,  $n$ , as  $f$  varies from 0 to 1. This is done for  $\sigma = 0.2$ , and the cost function  $g_1(x)$  defined above. It is evident that the formal legal system has an influence on the verdicts rendered by the customary authority, as described in Proposition 1(i). The figure also shows that as  $f$  increases, more and more individuals leave the community. Thus, the ‘pull’ of the law on the custom is not sufficient to induce the community member ‘at the margin’ (i.e. the one who is indifferent or nearly indifferent between remaining in and leaving the community) to stay. This result was highlighted in Proposition 2(i).

As  $f$  increases, there are two countervailing effects on the expected per-period utility of a commoner from membership in the community. He loses out in terms of the community public good as the community shrinks, but gains to the extent that the customary authority delivers a more ‘progressive’ verdict. Figure 2 depicts the net effect on his utility. In fact, we see that his welfare from community membership is always increasing in  $f$ . This relationship is sufficient to ensure that a radical legal reform, favouring the commoner, is optimal for *any* social welfare function we may consider. This is because the utility plotted in figure 2

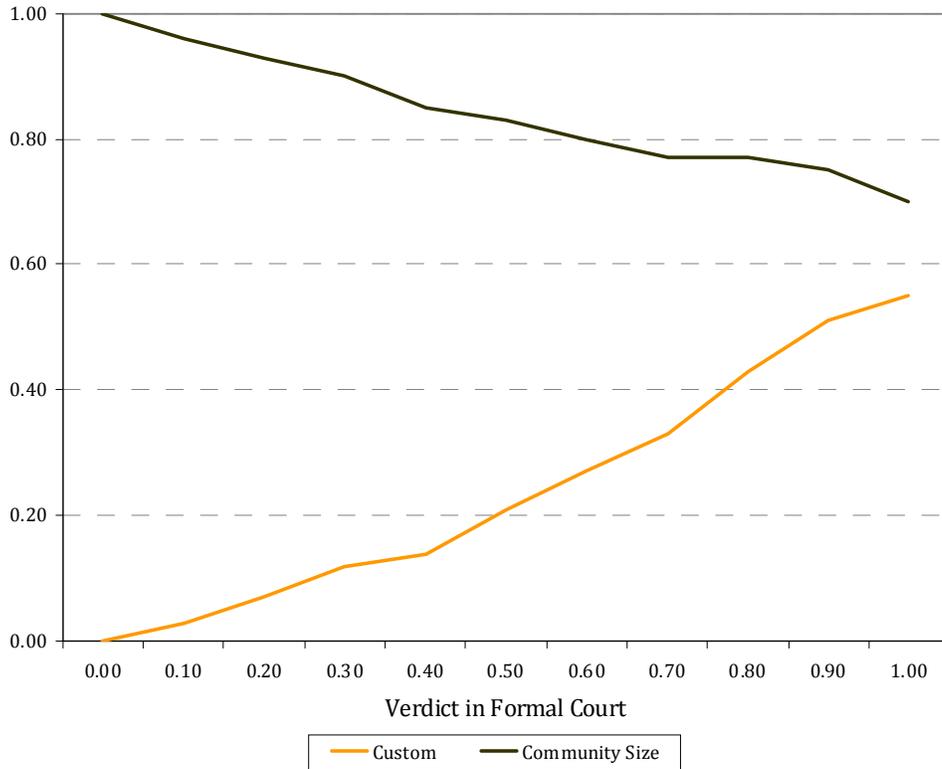


Figure 1: Impact of the formal law for the cost function  $g_1(x)$

is accessible to any commoner who is initially a member of the community, before reform begins; and any commoner who has already left the community before reforms are initiated can only gain as the formal law becomes more favourable to commoners.

However, this result can change substantially if we consider a situation where the customary authority is very reluctant – i.e. finds it very costly – to deviate from his preferred position beyond a certain limit. Figure 3 plots the verdict in the informal court,  $v^M$ , as  $f$  varies from 0 to 1, as in figure 1, but with the function  $g_2(x)$  replacing  $g_1(x)$ . As expected, the customary authority adapts the custom to changes in the formal law till  $v^M$  reaches 0.3, but adapts more gradually beyond this point (though, it should be noted, that at the point where the formal sides entirely with the commoner, at  $f = 1$ , the customary authority responds sharply to preserve the community).

Thus the commoners leave the community in large numbers as the formal law becomes increasingly ‘progressive’. Those who remain within the community lose out because of the declining value of the community public good. To the extent that the informal court is unwilling to adapt to the formal law, there is no countervailing gain. Thus, if the formal law becomes increasingly ‘progressive’, these community members experience a net loss in welfare, as shown in figure 4 .

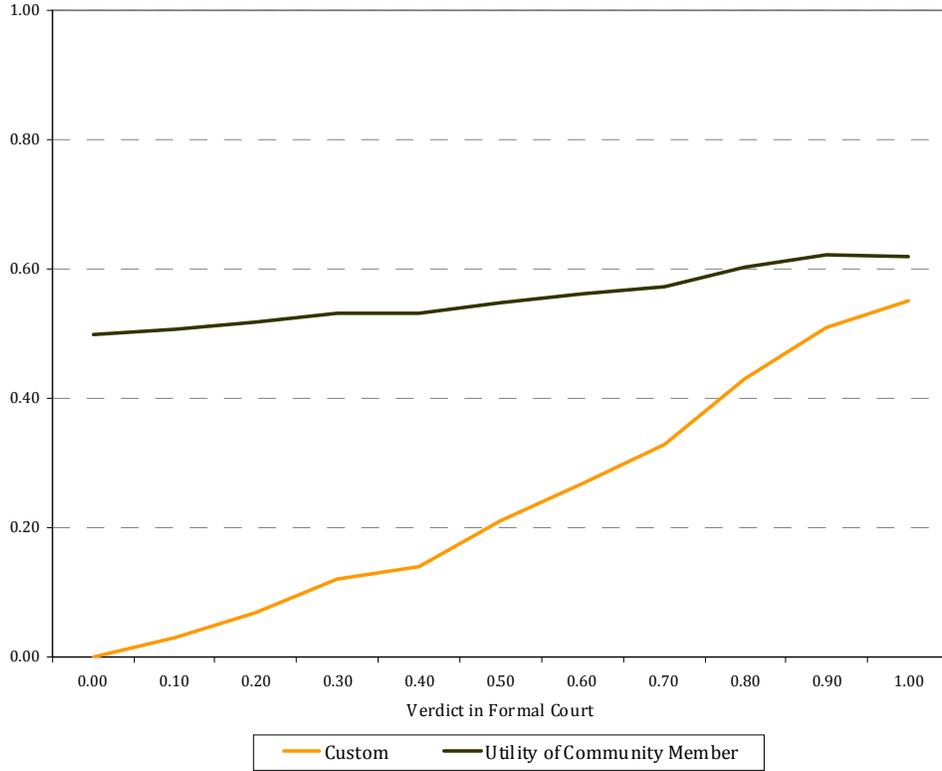


Figure 2: Impact of the formal law for the cost function  $g_1(x)$

Who are these commoners? They are those whose outside options are so poor that they would choose to remain in the community even as the formal legal system becomes radically ‘progressive’. If the social planner gives sufficient weight to their welfare (e.g. if he follows a Rawlsian approach), the implication is that a moderate reform is preferable to a radical reform.

The role of the social prestige function is equally clear. Assume that the social prestige achieved by the informal judge becomes very sensitive, say below a certain threshold, to appeals to the formal court by community members. As the modern law becomes more radical, he would then be more responsive to it as the proportion of intra-community disputes that go before the formal court exceeds this threshold and social prestige enters the sensitive region. If the informal judge only begins to respond significantly to legal reform when his influence is seriously threatened, there is a strong case for radicalism in the legal reform process.

An interesting implication of the above two results comes out when we think of a traditional setup as being simultaneously characterized by strong sensitivity of the customary authority to significant departures from the custom and to loss of social prestige due to the use of the formal legal system by community members. Whereas the latter characteristic provides ground for radical legal reform, the former points to the opposite conclusion. In other words, the existence of traditionally-minded communities does not provide

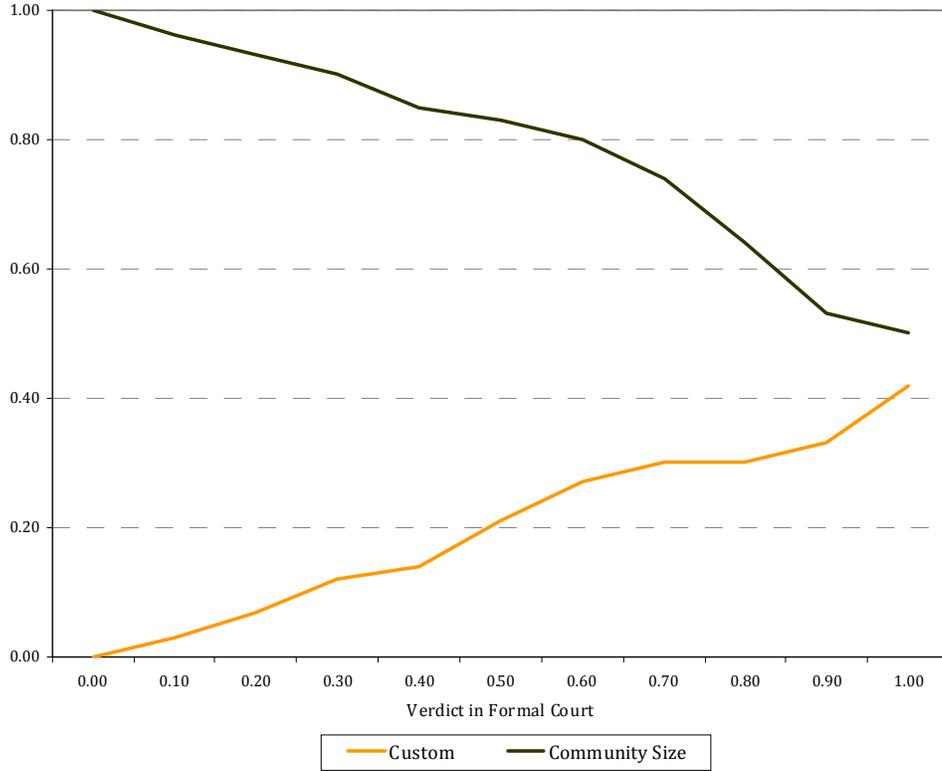


Figure 3: Impact of the formal law for the cost function  $g_2(x)$

unambiguous justification for either moderate or radical legal reform. This said, if sensitivity to departure from the custom is the dominating effect, a moderate law that does not antagonise the customary authority too much may better enhance the interest of the commoners.’

