Using the law to change the custom

Gani Aldashev a, Imane Chaara b, Jean-Philippe Platteau a,*, Zaki Wahhaj b

a University of Namur (FUNDP) and CRE, 8 Rempart de la Vierge, 5000 Namur, Belgium
b University of Oxford Queen Elizabeth House, 3 Mansfield Road, Oxford OX1 3TR, United Kingdom, and CRE, University of Namur, Belgium

1. Introduction

Numerous examples attest that modern laws intended to modify or supersede customary rules have had no impact on such rules. These laws thus remain ‘dead letter’. For instance, laws enacted in Sub-Saharan Africa aimed at preventing excessive fragmentation of rural landholdings – through inheritance or land sale transactions – have never been enforced. The main cause is not the citizens’ ignorance of the law but their widespread belief that, given that these laws run counter to the custom, they will never be invoked to declare the marriage void. However, the legal prescription against behavior prescribed by the old rule. Whether the new formal law will replace the existing custom then depends on the ability of the law to change the custom in the direction intended by the legislator. Formal law then acts as an 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 disadvantaged sections of the population. We illustrate our insights using examples on inheritance, marriage, and divorce in Sub-Saharan Africa and India.

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* Corresponding author. Tel.: +32 81 724860; fax: +32 81 724840.

E-mail addresses: gani.aldashev@fundp.ac.be (G. Aldashev), imane.chaara@fundp.ac.be (I. Chaara), jean-philippe.platteau@fundp.ac.be (J.-P. Platteau), zaki.wahhaj@qeh.ox.ac.uk (Z. Wahhaj).

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1 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 (Pistor and Wellons, 1999; Pistor et al., 2003).
This dominant view puts the primary emphasis on the role of expectations. In this paper, we suggest an alternative approach that draws attention to the empowering effect of the modern law in situations where the custom benefits a privileged category of citizens and the preferences of the privileged and disadvantaged groups are antagonistic. More precisely, the law offers the disadvantaged citizens an exit option that enhances their bargaining power inside the community. Numerous field studies support our argument. Rao (2007) thus states that legal support in India effectively adds authority to women's voice, given that their land claims are thereby strengthened, even though women do not necessarily resort to formal courts (see also Davis, 2009; Quisumbing et al., 2001). Kevane (2004) observes that in Sahelian countries divorce was not customarily granted to a wife wishing to leave her husband except in the case of proven mistreatment by the latter (see also Plateau et al., 1999). Over the recent years, however, women have progressively acquired a de facto right to leave an unhappy union. This, according to Kevane (2004), is partly because of the administrative pressure “as successive regimes continue to push for explicit legal rules and rights for women in marriage” (p. 75; see also Jewsewiciki, 1993). Hilhorst (2000) also stresses that improved legal status may provide a stronger bargaining position to women. Finally, 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 opened a viable 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 came with the new “outside option” provided as a result of the reform of the legal contract.

We argue that under certain conditions the modern law can act as an outside anchor or a 'magnet' pulling the custom in the direction favorable to marginalized groups. We show this in the framework of a dynamic model featuring a customary authority (an informal judge) that behaves strategically. The informal judge faces a trade-off between choosing a verdict (which represents the custom) closer to his preferred one, which gives him intrinsic utility, and choosing a verdict further away from it, so as to retain disputants within the realm of his jurisdiction, which brings him social prestige. The informal judge changes the custom because of the threat of the appeal to the formal court by the disputants belonging to the marginalized group. Secondly, there is a threat of exit by marginalized citizens from the community, which means that the formal law will always be invoked by them in the event of a dispute. When deciding on leaving the community, marginalized people weigh the benefits of receiving a more favorable judgment when a dispute arises and of earning alternative incomes outside the community against the cost of losing the benefit from the community-level public good. In deciding to challenge the verdict of the customary authority (but staying within the community), a marginalized citizen weighs the resulting punishment inflicted on her against the cost of an unfavorable judgment.