Finally, it bears noticing that if the community public good is very sensitive to community size below a certain threshold, there is a direct argument for a moderate reform. This is because a social planner guided by a Rawlsian welfare criterion would not like to cause community size to fall below this threshold: such a fall, indeed, would be very costly in terms of the welfare of the remaining community members.

## 4 Extensions

In this section, we discuss the possible extensions of the model in several directions. While we do not model these extensions explicitly, we do care about the robustness of our main results because applicability of our model for policy purposes depends on it.

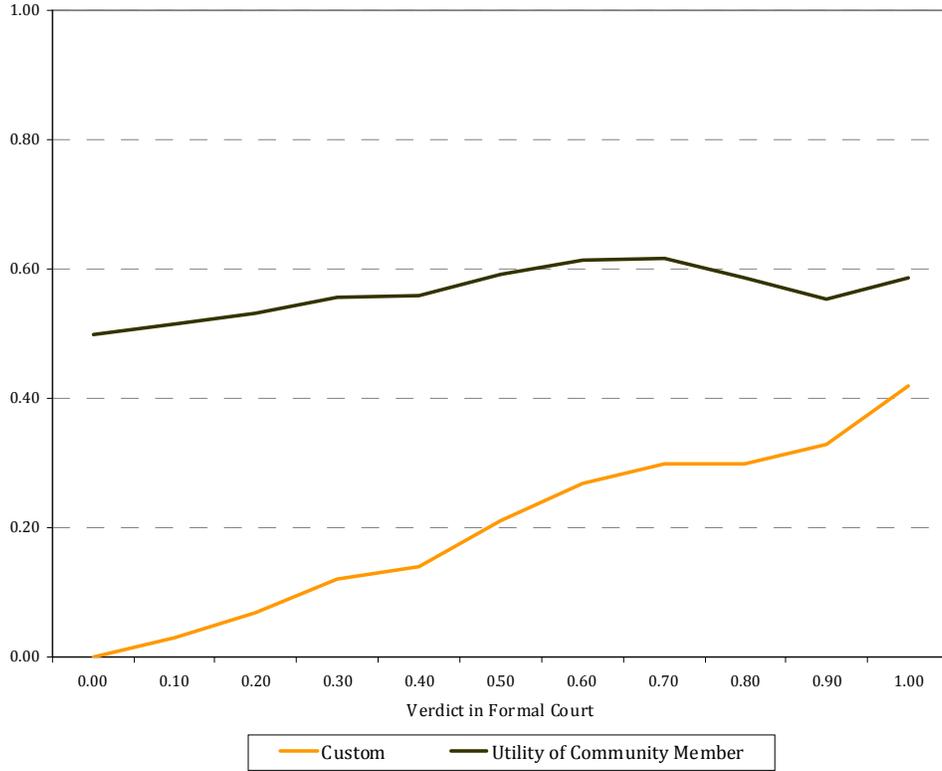


Figure 4: Impact of the formal law for the cost function  $g_2(x)$

#### 4.1 Endogenous punishments

The degree of punishment inflicted by the community on the individuals who appeal to the formal court can be made a choice variable of the informal judge. In such an extension, the informal judge would choose, at the end of each stage, the severity of punishment for that period,  $p_t \in [0, \bar{p}]$ , where  $\bar{p}$  denotes the maximum possible punishment. For tractability, it is necessary to assume that the punishments cannot be differentiated across disputes within the same period (but can be varied across periods). In this case, the informal judge's optimization problem would give rise to two Euler equations: one for the verdict (custom) and the second for the severity of punishment.

Note that the severity of punishment is orthogonal to the verdict preferences of the informal judge. The current-period payoff of the informal judge would then depend on the severity of punishment in two ways. First, a more severe punishment would reduce the share of disputes that are appealed to the formal court (which increases the prestige utility of the informal judge). Second, a more severe punishment would decrease the ex ante utility of all commoners, and therefore, would increase the share of commoners exiting the community before disputes arise (which reduces the utility of the informal judge). The future-period

payoff of this judge would only feature the (discounted) effect of punishment on exit of commoners, with his future-period utility varying inversely with the severity of current-period punishment.

Clearly, if the positive appeal-reducing effect is sufficiently small (i.e. the elasticity of appeals with respect to the severity of punishment is sufficiently low), in the within-period part of the Euler equation, the net benefit of severity of punishment would be negative. This would imply that the judge would choose the corner solution: zero punishment in every period. If, on the contrary, and more realistically, the positive appeal-reducing effect is sufficiently large, the judge would face a non-trivial inter-temporal trade-off: more severe punishment today would reduce current appeals but increase exodus from the community in the future. The exact shape of the optimal punishment path depends on precise assumptions concerning functional forms. Given that these assumptions would be arbitrary without more information about a specific context, we refrain from modelling endogenous punishments in this paper.

## 4.2 Uncertainty of formal verdicts

The modern judge's verdict is not completely predictable. There are three important sources of uncertainty: the first two have to do with verifiability problems while the third arises from the commoners' imperfect knowledge about the type of the judge.

First, there is an information problem. Quoting Robert Bates, it can be stated as follows: "Although those who impose the statutory law make efforts to inform themselves (about the case), they remain outsiders and are therefore less likely to possess detailed information than would neighbors and kin" (Bates 2001: 64; see also Davis, 2009). Since witnesses are expected to present conflicting evidence before the judge, the verdict eventually pronounced by him may well deviate from the ruling expected by the claimant on the basis of his reading of the statutory law. For example, unlike the custom that prevailed until recently in Sub-Saharan Africa, the statutory land law recognizes the right of an owner to alienate his land. Yet, local witnesses or customary authorities can render the law void by arguing that the claimant is not the genuine owner of the land that he has sold or wishes to sell. In an extreme situation, the evidence is so contradictory that the judge may decide to abdicate and refer the case back to the informal settlement procedure.

Second, the judge may have not one but several bodies of law available to him to support his decision. In other words, the situation may be more complex than the state of legal dualism depicted above. Note that legal pluralism in this sense is more frequently observed in countries with important Muslim populations. In Tanzania, for example, up until recently, inheritance was governed by different laws of succession, including customary, Islamic and statutory laws. The customary law is the most unfavourable to women and the statutory law, which tends towards giving equal recognition to women's rights, is the most favourable (the Islamic law is somewhere in between). In deciding which law should apply to a particular case, courts tend to base their judgement on what is known as the "mode-of-life test" whereby the ethnicity and religious affiliation of the heir, as well as the intent of the deceased are taken into account. As a matter of principle, customary law is applied to African Christians unless they can prove that the family had abandoned the African mode of life, in which case statutory law applies. For African Muslims, the Islamic law is applied, unless it can be proven that the deceased had other intentions (Longway 1999, as cited by Hilhorst 2000:

187).<sup>13</sup> Uncertainty clearly is present in such a situation since it is rather easy for claimants to distort information regarding their “mode of life” or the intent of the deceased. Yet, disagreement about the latter may also be genuine rather than opportunistic. In the court of Koutiala (Mali), for example, a judge explained how he dealt with the case of a woman who claimed an equal inheritance share against the will of her only brother, on the basis of the statutory law. Applying the “mode-of-life test”, he asked the brother whether he was a “good Muslim”. Since the answer was positive, he applied the Islamic law granting the plaintiff half the share of her brother (based on Verse 12 of Sourate IV of the Quran). Clearly, the plaintiff could have hoped to get a full share while the defendant could have expected her to be rebuked in the name of the custom. In Senegal, like in Mali, the lawmakers have explicitly allowed the Muslim law to be invoked in matters of inheritance because they have realized that the French-inspired statutory law is too distant from the customary law to offer a realistic alternative to it (Ntampaka 2004: 153-67).

Third, even in cases where there is a unique body of statutory laws, interpretation problems may create an uncertainty. This point is much emphasized in the literature and is known in the legal profession as the problem of the subjectivity of the judge. The flexibility of the formal law can thus be used by the judge to gain privileges for himself or to make it more congruent with his own preferences and values. The former possibility is illustrated by the case of the Forestry Law in Cameroon where the overriding consideration of the bureaucrats in charge of the law is to interpret it in such a way as to vest themselves with power and privilege (Egbe, 2002). An example of the latter possibility is provided by the new Family Code of Morocco which contains provisions much more favourable to women than the old one based on a combination of the Islamic and customary laws. Factual evidence nevertheless shows that the new law is less strictly applied by judges with more conservative inclinations (personal field observations of Imane Chaara). In Ghana, likewise, judges have some flexibility in applying the new Intestate Succession Law (PNDC 111) of 1985, which is a clear attempt to curb the effects of customary succession by making the nuclear family, rather than the extended family, the focus of succession. For example, flexibility is manifested in the way a natural child or the spouse from an unregistered marriage is being treated (Josiah-Aryeh, 2008).

In our model, the payoffs of agents are linear. As a result, changes in the uncertainty of formal verdicts do not have an effect on their behavior. A more realistic model would incorporate some risk aversion into the agents’ payoff. Risk, indeed, is certainly a concern for commoners who are considering whether to appeal the informal judge’s decision to the formal court. In the presence of risk aversion, a reduction in the uncertainty of the modern judge’s verdict would increase the attractiveness of appealing to the formal court, even if the mean of such verdicts does not change. If agents act as expected utility maximizers, then, analytically, the effect of reduced uncertainty of formal verdicts (on the behavior of the informal judge and commoners) would be essentially the same as that of an increase in the average verdict.

This opens an interesting avenue for analyzing the effect of a second form of legal reform: moving from standards (that allow for more discretion of formal judges) to rules (which are highly specific statements of the law).<sup>14</sup> For instance, moving to rules might help to reduce the judicial bias or to reduce the chance

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<sup>13</sup>In 2001, laws voted in 1999 (the Land Act No. 4 and the Village Land Act No. 5) and providing for the integration of customary practices into the modern law were eventually put into operation (personal communication of Rasel Madaha).