The implications of our model for the choice of a legal reform – moderate versus radical – are ambiguous. This is because a progressive law may not only incite more people to challenge the custom but also encourage those with the best outside opportunities to leave the community. To the extent that the benefits from the public good produced by the community vary positively with community size, there are effects operating in opposite directions. Therefore, a radical legal reform is not necessarily most favorable to the disadvantaged citizens.

The remainder of the paper is organized as follows. Section 2 presents the model of legal dualism with two normative systems: the statutory law and the custom. Section 3 studies the optimal legal reform from the viewpoint of the marginalized section of the population, asking whether the most radical law is always the most favorable to the interests of this group. Section 4 discusses two possible extensions of the model. Section 5 presents and discusses several examples illustrating how changes in various key parameters of the model affect the way in which conflicts are resolved in customary settings. We draw these examples from the studies on women's rights and land tenure, particularly in the context of Sub-Saharan Africa and India. Section 6 situates our theoretical analysis in the existing law and economics literature. Section 7 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 customary judge lives in the community and has a preferred judgment (in each judicial case) 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-run 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 traditional elite (Davis, 2009). Note that the informal judge is not necessarily one individual but may be a council composed of influential members of the community (e.g., elders, lineage heads). The community consists 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 case is settled either informally (within the community) or formally (in the court). The formal judge who operates in the latter framework bases his judgment on the written law. In order to focus our analysis on the 'magnet effect' of the statutory law, we assume that people have perfect information about its content and sufficient trust in its enforceability.

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 natural way to motivate this assumption is that if individuals begin to abandon a community in large numbers, then there must come a point where the possibility of economic and social exchange within the community begins to suffer (this is akin to a result by Krantons, 1996). Such a situation, which is likely to occur when the modern economy is expanding, is the one most relevant to our theoretical analysis2. Note that the public good does not exclusively consist of village-level facilities but also includes utility-bearing social interactions: informal mechanisms of social protection, religious celebrations, village meetings and feasts, social events and ceremonies on the occasion of births, marriages, funerals, 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 varies across individuals but also depend on 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. It seems reasonable to assume that individuals are not able to re-enter the community easily once they leave. If they were, then people would exit the community frequently to take advantage of formal courts and economic opportunities, and simply re-enter during times of economic hardship. This assumption is fully consistent with the observation by Crook (2004) and Gedzi (2009) that, in Ghana, urban residents seek resolution of litigation cases only in the formal courts, as opposed to rural residents who are more likely to use indigenous forums such as chiefs or elders’ courts first, before accessing the formal courts.

2 Under severe population pressure, an exit from the community may be beneficial to those who remain behind. However, in such situations, the marginalized sections of the community may be forced out by the politically powerful in any case. The informal judge may then have an incentive to encourage exit. The presence of these additional political forces and incentives suggests that any analysis of legal pluralism in such a setting should be fundamentally different from the basic framework adopted in our paper.
2.2. Setup of the model

The community consists of two groups of individuals: A (the elite) and B (the commoners). 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 (‘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 our own field observations in rural West Africa (Senegal and Mali) and by Fenrich and Higgins (2001) and Uwazie (2000) in Ghana, the individual who appeals to the formal court receives 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 stain the image of the family or community, thereby jeopardizing the ongoing relationships and undermining the group’s cohesion (Gedzi, 2009). We therefore believe that the chosen game structure and timing realistically describes 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 \( I_t \) the subset of individuals who remain within the community in period \( t \). We normalize the total population size of the community to 1. The game is repeated infinitely, and the timing of events within each period of the game is as follows:

(i) a stochastic variable \( \sigma_t \) is realized; \( \sigma_t \) captures the current state of the economy, which affects the outside options of community members as defined below;

(ii) the customary authority declares a custom \( \psi^C \in [0,1] \); given that his reputation is at stake, we assume that the customary authority is able to commit to providing judgment in actual cases consistent with his declared position;

(iii) each individual \( i \in I_t(t-1) \) decides whether to exit or remain within the community in period \( t \); the decision is represented by \( e_\ell \in \{0,1\} \), with \( e_1 = 1 \) denoting exit;