<sup>14</sup>We thank one of the referees for suggesting this alternative reform route.

that the (pro-commoner) discretionary judicial decisions are challenged by some other formal authority. If moreover, there might be political pressure against changing the body of the formal law (the mean formal verdict in our model), a more viable alternative that might still increase the welfare of the commoners is reducing the uncertainty of the formal verdicts. We leave the exploration of this interesting issue of legal design for future work.

### 4.3 Preferences of formal judges

In our model, the formal law is represented in a schematic manner, as the mean formal verdict  $f$ . We have just indicated that the model can be made more realistic by adding a new parameter reflecting the uncertainty surrounding this verdict. As pointed out above, the implications are rather straightforward: improving the predictability of the law is equivalent to making it more progressive. Further insights can be gained by being more precise about the behaviour of the modern judge, assuming in a way similar to our treatment of the informal judge that he acts rationally and maximizes some objective function. Thus, for example, a more realistic model might be based on the assumption that the formal judge has some written code on which he can base his decisions, while he has his own preferences over verdicts. His objective function would thus include two elements: law abidingness and the extent to which his verdict differs from his preferred judgement. More precisely, he would earn a positive utility from strictly implementing the law and a negative utility, whose absolute value would increase in the size of deviation from his preferred judgement.

In this case, the evaluation of the effect of a legal reform (i.e. the change in the code that has to be followed by the formal judge, corresponding to a change in  $f$ ) has to be seen through the effect on the behavior of the formal judge as well. Under some conditions, a more radical law would make its strict implementation too costly for a certain fraction of formal judges for whom it deviates too far from their preferred judgement. These judges would respond by ceasing to follow the written law and shifting, instead, to their preferred judgment. If the proportion of such judges is large enough, their response can outweigh that of the more progressive judges who do follow the more radical (pro-commoner) prescription of the revised law. In that case, the enactment of a radical law would eventually hurt the interests of the commoners. Again, we leave verifying the conditions under which such an effect would arise for future work.

Notice, incidentally, that the most radical law may also prove undesirable if the intended beneficiaries have internalized the norms prevailing under the existing social order to such a degree that they dislike strong departures from them. In terms of our model, a straightforward way to take this aspect into account is by assuming that the bliss point for the commoners is smaller than one. The implication for the results is then evident.

## 5 Application: Formal laws and informal rules in the case of women's and immigrants' rights

This section illustrates, on the basis of several examples, how the different variables highlighted in our model influence the welfare of the disadvantaged groups. Before presenting these examples, it is useful to summarize

|  | Nobody leaves the community | At least one individual leaves the community |
|--|-----------------------------|--|
| The custom stays unchanged<br>(no 'magnet effect') | (i)                         | (ii)   |
| The custom evolves<br>('magnet effect' at work)    | (iii)                       | (iv)   |

the results of the model in terms of two outcome variables: whether the custom changes or not (whether the 'magnet effect' operates or not), and whether some people leave the community or not. As we can see from Table 1, all of the four possible configurations are feasible. Case (i) depicts situations in which the informal judge has no incentive to adapt his customary judgment because nobody leaves the community (exit options are poor and the formal law is not very different from the custom), and there is no credible threat of appeal to the formal court from within the community. However, if the customary judgment stays unchanged because the cost of deviating from it for the informal judge is too high, we can have a situation in which nobody leaves the community, the custom is unchanged, but some people from the community appeal to the formal court. Case (ii) occurs when exit options are good enough to prompt a number of individuals to leave the community, yet the informal judge finds it very costly to adapt his judgment to the formal law beyond a point. Case (iii) arises when, relative to the custom, the modern law is sufficiently 'progressive' to drive some people to appeal to the formal court, yet not sufficiently 'progressive' to induce people to leave the community because only poor outside opportunities are available. Since appeals to the formal court occur, the informal judge chooses to adapt his verdict. When the same forces that induce people to leave the community, that is an improvement of the outside options and/or of the formal law, also cause the custom to change, we are in the situation depicted by the canonical case (iv).

**Inheritance.** In the Senegal river valley, all populations are Muslim and they have been so for several centuries. Indeed, Islamization of these societies resulted from the colonization of the (Middle) valley by successive waves of foreign conquerors since the 10th century, and Maraboutic power used the 1776 revolution in Senegal to assert itself and establish the Almaami regime based on the Islamic law (Minvielle 1977). It is, therefore, not surprising that local inhabitants are quite aware that the Qur'an contains provisions that deal explicitly with inheritance. In particular, there is a Qur'anic prescription to the effect that women should inherit half of the share of their brothers (see subsection 2.1). Despite the existence of this religious prescription, and perfect information about its content, the customary principle according to which women do not inherit at all has been generally followed until recently. The idea that daughters are entitled to inherit a share of the family land is deemed unacceptable in patriarchal societies because of the fear that ancestral lands may fall into stranger hands or be excessively split, especially when marriage practices follow the rule of virilocal exogamy (Goody 1976). This observation qualifies Timur Kuran's statement that in a matter such as inheritance that it addresses explicitly, the Qur'an carries an explicitly strong authority (Kuran 2003, 2004).

In the above situation, as a field survey revealed (Platteau et al., 1999), women never thought of invoking the Islamic law to advance their interests lest they should antagonize their male relatives and be

compelled to forsake key social protections that they have traditionally enjoyed<sup>15</sup>. Under the customary land tenure system, indeed, women are insured against various contingencies, in particular the prospects of separation/divorce, widowhood, and unwed motherhood. In such circumstances, they typically enjoy the right to return to their father's land where they are allowed to work and subsist till they find a new husband (see also Cooper 1997: 62-63, for similar observations in the case of Niger). This means that the cost of appealing to the Islamic law (considered here as the formal law) and of resorting to the local marabout (considered here as the formal judge) was too high in terms of (insurance) benefits foregone for the formal law to confer bargaining power upon rural women. Moreover, the psychological cost of taking a land dispute to the formal judge was also perceived to be large insofar as, in the women's view, open disputes between close kin "are to be avoided at all cost" (Cooper 1997: 79). In terms of our model, we are therefore in the case where no member of a disadvantaged group appeals to the formal judge or leaves the community because of the large size of the benefits derived from the community-level public good and because of the severity of the punishment inflicted by the customary authority.

Over the last decades, however, as shown by a study of sixteen villages located in the delta area (department of Dagana) and the Middle valley (departments of Podor and Matam), the benefit from participating in the social game has fallen as a result of an increase in women's education and an expansion of their non-agricultural employment opportunities (Platteau et al., 1999). Moreover, women that have completed their primary schooling and those who have a non-agricultural occupation (even after excluding marketing of agricultural products) have a tendency to manifest their opposition against customary practices such as the levirate system (whereby a widow is remarried to a brother of her deceased husband)<sup>16</sup>. Although the study did not measure the proclivity of (progressive) women to call customary inheritance practices openly into question or to invoke the Islamic law, it is interesting to note that the custom has recently evolved toward enhancing women's rights.

There is no evidence, though, that the custom has adopted the Islamic prescription according to which daughters should inherit half of their brothers' share. Instead, what we find is an evolving practice of transfers aimed at compensating women for their *de facto* exclusion from inheritance of a portion of their father's land. The same phenomenon has been observed in Niger where Cooper (1997) describes cases where women, in recognition of their ownership rights, receive part of the crop harvested on the family land by their brothers under an arrangement known as *aro* (Cooper 1997: 78). This said, women's access to land often remains fragile and difficult to secure: owing to their absence from the native village following marriage, they typically find it difficult to exercise whichever rights over land might have been granted to them, all the more so as their male relatives are ready to exploit the situation (Cooper 1997: 81).

This inability to secure their rights on land explains why, in fieldwork, it is so difficult to obtain precise information about the extent of women's rights as well as about the amount and regularity of unilateral

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<sup>15</sup>In Ghana, likewise, women typically refuse to use the PNDC law III (on Intestate Succession). Due to "fear of spiritual reprisals from the family, family and community pressure and the strong moral sense not to wash the family linen in public", they are reluctant to take their deceased husbands' family members to the formal courts when the latter infringe on their inheritance rights (Gedzi 2009: 27; see also Henrysson and Joireman 2009 for Kenya).

<sup>16</sup>There is plausibly a identification problem here. Indeed, it could be argued that women with a more independent character tend to better succeed at school and in obtaining employment outside the farm sector.

transfers received from their brothers. Another reason lies in the fact that male respondents are obviously embarrassed when their un-Islamic behavior is pointed to them. This embarrassment reflects the potential impact of the formal law even when it is not actually (strictly) followed. As is evident from the above story, such potential impact is manifested in the gradual transformation of the custom in a direction that implicitly recognizes some right of women to inherit. The ultimate cause of this transformation, we argue, is the emergence of new education and non-agricultural employment opportunities for women that have the effect of diminishing the importance of traditional mechanisms of social insurance against the risk of distress due to separation, widowhood and unwed motherhood. Since these new opportunities also amount to improved outside options, two changes take place concurrently: the custom evolves and a number of women leave the community (shift from scenario (i) to scenario (iv) in Table 1).

An important point to note is that the situation of women has improved even though the formal law has remained unchanged. We argue that the formal law induces a change in the custom (acts as a magnet) thanks to the availability of new outside options for women. In the absence of a formal law, the community members' outside option is unlikely to compensate for the loss of the benefit of the social game. In this situation, a strengthening of outside options would not increase their bargaining power; and the informal judge would not be induced to adapt his position. On the contrary, the existence of a formal law prompts the informal judge to bend the custom in the direction of the statutory law out of fear of losing too many members of the community. In other words, the mutual play of the formal law and the outside options comes into effect when the combination of the two provides a viable alternative to participation in community life.