(iv) a binary random variable \( d_i^t \) for each \( i \in I_t \) is realized, indicating whether an individual \( i \) is embroiled in 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 \( i \in I_t(t) \cap D(t) \), where \( D(t) = \{ i \in I_t : d_i^t = 1 \} \) ), individuals decide whether to accept the customary judgment or appeal to the formal legal system; the decision is represented by \( a^t_\ell \in \{0,1\} \), with \( a_1 = 1 \) denoting appeal;

(vii) if a case is taken to the formal court, the customary authority punishes the detractor by imposing an exogenously determined level of punishment.\(^3\)

We represent the range of possible outcomes of a case by the interval \([0,1]\), where an outcome of 0 is most favorable to A and 1 is most favorable 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 \( \sigma_t + \epsilon^t \) where \( \sigma_t \) is public information, and \( \epsilon^t \) 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.** \( \epsilon^t \sim U(0,1) \).

In each period \( t \), being part of the community yields a utility of \( y(n) \) 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.** \( y^t(n) > 0 \) and \( y^t(n) < 0 \) for all \( n \).

We impose a further condition on \( y^t() \) 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.** \( y^t(n) < 1 \) for all \( n \).\(^4\)

We denote by \( y^t(\cdot) \) 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. \( d_i^t = 0 \), then we set \( \frac{1}{y^t(\cdot)} = 0 \)).\(^5\) 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 \( y^t(\cdot) \):

**Assumption 4.** \( y^t(\cdot) \sim U[\gamma_{\min}^t, \gamma_{\max}^t] \) for each \( i \in D(t) \), and \( E \left( \frac{1}{\gamma_{\max}^t} \right) = 1 \).

For simplicity, we assume in this section that the formal law is applied in a consistent manner, and the judgment to be received from the formal legal system is known in advance with full certainty. Therefore, \( v^t_i = s^t_i \) for each \( i \) and \( t \). We discuss in Section 4.1 the implications of introducing uncertainty within the formal legal system.

We assume that the stochastic variable \( \gamma^t_i \), 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 \( \sigma_t^t \). Specifically, we have

**Assumption 5.** \( \sigma_t \sim Q(\sigma) \), where \( Q(\sigma) \) is a distribution function parameterized 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 to leave the community in anticipation of future punishments but he cannot avoid a punishment that is already due by doing so. This punishment structure has been adopted

\(^3\) Alternatively, one can endogenize the level of punishment and have it chosen by the customary authority to maximize his expected utility. Making punishments harsher would then discourage appeal by community insiders but encourage ex-ante exit by community members in anticipation of punishments. We do not take this route as it would not provide additional insights regarding punishments without empirical knowledge (which the literature lacks at present) about the extent to which the informal authorities are concerned about exit versus appeal.

\(^4\) The condition \( y^t(n) < 1 \) for all \( n \) also ensures that exit from the community is gradual. If we had assumed instead that \( y(n) \rightarrow 1 \) then, starting at an equilibrium point, any improvement in outside option would cause the community to unravel immediately.

\(^5\) The definition of the severity of dispute as the inverse of \( y \) rather than \( y \) itself is adopted for the sake of simplicity. Indeed, the Proof of Proposition 2 below would be more difficult with the second definition because the first derivative of the threshold value \( \gamma \) (see infra) with respect to \( \gamma \) would be non linear.
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 intractable. 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.

2.2.1. Payoffs

For each person who belongs to the community, i.e. for each \( i \in I_C(t) \), the per-period utility is given by

\[
u_i^t = y(n_i) + d_i \left( \frac{v_i^f - 1}{\gamma_i^f} - p \right) + \left( 1 - d_i \right) \left( \frac{v_i^M - 1}{\gamma_i^M} \right).
\]  

(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 \( \left( \frac{v_i^f - 1}{\gamma_i^f} - p \right) \), 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 \( \left( \frac{v_i^M - 1}{\gamma_i^M} \right) \), which depends on the decision received within the formal legal system, and the punishment imposed by the customary authority on the individual for seeking out this judgment. For each person who has exited the community, i.e. for each \( i \in I_C(t) \), the per-period utility is given by

\[
u_i^t = \alpha_i + v_i^t + d_i \left( \frac{v_i^f - 1}{\gamma_i^f} \right).
\]  