**Divorce, marriage, and widowhood.** In the Sahel, the gradual transformation of the custom regarding women's rights to initiate a divorce can be analyzed in the light of the above discussion. In the initial situation, divorce was not readily granted to a wife wishing to leave her husband except in the case of proven mistreatment by the latter (Kevane 2004; Platteau et al., 1999). Over the recent years, however, women have progressively acquired a *de facto* right to leave an unhappy union. The main reasons are two: first, the severity of social sanctions against leaving an arranged marriage has diminished, to a large extent as a result of continued migration to neighboring countries such as the Ivory Coast. Second, there is the effect of administrative pressure "as successive regimes continue to push for explicit legal rules and rights for women in marriage" (Kevane 2004: 75, Jewsiewicki 1993). As pointed out by Hillhorst (2000), "A stronger legal status does not automatically afford women more independence but it may provide a strong bargaining position" (Hillhorst 2000: 195).

From a tribal area in India (Jharkhand) comes another story illustrating the capacity of the formal law to promote women's interests through evolution of the custom. There, a law known as the Santal Pargana Tenancy Act (1949) recognizes women's inheritance rights through marriage to a resident son-in-law (*gharjawae*), but only in the absence of a male heir in the woman's family (Rao 2007). This law was intended to protect such women against harassment and acts of violence by male kin eager to appropriate the land which has fallen into their hands. Registering a *gharjawae* marriage with the authorities affords a woman an effective protection. Two lessons from this experience deserve special attention. First, as a consequence of the law, customary authorities (village elders) have modified the custom in a direction

favourable to women. It is apparently because of prestige reasons - they want “to present themselves as fair and just” - that they have adopted a more pro-women stance. Second, the new law does not represent a radical departure from the existing practice, and this appears to be an important reason why it has had a real impact. In terms of our model, indeed, the effectiveness of a moderate legal reform as opposed to a more radical one is enhanced when customary authorities are very sensitive to deviations from their preferred judgement. In actual fact, the SPTA [Santal Pargana Tenancy Act] represented the *gharjawae* as an adopted son who inherits the land, rather than the daughter, and it is thus far away from the Hindu Succession Act (1956) which provides equal inheritance rights to sons and daughters (Rao 2007: 310-311; in the same vein, see Fafchamps and Quisumbing, 2002, for Ethiopia). Interestingly, the SPTA was inspired by a practice that evolved in the area itself thanks to the desire of fathers to keep family land in the hands of their children even in the absence of male heirs. Under conditions of growing scarcity of land, however, the practice of the *gharjawae* marriage was increasingly contested by male kin (standing for the elite in our model) who tended to bend decisions of village elders in their favour. The enactment of the Act and the registering procedure that it provides have had the effect of counteracting this evolution of the custom in favour of men’s interests.

In rural areas subject to acute land pressure, such as in areas with good access to water and high population growth, the situation is often much less favourable to women than the one discussed above in the case of Sahelian countries. There, instead of improving exit opportunities for women, it is the scarcity-induced evolution of the custom in a direction contrary to their interests which induces them to have recourse to the formal law. Scarcity of land assets tends to undermine women’s customary rights of access, making them more vulnerable, especially after the death of their husband. In Rwanda, the customary right of a daughter to return to her father’s land in the event of separation, divorce or unwed motherhood became increasingly threatened as land pressure grew, giving rise to severe intra-family conflicts (André and Platteau, 1998; for Kenya, see Haugerud, 1993: 162-182; Verma, 2001, and Henrysson and Joireman, 2009). In Uganda, the Federation of Women Lawyers (FIDA), reported that 40% of the cases they handled were related to the harassment of widows and property grabbing by their husbands’ relatives (Bikaako and Ssenkumba 2003: 250). In the Luwero and Torero areas, 29% out of a total of 204 widows indicated that property was taken from them following the death of their husbands. In Zambia, 41% of female-headed households with orphans indicated that they had lost all their cattle and 47% had lost all their pigs (Joireman 2008: 1240). In Niger, half of the women living in the city of Maradi and who inherited land from their fathers lost that land as a result of some action (sale or appropriation) by their brothers (Cooper 1997: 81- 82). As noted by S.F. Joireman (2008: 1240), “if land is valuable, or a woman has property left by her husband that is viewed as valuable, she may find herself cast off with no land to farm and her household goods appropriated by members of the lineage”.<sup>17</sup>

The above-described situation, born of growing land pressure, is bad for women on a double count. For one thing, like in the above-told story about Jharkand, there has been a regressive shift of the custom reflected in the erosion of women’s use rights, particularly in cases of widowhood. (In terms of our model,

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<sup>17</sup>In such situations, women are left with no other option than migrating to cities where they may try to engage in some (trade) business or prostitution and, if they are successful, they will end up purchasing a dwelling and perhaps some farmland (Cooper 1997: 82-89).

$I$  decreases and gets closer to zero assuming that  $I > 0$  initially). For another thing, women's benefits of participating in the life of the community have decreased, as attested by the undermining of customary social protection mechanisms. (In terms of our model,  $Y(n)$  decreases for all  $n$ ). Following these two changes, which have reduced the attractiveness of the customary law system, some women are prompted to confront the new local practices by appealing to the modern court system, and using, in Kenya, the law of Succession Act (1981) which provides significant protections for women. Such trend is strengthened as a result of the work of organisations aimed at defending women's rights and active in advocating legal reforms favourable to women, raising awareness among them, and supporting their efforts to appeal to the formal law.

**Land rights.** Another illustration of a regressive shift of the custom as a result of growing land scarcity concerns immigrant farmers in lineage-based societies. They traditionally enjoyed long-term use rights granted by the local customary authorities. However, as land pressure increases, these rights become increasingly precarious and immigrant farmers even face the risk of eviction (Platteau 2000, Chap. 4). The state may then intervene to counteract this ominous tendency. Thus, in the Ivory Coast, where land scarcity has sparked extreme tensions which degenerated into wild expulsion of foreign immigrants (mainly Burkinabé), the state eventually passed a law (Law N° 98-750, 23 December 1998) that declares lands cultivated by immigrants to be state land leased to them for a period of 99 years (Aka 2007). This is a vivid illustration of how the formal law can force customary practices to change in conditions where they are both inefficient (since immigrants are dynamic farmers) and inequitable. The Ivorian state was successful because it did not choose too radical a solution: stopping short of granting full private property rights to immigrants, it conferred upon them an ownership status (long-term use rights) that is more acceptable to village communities because it is part of a tradition inherited from colonial and post-independence times (bare ownership of rural lands is vested in the state). The situation was thus stabilized thanks to the effective enforcement of the new legal provision which, in the context of Africa, ultimately depends on the agreement of local informal authorities, however reluctant it may be. A more radical pro-immigrant law provision would have been less favourable to this vulnerable group as it would have stirred up huge resentful and antagonistic feelings within the host rural communities. Here is, therefore, another case where too strong a departure from the preferred judgement of the customary authorities (precarious rights for immigrants) would have been self-defeating.

**Speed of reform.** The question as to how radical a legislation ought to be to have significant effects has always been the object of intense controversies between reformists and revolutionaries concerned with improving the lot of the poor. For instance, toward the beginning of the 20th century, the reformist *ulema* Ibnou Zakri stood up against the archaism of rural Islam in Kabylia, denouncing, in particular, the ignorance of the Islamic law of inheritance. Unlike other radical reformers, however, he was convinced that any change in the law had to be at least partly approved by the customary authorities. In the case of Kabylia, this meant that the village *zawaya* (local council), considered as a "furnace of heresy", had to evolve so as to gradually accommodate a more progressive and Islamic approach to women's rights (Chachoua 2001: 176, 180-187).

What we have offered above is obviously suggestive evidence rather than a test of the theory. In order to have a rigorous empirical test, one would need to disentangle the influence of the modern law on the

custom from other influences born of economic, demographic, and ecological changes (population growth and increased market integration, in particular). This is extremely difficult since it requires the occurrence of a legal shock unaccompanied by other changes potentially affecting the custom, as well as the availability of relevant information about the pre- and post-shock situations.

## 6 Conclusion

The impact of reforms brought through the channel of modern state agencies has always been a central issue in developing countries eager to transform their institutions and their people's behavioral patterns so as to effectively meet the pressing challenges of long-term economic growth and poverty reduction. There are many well-known difficulties involved in a legalistic approach to change, in particular, people's ignorance of modern laws, manipulation of these by elites adept at using customary rules malevolently to acquire new, officially recognized rights, or the lack of credibility of the new rules and low trust in the state's enforcing ability. In this paper, we have analyzed the issue from a different point of view: one that stresses the interaction between modern and customary rules. Assuming that people have a reasonably good knowledge about the written law, the formal law, under certain conditions, may act as a "outside anchor" that exerts a "magnet effect" on the custom in the sense of pushing it in the direction wished by the legislator.

As our model shows, how far modern legislation succeeds in causing the custom to evolve in a direction favourable to the commoners (understood in a wide sense allowing for any change that favours disadvantaged sections of the population) crucially depends upon the incentives of the customary authorities to keep their people within the fold. These, in turn, depends on several factors: the social prestige derived by these authorities from dispute adjudication, the cost of deviating from their preferred judgment, the content (and the degree of predictability) of the statutory law, the value to people of the community public good, and the available outside options.

A 'progressive' change in the formal law is expected to pull the custom in the same direction, an effect that we label the 'magnet effect'. However, adaptation of the custom to the new modern law is never sufficient to prevent a fraction of community members from leaving their village, and to prevent a greater number of them from appealing to the formal court even if they choose to stay in the community.

The question of the optimal statutory law and the unsettled controversy between revolutionaries and reformists take on added meaning when placed in the above analytical perspective. There is, indeed, good ground to believe that a moderate law may be more welfare-enhancing than a radical law, especially if great weight is attached to the situation of the people with the lowest outside options (the so-called Rawlsian approach). This is because of the loss of local public goods suffered by these people when other people with better outside opportunities leave their community. Moreover, if modern judges choose their verdict as the outcome of a trade-off between the benefit earned from law-abidingness and the benefit from clinging to their preferred judgment, too radical a legal reform may also be self-defeating because of perverse effects on the level of the verdicts pronounced in the formal courts themselves.

Upon careful thinking, the fact that the custom remains quite alive in regions such as Sub-Saharan Africa does not necessarily imply that the state is insufficiently strong. To the extent that the customary

law evolves under the impact of changes occurring not only in the broad economic and ecological environment but also in the modern law, the state is not as ineffective as it appears to be. A stronger state may even be counter-productive if it tries to impose radical legal reforms through legislative fiat. By allowing the modern statutory law to remain optional, the state exerts its influence through an indirect channel. This is possibly a suitable path of institutional development in countries where the custom remains strong.