(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

\[
u_i^M = y(n_i) + X(1 - \alpha_i) - g \left( \frac{v_i^M - 1}{\gamma_i^M} \right)
\]  

(3)

where \( \alpha_i \) represents the proportion of community members who challenge the verdict of the customary authority by seeking recourse to the formal legal system. The function \( X(.) \) captures the 'prestige' of the formal judge, which is decreasing in the extent to which his position 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 \( I(0) \) represents the preferred custom of the customary authority. If his declared position and actual judgments differ from his preferred custom, he incurs a disutility equal to \( g \left( \frac{v_i^M - 1}{\gamma_i^M} \right) \). We make the following assumptions about the function \( g(.) \):

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

The assumption of convexity for the function \( g(.) \) 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.

We impose a final assumption to ensure that the expected utility of the customary authority is globally concave in the custom:

**Assumption 8.** \( y^*(n) \leq -\frac{1}{6\delta\gamma_{\min}[\ln(\gamma_{\max} + \ln p)^2]} \text{ and } \gamma_{\max} > \frac{1}{p} \).

The need for Assumption 8 arises from the fact that as the custom becomes more 'progressive', community members will have more disputes settled by the customary authority for a wider range of disputes; and therefore their ex-ante expected utility becomes more sensitive to changes in the custom. This, in turn, means that the marginal utility gain to the informal judge from an increase in \( v_i^M \) may, in fact, be increasing in \( v_i^M \). For reasons of tractability, we suppress this possibility by assuming, in Assumption 8, that the public good function \( y(.) \) is sufficiently concave. The condition \( \gamma_{\max} > \frac{1}{p} \) – which is needed to ensure that the restriction on \( y^*(.) \) is well-defined – says that there are always some low-intensity disputes (even in the extreme case where \( v_i^M = 0 \) and \( f = 1 \)) which are fully resolved by the customary authority, without appeal to the formal courts by any party.

2.3. Strategic choices by community members and the customary authority

To solve for the behavior 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 \( \alpha_i, n_i, f \) 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 \( \alpha_i, n_i, f \) and the declared position of the customary authority in the current period, \( v_i^M \). 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).

2.3.1. 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 \( \frac{1}{\gamma_i^M} \), then he or she makes an appeal to the formal court if and only if

\[
\frac{1}{\gamma_i^M}(f - 1) - p > \frac{1}{\gamma_i^M} \left( \frac{v_i^M - 1}{\gamma_i^M} \right.
\]

(4)

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

\[
\gamma_{\min} \text{ if } \frac{f - v_i^M}{p} < \gamma_{\min},
\]

\[
\gamma_{\max} \text{ if } \frac{f - v_i^M}{p} > \gamma_{\max}.
\]

\[
\frac{f - v_i^M}{p} \text{ otherwise}
\]
Thus, we have $\hat{\alpha}(f \mid v^M) = 1$ if $\gamma^t < \gamma(f \mid v^M)$ and $\hat{\alpha}(f \mid v^M) = 0$ otherwise. Letting $\alpha(f \mid v^M) = \hat{\alpha}(f \mid v^M) - \gamma_{\min} - \gamma_{\max}$, we obtain, under Assumption 4, and the Law of Large Numbers, $\alpha = \alpha(f, v^M)$, where $\alpha$ is the fraction of marginalized community members who challenge the customary authority by making an appeal to the formal court. Note that this fraction is independent of $\sigma$ and $n$.

2.3.2. 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

$$\alpha_t + \epsilon_t + \delta(f-1) > y(n_t-1) - \sum_{i \in I, j \neq t} \epsilon_i + \delta G(f, v^M) + \delta G(f, v^M)$$

(5)

where $G(f, v^M)$ represents the 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 $1/\gamma(f \mid v^M)$.