## 7 Appendix A

In this section, we prove Lemma 1, and Propositions 1 and 2. The proofs will involve the first-derivatives of  $\bar{\varepsilon}(f, \sigma, v^M)$ ,  $\bar{\gamma}(f, v^M)$ ,  $\alpha(f, v^M)$  and  $m_e(f, \sigma, n, v^M)$  with respect to their parameters. Some of the first derivatives are undefined under certain conditions because of kinks in the functions concerned. Therefore, for the sake of legibility, we first assign names to these conditions:

**Condition 1**  $\frac{f-v_t^M}{p} = \gamma_{\min}$

**Condition 2**  $\frac{f-v_t^M}{p} = \gamma_{\max}$

**Condition 3**  $\sigma_t + 1 + \delta(f - 1) = y(1) + \delta G(f, v_t^M)$

**Condition 4**  $\sigma_t + 0 + \delta(f - 1) = y(0) + \delta G(f, v_t^M)$

**Condition 5**  $\sigma_t + 1 + \delta(f - 1) < y(1) + \delta G(f, v_t^M)$

**Condition 6**  $\sigma_t + 0 + \delta(f - 1) > y(0) + \delta G(f, v_t^M)$

We proceed by computing the first derivatives.

From the definition of  $\bar{\gamma}(f, v^M)$ , we have

$$\frac{\partial \bar{\gamma}(f, v_t^M)}{\partial v^M} = \begin{cases} -\frac{1}{p} & \text{if } \frac{f-v_t^M}{p} \in (\gamma_{\min}, \gamma_{\max}) \\ 0 & \text{if } \frac{f-v_t^M}{p} < \gamma_{\min} \text{ or } \frac{f-v_t^M}{p} > \gamma_{\max} \end{cases} \quad (20)$$

$$\frac{\partial \bar{\gamma}(f, v_t^M)}{\partial f} = \begin{cases} \frac{1}{p} & \text{if } \frac{f-v_t^M}{p} \in (\gamma_{\min}, \gamma_{\max}) \\ 0 & \text{if } \frac{f-v_t^M}{p} < \gamma_{\min} \text{ or } \frac{f-v_t^M}{p} > \gamma_{\max} \end{cases} \quad (21)$$

Note that  $\frac{\partial \bar{\gamma}(f, v_t^M)}{\partial v^M}$  and  $\frac{\partial \bar{\gamma}(f, v_t^M)}{\partial f}$  are undefined under Conditions 1 and 2.

From the definition of  $\bar{\varepsilon}(f, \sigma, v^M)$  in (6)-(8), we have

$$\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M} = \begin{cases} \frac{\delta[\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)]}{1-y'(\bar{\varepsilon})} & \text{if } \bar{\varepsilon} \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases} \quad (22)$$

$$\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial f} = \begin{cases} \frac{\delta[\ln \bar{\gamma}(f, v^M) - \ln \gamma_{\max}]}{1-y'(\bar{\varepsilon})} & \text{if } \bar{\varepsilon} \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases} \quad (23)$$

Note that  $\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M}$  and  $\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial f}$  are undefined under Conditions 3 and 4.

From the definition of  $\alpha(f, v^M)$ , we have

$$\begin{aligned} \frac{\partial \alpha(f, v^M)}{\partial v^M} &= \frac{\delta}{\gamma_{\max} - \gamma_{\min}} \frac{\partial \bar{\gamma}(f, v^M)}{\partial v^M} \\ \Rightarrow \frac{\partial \alpha(f, v^M)}{\partial v^M} &= \begin{cases} -\left(\frac{\delta}{p}\right) \frac{1}{\gamma_{\max} - \gamma_{\min}} & \text{if } \frac{f-v^M}{p} \in (\gamma_{\min}, \gamma_{\max}) \\ 0 & \text{if } \frac{f-v^M}{p} < \gamma_{\min} \text{ or } \frac{f-v^M}{p} > \gamma_{\max} \end{cases} \end{aligned} \quad (24)$$

Similarly,

$$\frac{\partial \alpha(f, v^M)}{\partial f} = \begin{cases} \left(\frac{\delta}{p}\right) \frac{1}{\gamma_{\max} - \gamma_{\min}} & \text{if } \frac{f-v^M}{p} \in (\gamma_{\min}, \gamma_{\max}) \\ 0 & \text{if } \frac{f-v^M}{p} < \gamma_{\min} \text{ or } \frac{f-v^M}{p} > \gamma_{\max} \end{cases} \quad (25)$$

Note that  $\frac{\partial \alpha(f, v^M)}{\partial f}$  and  $\frac{\partial \alpha(f, v^M)}{\partial v^M}$  are undefined under Conditions 1 and 2.

From the definition of  $m_e(f, \sigma, n, v^M)$ , we have

$$\frac{\partial m_e(f, \sigma, n, v^M)}{\partial v^M} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ -\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (26)$$

$$\Rightarrow \frac{\partial m_e(f, \sigma, n, v^M)}{\partial v^M} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ -\frac{\delta[\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)]}{1-y'(\bar{\varepsilon})} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (27)$$

Similarly,

$$\frac{\partial m_e(f, \sigma, n, v^M)}{\partial f} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ -\frac{\delta[\ln \bar{\gamma}(f, v^M) - \ln \gamma_{\max}]}{1-y'(\bar{\varepsilon})} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (28)$$

$$\frac{\partial m_e(f, \sigma, n, v^M)}{\partial n} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \\ 1 & \text{if } n \geq \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (29)$$

Note that  $\frac{\partial m_e(f, \sigma, n, v^M)}{\partial v^M}$  is undefined if  $\bar{\varepsilon}(f, \sigma, v^M) = n$ .

Finally, if  $\hat{n}(f, \sigma, n, v^M) = n - m_e(f, \sigma, n, v^M)$ , we obtain

$$\begin{aligned} \frac{\partial \hat{n}(f, \sigma, n, v^M)}{\partial v^M} &= -\frac{\partial m_e(f, \sigma, n, v^M)}{\partial v^M} \\ \Rightarrow \frac{\partial \hat{n}(f, \sigma, n, v^M)}{\partial v^M} &= \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ \frac{\delta[\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)]}{1-y'(\bar{\varepsilon})} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \end{aligned} \quad (30)$$

$$\frac{\partial \hat{n}(f, \sigma, n, v^M)}{\partial f} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ \frac{\delta[\ln \bar{\gamma}(f, v^M) - \ln \gamma_{\max}]}{1-y'(\bar{\varepsilon})} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (31)$$

$$\frac{\partial \hat{n}(f, \sigma, n, v^M)}{\partial n} = \begin{cases} 1 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \\ 0 & \text{if } n \geq \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (32)$$

Note that  $\frac{\partial \hat{n}(f, \sigma, n, v^M)}{\partial v^M}$  is undefined if  $n = \bar{\varepsilon}(f, \sigma, v^M)$ .

We are now in a position to prove Lemma 1:

**Lemma 1** *Under Assumptions 1-8,  $MU(v^M)$  is defined in the interval  $[0, 1]$ , except, at most, four points; and  $MU'(v^M) < 0$  wherever  $MU(v^M)$  is defined.*

**Proof.** of Lemma 1: Taking the derivative w.r.t.  $v^M$  throughout (11), we obtain

$$\begin{aligned}
& -y''(\cdot) \frac{\partial n}{\partial v^M} \frac{\partial m_e}{\partial v^M} - y'(\cdot) \frac{\partial^2 m_e}{\partial (v^M)^2} \\
& + X''(\cdot) \left( \frac{\partial \alpha}{\partial v^M} \right)^2 - X'(\cdot) \frac{\partial^2 \alpha}{\partial (v^M)^2} \\
& - g''(\cdot) - \beta \frac{\partial^2 EU^M}{\partial n^2} \frac{\partial n}{\partial v^M} \frac{\partial m_e}{\partial v^M} - \beta \frac{\partial EU^M}{\partial n} \frac{\partial^2 m_e}{\partial (v^M)^2}
\end{aligned} \tag{33}$$

To obtain the sign of (33), we need to determine the signs of  $\frac{\partial^2 m_e}{\partial (v^M)^2}$ , and  $\frac{\partial^2 \alpha}{\partial (v^M)^2}$ . Therefore, we proceed as follows. From (22), we obtain

$$\frac{\partial^2 \bar{\varepsilon}}{\partial (v^M)^2} \equiv \begin{cases} \frac{\delta^2 y''(\bar{\varepsilon})}{(1-y'(\bar{\varepsilon}))} \left[ \frac{\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)}{(1-y'(\bar{\varepsilon}))} \right]^2 - \frac{\delta}{(1-y'(\bar{\varepsilon}))\bar{\gamma}(f, v^M)} \frac{d\bar{\gamma}(f, v^M)}{dv^M} & \text{if } \bar{\varepsilon} \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases} \tag{34}$$

Note that  $\frac{\partial^2 \bar{\varepsilon}}{\partial (v^M)^2}$  is undefined under Conditions 3 and 4. From (22), we obtain  $\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M} \geq 0$  if defined.

Therefore, we obtain from (34), under Assumption 8,  $\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial (v^M)^2} \leq 0$  if defined.

From (26), we obtain

$$\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial (v^M)^2} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or if Condition 5 or 6 holds} \\ -\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial (v^M)^2} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \tag{35}$$

Note that  $\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial (v^M)^2}$  is undefined at  $n = \bar{\varepsilon}(f, \sigma, v^M)$  and under Conditions 3 and 4. Since  $\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial (v^M)^2} \leq 0$  if defined, we obtain, using (35), that  $\frac{\partial^2 m_e}{\partial (v^M)^2} \geq 0$  if  $n <> \bar{\varepsilon}(f, \sigma, v^M)$  or if Condition 5 or 6 holds.

From (24), we obtain

$$\frac{\partial \alpha^2(f, v^M)}{\partial (v^M)^2} = 0 \tag{36}$$

Note that  $\frac{\partial \alpha^2(f, v^M)}{\partial (v^M)^2}$  is undefined under Conditions 1 and 2.

Now, we are able to sign all the terms on the right-hand side of (33). Under Assumption 2,  $y'(\cdot) > 0, y''(\cdot) < 0$ . Under Assumption 6,  $X'(\cdot) > 0, X''(\cdot) < 0$ . Under Assumption 7,  $g''(\cdot) > 0$ . From (30),  $\frac{\partial n}{\partial v^M} \geq 0$ . From (27),  $\frac{\partial m_e}{\partial v^M} \leq 0$ . Furthermore, it can be shown that  $\frac{\partial^2 EU^M}{\partial n^2} \leq 0$ . Thus we obtain, from (33) that  $\frac{\partial MU}{\partial v^M} < 0$  wherever defined.

We identified five conditons, 1-4 and  $n = \bar{\varepsilon}(f, \sigma, v^M)$ , under which one or more of the terms in (33) are undefined. Note that, given parameters  $f, \sigma, n$ , there is, at most, one value of  $v^M \in [0, 1]$  at which any one of above conditions is satisfied. Note, also, that under Assumption 8, Condition 2 cannot hold.<sup>18</sup> Therefore, there are at most four points at which  $\frac{\partial MU}{\partial v^M}$  is undefined. ■

Lemma 1 enables us to characterise the optimal strategy of the customary authority using the first-order conditions, as described in Section 2.3. The following lemma describes how the optimal strategy varies with community size at the beginning of the period. The lemma will be used subsequently to establish the concavity of the function  $U^M(n, \sigma)$  in  $n$ .

<sup>18</sup>To see this, note that  $\frac{f-v^M}{p} \leq \frac{1}{p}$  and Assumption 8 implies that  $\frac{1}{p} < \gamma_{\max}$ .

**Lemma 2** *If the optimal strategy of the customary authority is given by  $MU(f, \sigma, n, v^{M^*}(n, \sigma, f)) = 0$ , then  $\frac{\partial v^{M^*}}{\partial n} = 0$  and  $\frac{\partial^2 v^{M^*}}{\partial (n)^2} = 0$ . Otherwise, if  $n = \bar{\varepsilon}(f, \sigma, v^{M^*}(f, \sigma, n))$  and  $MU(f, \sigma, n, v^{M^*}(n, \sigma, f)) \neq 0$  (specifically,  $MU(f, \sigma, n, v^{M^*}(n, \sigma, f))$  is undefined) then  $\frac{\partial v^{M^*}}{\partial n} > 0$  and  $\frac{\partial^2 v^{M^*}}{\partial (n)^2} \geq 0$ .*

**Proof.** of Lemma 2: (i) Suppose the solution is given by  $MU(f, \sigma, n, v^M) = 0$ . Then, using the Implicit Function Theorem,

$$MU(f, \sigma, n, v^{M^*}(n, \sigma, f)) \equiv 0 \quad (37)$$

Differentiating throughout (37) w.r.t.  $n$ , we obtain

$$\begin{aligned} & -y''(n) \frac{\partial n}{\partial n} \frac{\partial m_e}{\partial v^M} - y'(n) \frac{\partial^2 m_e}{\partial (v^M)^2} \frac{\partial v^M}{\partial n} \\ & + X''(\cdot) \frac{\partial \alpha}{\partial v^M} \frac{\partial v^M}{\partial n} - X'(\cdot) \frac{\partial^2 \alpha}{\partial (v^M)^2} \frac{\partial v^M}{\partial n} \\ & - g'(\cdot) \frac{\partial v^M}{\partial n} - \beta \frac{\partial^2 EU^M}{\partial n^2} \frac{\partial n}{\partial n} \frac{\partial m_e}{\partial v^M} \\ & - \beta \frac{\partial EU^M}{\partial n} \frac{\partial^2 m_e}{\partial (v^M)^2} \frac{\partial v^M}{\partial n} \\ & = 0 \end{aligned} \quad (38)$$

Note that any term involving  $\frac{\partial n}{\partial n} \frac{\partial m_e}{\partial v^M}$  is equal to zero given (26) and (32). Therefore,  $\frac{\partial v^{M^*}(n, \sigma, f)}{\partial n} = 0$ . Consequently,  $\frac{\partial^2 v^{M^*}(n, \sigma, f)}{\partial (n)^2} = 0$ .

(ii) Suppose, instead, that the solution is given by

$$n \equiv \bar{\varepsilon}(f, \sigma, v^{M^*}(n, \sigma, f)) \quad (39)$$

and  $MU(f, \sigma, n, v^M) > 0$  for each  $v^M < v^{M^*}(n, \sigma, f)$  and  $MU(f, \sigma, n, v^{M^*}(n, \sigma, f))$  is undefined. Then, we obtain  $\frac{\partial v^M}{\partial n}$  by differentiating throughout (39) w.r.t.  $n$ :

$$1 = \frac{\partial \bar{\varepsilon}}{\partial v^M} \frac{\partial v^M}{\partial n} \quad (40)$$

Assuming  $\bar{\varepsilon}(n, \sigma, f) \in (0, 1)$ , we have

$$\frac{\partial v^M}{\partial n} = \frac{1 - y'(\bar{\varepsilon})}{\delta [\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)]}$$

By Assumption 3,  $1 - y'(\bar{\varepsilon}) > 0$  and, from Assumption 8, it follows that  $\bar{\gamma}(f, v^M) < \gamma_{\max}$ . Therefore,  $\frac{\partial v^{M^*}(n, \sigma, f)}{\partial n} > 0$ . Differentiating throughout (40) w.r.t.  $n$ , we obtain

$$0 = \frac{\partial^2 \bar{\varepsilon}}{\partial (v^M)^2} \left( \frac{\partial v^{M^*}}{\partial n} \right)^2 + \frac{\partial \bar{\varepsilon}}{\partial v^M} \frac{\partial^2 v^{M^*}}{\partial (n)^2} \quad (41)$$

If  $\bar{\varepsilon}(n, \sigma, f) \in (0, 1)$ , we have, using (22),  $\frac{\partial \bar{\varepsilon}}{\partial v^M} > 0$ . Moreover, using (34) and Assumption 8, we have  $\frac{\partial^2 \bar{\varepsilon}}{\partial (v^M)^2} \leq 0$ . Therefore, from (41), we obtain  $\frac{\partial^2 v^{M^*}}{\partial (n)^2} \geq 0$ . ■

The following Lemma will be used in the proof of Proposition 1.

**Lemma 3**  $\frac{\partial^2 U^M(n, \sigma)}{\partial (n)^2} \leq 0$ .

**Proof.** of Lemma 3: Differentiating throughout (9) w.r.t.  $n$ , we obtain

$$\frac{\partial U^M}{\partial n} = \sum_{t=1}^{\infty} \beta^{t-1} \left[ y'(n_t) \frac{\partial n_t}{\partial n} - \{X'(1 - \alpha(f, v_t^M)) + g'(v_t^M - I)\} \frac{\partial v_t^M}{\partial n} \right] \quad (42)$$

Differentiating throughout (42) w.r.t.  $n$  once again, we obtain

$$\frac{\partial^2 U^M}{\partial (n)^2} = \sum_{t=1}^{\infty} \beta^{t-1} \left[ \begin{array}{c} y''(n_t) \left(\frac{\partial n_t}{\partial n}\right)^2 + y'(n_t) \frac{\partial^2 n_t}{\partial (n)^2} \\ - \left\{ g''(\cdot) - X''(\cdot) \frac{\partial \alpha}{\partial v_t^M} \right\} \left(\frac{\partial v_t^M}{\partial n}\right)^2 \\ - \{X'(1 - \alpha(f, v_t^M)) + g'(v_t^M - I)\} \frac{\partial^2 v_t^M}{\partial (n)^2} \end{array} \right] \quad (43)$$

First, consider the case where  $\bar{\varepsilon}(f, \sigma_t, v_t^M) = n_t$  and  $\bar{\varepsilon}(f, \sigma_\tau, v_\tau^M) \geq n_\tau$  for each  $\tau < t$ . Then, using (32), we obtain  $\frac{\partial n_t}{\partial n} = 1$  and  $\frac{\partial^2 n_t}{\partial (n)^2} = 0$ . Furthermore, using Lemma 2, we have  $\frac{\partial v_t^M}{\partial n} > 0$  and  $\frac{\partial^2 v_t^M}{\partial (n)^2} > 0$ . Then,  $\frac{\partial^2 U^M}{\partial (n_1)^2} < 0$ .

Second, consider the case  $\bar{\varepsilon}(f, \sigma_\tau, v_\tau^M) < n_\tau$  for some  $\tau \leq t$ . Then, using (32), we obtain  $\frac{\partial n_t}{\partial n} = 0$  and  $\frac{\partial^2 n_t}{\partial (n)^2} = 0$ . Furthermore,  $\frac{\partial v_t^M}{\partial n} = 0$  and  $\frac{\partial^2 v_t^M}{\partial (n)^2} = 0$ . Therefore  $\frac{\partial^2 U^M}{\partial (n)^2} = 0$ .

Finally, consider the case  $\bar{\varepsilon}(f, \sigma_\tau, v_\tau^M) \geq n_\tau$  for each  $\tau < t$  and  $\bar{\varepsilon}(f, \sigma_t, v_t^M) > n_t$ . Then, using (32), we obtain  $\frac{\partial n_t}{\partial n} = 1$  and  $\frac{\partial^2 n_t}{\partial (n)^2} = 0$ . But  $\frac{\partial v_t^M}{\partial n} = 0$  and  $\frac{\partial^2 v_t^M}{\partial (n)^2} = 0$ . Then, it is straightforward to verify that  $\frac{\partial^2 U^M}{\partial (n_1)^2} < 0$ .

In summary,  $\frac{\partial^2 U^M}{\partial (n)^2} \leq 0$ . ■

We now have the necessary results for the proofs of Propositions 1 and 2.

**Proof.** of Proposition 1: (i) First, consider the case where the optimal response of the customary authority is given by (12). Then, differentiating throughout (12) w.r.t.  $f$ , we obtain

$$\begin{aligned} g''(v^M) \frac{\partial v^M}{\partial f} &= -\frac{\partial n}{\partial f} \frac{\partial m_e}{\partial v^M} \left( y''(n) + \beta \frac{\partial^2 EU^M}{\partial n^2} \right) \\ &\quad - \frac{\partial^2 m_e}{\partial v^M \partial f} \left( y'(n) + \beta \frac{\partial EU^M}{\partial n} \right) \\ &\quad + X''(1 - \alpha(f, v^M)) \left( \frac{\partial \alpha}{\partial v^M} \right) \left( \frac{\partial \alpha}{\partial f} \right) \\ &\quad - X'(1 - \alpha(f, v^M)) \frac{\partial^2 \alpha}{\partial f \partial v^M} \end{aligned} \quad (44)$$

To determine the sign of  $\frac{\partial v^M}{\partial f}$ , we need to determine the signs of  $\frac{\partial^2 m_e}{\partial v^M \partial f}$  and  $\frac{\partial \alpha(f, v^M)}{\partial f \partial v^M}$ , which we do as follows. From (22), we obtain

$$\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M \partial f} \equiv \begin{cases} -\frac{1}{(1-y'(\bar{\varepsilon}))} \left[ \delta^2 y''(\bar{\varepsilon}) \left\{ \frac{\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)}{(1-y'(\bar{\varepsilon}))} \right\}^2 + \frac{\delta}{\bar{\gamma}(f, v^M)} \frac{d\bar{\gamma}(f, v^M)}{df} \right] & \text{if } \bar{\varepsilon} \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases} \quad (45)$$

Note that  $\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M \partial f}$  is undefined under Conditions 3 and 4. From (26), we obtain

$$\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial v^M \partial f} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ -\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M \partial f} & \text{if } n > \bar{\varepsilon}(f, \sigma, v^M) \end{cases} \quad (46)$$

Note that  $\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial v^M \partial f}$  is undefined if  $\bar{\varepsilon}(f, \sigma, v^M) = n$  or if  $\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M \partial f}$  is undefined. The expression on the right-hand side of (45), if defined, is greater than or equal to zero under Assumptions 2,3 and 8. Therefore,

from (46), we obtain the result that  $\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial v^M \partial f} \leq 0$  if defined. Furthermore, from (24), we obtain  $\frac{\partial \alpha(f, v^M)}{\partial f \partial v^M} = 0$  if defined.

Now, we are able to sign all the terms on the right-hand side of (44). Under Assumption 2,  $y''(\cdot) < 0$  and  $y'(\cdot) > 0$ . Under Assumption 6,  $X'(\cdot) > 0$  and  $X''(\cdot) < 0$ . Under Assumption 7,  $g''(\cdot) > 0$ . From (31),  $\frac{\partial n}{\partial f} \leq 0$  if defined. From (27),  $\frac{\partial m_e}{\partial v^M} \leq 0$  if defined. From (24),  $\frac{\partial \alpha}{\partial v^M} \leq 0$  if defined. From (25),  $\frac{\partial \alpha}{\partial f} \geq 0$  if defined. Thus, we obtain, from (44) that  $\frac{\partial v^M}{\partial f} \geq 0$  wherever defined.

Second, consider the case that (12) is not satisfied for any  $v^M \in [0, 1]$  and  $v^{M*}(f, \sigma, n)$  takes an interior value. Then,  $v^{M*}(f, \sigma, n)$  satisfies either one of the the following two conditions:

$$\bar{\varepsilon}(f, \sigma, v^{M*}) \equiv n \quad (47)$$

$$\frac{1}{p}(f - v^{M*}) \equiv \gamma_{\max} \quad (48)$$

Differentiating throughout (47) w.r.t.  $f$  and rearranging, we obtain

$$\frac{\partial v^{M*}}{\partial f} = -\frac{\partial \bar{\varepsilon}}{\partial f} / \frac{\partial \bar{\varepsilon}}{\partial v^M} \text{ if } \bar{\varepsilon} \in (0, 1) \quad (49)$$

Then, using (22) and (23), we obtain  $\frac{\partial v^{M*}}{\partial f} = 1$  if  $\bar{\varepsilon} \in (0, 1)$ . If  $\bar{\varepsilon}(f, \sigma, v^{M*}) = 0$  or 1 and either Condition 5 or 6 holds, then  $\frac{\partial \bar{\varepsilon}(f, \sigma, v^{M*})}{\partial f} = 0$ . Then, using (13),  $\frac{\partial v^{M*}}{\partial f} = 0$ . Note that  $\frac{\partial v^{M*}}{\partial f}$  is undefined if either Condition 3 or 4 holds. Differentiating throughout (48) w.r.t.  $f$ , we obtain  $\frac{\partial v^{M*}}{\partial f} = 1$ . Therefore,  $\frac{\partial v^{M*}}{\partial f} \geq 0$  wherever defined.

(ii) First, consider the case where the optimal response of the customary authority is given by (12). Then, differentiating throughout (12) w.r.t.  $\sigma$ , we obtain

$$\begin{aligned} g''(v^M) \frac{\partial v^M}{\partial \sigma} &= -\frac{\partial n}{\partial \sigma} \frac{\partial m_e}{\partial v^M} \left( y''(n) + \beta \frac{\partial^2 EU^M}{\partial n^2} \right) \\ &\quad - \frac{\partial^2 m_e}{\partial v^M \partial \sigma} \left( y'(n) + \beta \frac{\partial EU^M}{\partial n} \right) \\ &\quad + X''(1 - \alpha(f, v^M)) \left( \frac{\partial \alpha}{\partial v^M} \right) \left( \frac{\partial \alpha}{\partial \sigma} \right) \\ &\quad - X'_2(1 - \alpha(f, v^M)) \frac{\partial^2 \alpha}{\partial \sigma \partial v^M} \\ &\quad - \beta \frac{\partial m_e}{\partial v^M} \frac{\partial^2 EU^M}{\partial n \partial \sigma} \end{aligned} \quad (50)$$

To determine the sign of  $\frac{\partial v^M}{\partial \sigma}$ , we need to determine the signs of  $\frac{\partial n}{\partial \sigma}$ ,  $\frac{\partial \alpha}{\partial \sigma}$ ,  $\frac{\partial^2 \alpha}{\partial \sigma \partial v^M}$ ,  $\frac{\partial^2 m_e}{\partial v^M \partial \sigma}$  and  $\frac{\partial^2 EU^M}{\partial n \partial \sigma}$ . We proceed as follows. From the definition of  $\alpha(f, v^M)$ , we obtain  $\frac{\partial \alpha}{\partial \sigma} = 0$  and  $\frac{\partial^2 \alpha}{\partial \sigma \partial v^M} = 0$ . From the definition of  $\bar{\varepsilon}(f, \sigma, v^M)$ , we obtain

$$\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial \sigma} = \begin{cases} -\frac{1}{1-y'(\bar{\varepsilon})} & \text{if } \bar{\varepsilon} \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases} \quad (51)$$

Note that  $\frac{\partial \bar{\varepsilon}(f, \sigma, v^M)}{\partial \sigma}$  is undefined if either Condition 3 or 4 holds. From the definition of  $m_e(f, \sigma, n, v^M)$ , we obtain, using (51),

$$\frac{\partial m_e(f, \sigma, n, v^M)}{\partial \sigma} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ \frac{1}{1-y'(\bar{\varepsilon})} & \text{if Condition 5 or 6 holds} \end{cases} \quad (52)$$

Using (52) and Assumption 3, we have  $\frac{\partial m_e(f, \sigma, n, v^M)}{\partial \sigma} \geq 0$  wherever defined. From (51), we obtain

$$\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M \partial \sigma} = \begin{cases} -\frac{\partial \bar{\varepsilon}}{\partial v^M} \frac{y''(\bar{\varepsilon})}{[1-y'(\bar{\varepsilon})]^2} & \text{if } \bar{\varepsilon} \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases} \quad (53)$$

Using (53),  $\frac{\partial^2 \bar{\varepsilon}}{\partial v^M \partial \sigma} \geq 0$  if defined. From (26), we obtain

$$\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial v^M \partial \sigma} = \begin{cases} 0 & \text{if } n < \bar{\varepsilon}(f, \sigma, v^M) \text{ or } \bar{\varepsilon} = 0 \text{ or } \bar{\varepsilon} = 1 \\ -\frac{\partial^2 \bar{\varepsilon}(f, \sigma, v^M)}{\partial v^M \partial \sigma} & \text{if Condition 5 or 6 holds} \end{cases} \quad (54)$$

Using (54),  $\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial v^M \partial \sigma} \leq 0$  if defined. Since  $n(f, \sigma, n, v^M) = n - m_e(f, \sigma, n, v^M)$ , we obtain  $\frac{dn(f, \sigma, n, v^M)}{d\sigma} = -\frac{\partial m_e}{\partial \sigma}$ . Therefore,  $\frac{dn(f, \sigma, n, v^M)}{d\sigma} \leq 0$  if defined. Note that  $\frac{\partial m_e(f, \sigma, n, v^M)}{\partial \sigma}$ ,  $\frac{\partial^2 m_e(f, \sigma, n, v^M)}{\partial v^M \partial \sigma}$  and  $\frac{dn(f, \sigma, n, v^M)}{d\sigma}$  are undefined if either Condition 3 or 4 holds. Furthermore, we can show that  $\frac{\partial m_e}{\partial v^M} \frac{\partial^2 EU^M}{\partial n \partial \sigma} > 0$ .<sup>19</sup> Then, we can establish, using (50) and Assumptions 2,3,6 and 7,  $\frac{\partial v^{M*}(f, \sigma, n)}{\partial \sigma} \geq 0$ .

Second, consider the case that (12) is not satisfied for any  $v^M \in [0, 1]$  and  $v^{M*}(f, \sigma, n)$  takes an interior value. Then, as previously mentioned,  $v^{M*}(f, \sigma, n)$  satisfies either (47) or (48). Differentiating throughout (47) w.r.t.  $\sigma$  and rearranging, we obtain

$$\begin{aligned} \frac{\partial v^{M*}}{\partial \sigma} &= -\frac{\partial \bar{\varepsilon}}{\partial \sigma} / \frac{\partial \bar{\varepsilon}}{\partial v^M} \text{ if } \bar{\varepsilon} \in (0, 1) \\ \implies \frac{\partial v^{M*}}{\partial \sigma} &= \frac{1}{\delta [\ln \gamma_{\max} - \ln \bar{\gamma}(f, v^M)]} \text{ if } \bar{\varepsilon} \in (0, 1) \end{aligned} \quad (55)$$

Under Assumption 8,  $\bar{\gamma}(f, v^M) < \gamma_{\max}$ . Therefore, from (55),  $\frac{\partial v^{M*}}{\partial \sigma} > 0$  if  $\bar{\varepsilon} \in (0, 1)$ . If  $\bar{\varepsilon}(f, \sigma, v^{M*}) = 0$  or 1 and either Condition 5 or 6 holds, then  $\frac{\partial \bar{\varepsilon}(f, \sigma, v^{M*})}{\partial \sigma} = 0$ . Then, using (13),  $\frac{\partial v^{M*}}{\partial \sigma} = 0$ . Note that  $\frac{\partial v^{M*}}{\partial \sigma}$  is undefined if either Condition 3 or 4 holds. Differentiating throughout (47) w.r.t.  $\sigma$ , we obtain  $\frac{\partial v^{M*}}{\partial \sigma} = 0$ . Therefore,  $\frac{\partial v^{M*}}{\partial \sigma} \geq 0$  wherever defined. ■

**Proof.** of Proposition 2: In the following, we use the notation  $m_{e,t} = m_e(f, \sigma_t, n_t, v_t^M)$ .

(i)(a) First, we prove by contradiction that  $\frac{dv_t^M}{df} < 1$ . Suppose that  $v_t^M$  responds to  $f$  one-for-one, i.e.  $\frac{dv_t^M}{df} = 1$ , then, from the definition of  $\bar{\varepsilon}(f, \sigma_t, v_t^M)$  and  $\bar{\gamma}(f, v_t^M)$ , we obtain  $\frac{dm_{e,t}}{df} = 0$  and  $\frac{d\alpha_t}{df} = 0$ . Moreover,  $\frac{dn_t}{df} = 0$  and, from (24) and (27),  $\frac{\partial \alpha_t}{\partial v^M}$  and  $\frac{\partial m_e}{\partial v^M}$  are unchanged. On the other hand,  $g'(\cdot)$  is increasing in  $v_t^M$ . Therefore, following any increase in  $f$ , the first-order condition for  $v_t^M$  will not be satisfied: the expression in (11) will be smaller than zero.

Suppose, instead, that  $v_t^M$  responds to  $f$  more than one-for-one, i.e.  $\frac{dv_t^M}{df} > 1$ , then, from the definition of  $\bar{\varepsilon}(f, \sigma_t, v_t^M)$ , we obtain  $\bar{\varepsilon}(f, \sigma_t, v_t^M) \geq 0$ . Therefore,  $\frac{dm_{e,t}}{df} \leq 0$ . Therefore,  $\frac{dn_t}{df} \geq 0$ . Since, by Lemma 3,  $U^M(\cdot)$  is weakly concave,  $\frac{\partial U^M}{\partial n_t}$  is weakly decreasing in  $n_t$  and thus  $\frac{\partial U^M}{\partial n_t}$  is weakly decreasing in  $f$ . Furthermore, using the definition of  $\bar{\gamma}(f, v_t^M)$ , we obtain  $\frac{d\alpha_t}{df} < 0$ . Therefore,  $y'(n_t)$  and  $X'(1 - \alpha_t)$  are weakly decreasing in  $f$ . Finally, if  $\frac{dv_t^M}{df} > 1$  then  $g'(v_t^M - I)$  is increasing in  $f$ . Once again, we obtain the result that, following an increase in  $f$ , the first-order condition for  $v_t^M$  will not be satisfied: the expression

<sup>19</sup>To see this, note that wherever  $\bar{\varepsilon}(f, \bar{\sigma}, v^M) \geq \bar{n}$ , we have, using (26),  $\frac{\partial m_e(f, \bar{\sigma}, \bar{n}, v^M)}{\partial v^M} = 0$ . On the other hand, if  $\bar{\varepsilon}(f, \bar{\sigma}, v^M) < \bar{n}$ , we have, using (32),  $\frac{\partial n(f, \bar{\sigma}, v^M)}{\partial \bar{n}} = 0$ . Then, it follows from (10) that  $\frac{\partial U^M(\bar{n}, \bar{\sigma})}{\partial \bar{n}} = 0$ . Therefore,  $\frac{\partial^2 U^M(\bar{n}, \bar{\sigma})}{\partial \bar{n} \partial \sigma} = 0$ . Thus, we obtain the result that  $\frac{\partial m_e}{\partial v^M} \frac{\partial^2 EU^M}{\partial n \partial \sigma} = 0$ .

in (11) will be smaller than zero. Hence, we must have  $\frac{dv_t^M}{df} < 1$ . Then  $\frac{dm_{e,t}}{df} \geq 0$ . Also, from the definition of  $\alpha(f, v^M)$ , if  $\frac{dv_t^M}{df} < 1$ , it follows that  $\frac{d\alpha(f, v^M)}{df} \geq 0$ . Therefore,  $\frac{d\alpha_t}{df} \geq 0$ .

(i)(b) From the definition of  $\bar{\varepsilon}(f, \sigma, v^M)$ , we obtain  $\frac{d\bar{\varepsilon}}{d\sigma} = \frac{\partial \bar{\varepsilon}}{\partial \sigma} + \frac{\partial \bar{\varepsilon}}{\partial v^M} \frac{\partial v^M}{\partial \sigma}$ . We prove by contradiction that  $\frac{d\bar{\varepsilon}}{d\sigma} \leq 0$ . If  $\frac{d\bar{\varepsilon}}{d\sigma} > 0$ , then, since  $\frac{\partial \bar{\varepsilon}}{\partial \sigma} \leq 0$  and  $\frac{\partial \bar{\varepsilon}}{\partial v^M} \geq 0$ , we must have  $\frac{\partial v^M}{\partial \sigma} > 0$ . From the assumption  $\frac{d\bar{\varepsilon}}{d\sigma} > 0$ , we obtain  $\frac{dm_{e,t}}{d\sigma} < 0$ . Therefore,  $\frac{dn_t}{d\sigma} > 0$ . From  $\frac{\partial v^M}{\partial \sigma} > 0$ , we obtain  $\frac{d\alpha_t}{d\sigma} \leq 0$ . Therefore, following an increase in  $\sigma$ , the first-order condition for  $v_t^M$  in (12) will not be satisfied: the right-hand side of (12) will be greater than zero. Therefore, we must have  $\frac{d\bar{\varepsilon}}{d\sigma} \leq 0$ . Therefore,  $\frac{dm_{e,t}}{d\sigma} \geq 0$ .

(ii)(a) If the custom is given by the condition in (13), then it must satisfy either Condition (47) or (48). Then, following the reasoning in the proof of Proposition 1(i), we have  $\frac{\partial v^{M*}(f, \sigma, n)}{\partial f} = 1$ . Then, from the definitions of  $m_e(f, \sigma, n)$  and  $\alpha(f, v^M)$ , we obtain  $\frac{\partial m_{e,t}}{\partial f} = 0$  and  $\frac{\partial \alpha_t}{\partial f} = 0$ .

(ii)(b) If the initial custom satisfies Condition (47), then  $\frac{d}{d\sigma} [n - \bar{\varepsilon}(f, \sigma, v^{M*})] = 0$ . Therefore,  $\frac{dm_{e,t}}{d\sigma} = 0$ . Therefore, from the definition of  $\alpha_t = \alpha(f, v_t^M)$ , we obtain  $\frac{d\alpha_t}{d\sigma} \leq 0$ . If the initial custom satisfies Condition (48), then, since this condition is independent of  $\sigma$ , we obtain  $\frac{dm_{e,t}}{d\sigma} = 0$  and  $\frac{d\alpha_t}{d\sigma} = 0$ . ■

## 8 Appendix B

We show in this section that, in ‘a growing economy’, the Markov perfect equilibrium derived in Section 2.3 for the case of myopic community members also constitutes an equilibrium when community members are forward-looking. First, we formally state the assumption of ‘a growing economy’:

**Assumption 9:**  $\Pr(\sigma_{t+1} < \sigma_t) = 0$  for  $t = 1, 2, \dots, \infty$

According to Assumption 9, the common component of the outside option is expected to be at least as strong in future periods as it is in the current period.

In Section 2.3, it was shown that it is optimal for a myopic community member, involved in a dispute of intensity  $\frac{1}{\gamma_t^i}$  in period, to appeal to the formal court if and only if  $\gamma_t^i < \bar{\gamma}(f, v_t^M)$ . Since the decision to appeal has no impact on future utility (in particular, the appeal history has no effect on future verdicts within the informal system), a forward-looking agent would also find it worthwhile to appeal to the formal court if and only if  $\gamma_t^i < \bar{\gamma}(f, v_t^M)$ .

It was also shown that, in the unique equilibrium involving myopic community members, an individual with outside option  $\sigma_t + \varepsilon^i$  would exit the community if and only if  $\varepsilon^i > \bar{\varepsilon}(f, \sigma_t, v_t^M)$ . Considering the case of forward-looking agents, it should be evident that if  $\varepsilon^i \leq \bar{\varepsilon}(f, \sigma_t, v_t^M)$ , and all other community members follow the strategy described in Section 2.3, then a forward-looking agent would do at least as well to remain in the community for at least one period than to quit it immediately.

If  $\varepsilon^i > \bar{\varepsilon}(f, \sigma_t, v_t^M)$ , then the agent receives higher expected utility outside the community than inside during the *current* period. Furthermore, under Assumption 9, the welfare from being outside the community can only improve in future periods. From Proposition 2, given the Markov strategies outlined in Section 2.3, the custom responds to a future increase in  $\sigma$  by, at most, just enough to induce the marginal person to remain within the community. In addition, since it is assumed that no new members can join the community, the value of the community public good can only remain constant or decline over time. Therefore, if

$\varepsilon^i > \bar{\varepsilon}(f, \sigma_t, v_t^M)$ , then the agent also receives higher expected utility outside of the community in future periods.

Therefore, assuming that the customary authority and all other community members follow the Markov strategies described in Section 2.3, it is optimal for any one community member to do so as well. Therefore, under Assumption 9, the Markov strategies also constitute an equilibrium when community members are assumed to be forward-looking.

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