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.\footnote{Bear in mind that $\tilde{d}$ is the expected value of $d$: $\tilde{d} = E(d) = \delta*1(d = 1) + (1-\delta)*0$ ($d = 0$).}

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 above which individuals exit the community, and below which they unique equilibrium in the exit decision, involving a threshold value for.

Therefore, we have

$$\sigma_t = \max_{\sigma_{t+1}} \tilde{y}(n_t) + X(1-\alpha(f, v^M)) - \beta EU^M(\tilde{n}, \tilde{\sigma})$$

(10)

where $v^M$ corresponds to the Markov equilibrium strategy of the customary authority; $\beta$ is the discount factor, $\alpha_t = \alpha$ and $\tilde{\sigma} = Q(\sigma_t)$. From (10), we can compute the effect on the utility of the customary authority from a small increase in $v^M$ as follows:

$$MU(f, \alpha, n, v^M) = -y'(\tilde{n}) \hat{\delta}_{\alpha} \hat{X}(1-\alpha(f, v^M)) \hat{\alpha}_{\alpha}$$

(11)

The first term $-y'(\tilde{n}) \hat{\delta}_{\alpha}$ represents the increase in the value of the community public good in the current period from reduced exits. The second term $-\hat{X}(1-\alpha(f, v^M)) \hat{\alpha}_{\alpha}$ 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 $-\hat{g}(v^M-\hat{l})$ represents the increase in (psychological) cost in opting for a custom that is further from his ideologically preferred point. Finally, the term $-\hat{b}EU^M \hat{\alpha}_{\alpha}$ represents the gain in future utility from fewer exits in the current period.

Note that if $\tilde{\tau}(f, \alpha, v^M) = \tilde{n}$ for some $v^M \in [0,1]$, then $\hat{\delta}_{\alpha}$ is undefined for that value of $v^M$; similarly, if $\alpha(f, v^M) = 0$ for some $v^M \in [0,1]$, then $\hat{\alpha}_{\alpha}$ is undefined. Consequently, $MU(f, \alpha, n, v^M)$ is undefined at such points. However, it is possible to show that, under Assumption 8, $MU(f, \alpha, n, v^M)$ 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 $y(.), X(.), g(.), m(.)$ and $\alpha(.)$ are continuous, so is the objective function of the customary authority. Therefore, if

$$MU(f, \alpha, n, v^M) = 0$$

(12)

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

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

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 $\pi(f, \sigma, v_{M^*}) = \pi$) or just progressive enough to prevent any appeals to the formal court from community members (therefore, we have $\frac{1}{\sigma} f(\sigma^* - v_{M^*}) = \gamma_{\max}$).

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 judgments 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 become 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 characterization 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 favors 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 find 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.\(^8\)

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 behavior.

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 Proposition 2, 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 favor 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,

1. 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: $\frac{\partial v_{M^*}}{\partial f} < 1$; consequently, increasing $f$ leads to greater exit from the community and greater appeal to the formal legal system from within the community: $\frac{\partial m_{e^*}}{\partial f} > 0$ and $\frac{\partial d^*}{\partial f} > 0$;
   (b) increasing $\sigma$ leads to greater exit from the community and less appeal to the formal legal system from within the community: $\frac{\partial m_{e^*}}{\partial \sigma} > 0$ and $\frac{\partial d^*}{\partial \sigma} < 0$;

2. 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 characterizes 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 characterizes 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 favorable 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.

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\(^8\) 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) show 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 favorable to the commoners by becoming more conservative in his interpretation of the custom.
3. Welfare analysis and public intervention

3.1. Analytical argument

From the comparative statics analysis, it is evident that one positive effect of a legal reform favorable 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 marginalized section of the population would always benefit from a legal reform that renders the formal law more favorable 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 marginalized 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 $I_g$ and $I_{gc}(t)$ the population of commoners, and the subset of commoners who remain within the community in period $t$, respectively. We have $I_g = I_g \cap I$ and $I_{gc}(t) \subset I_{gc}(t)$. 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:

$$w(n, \sigma, v^M, f) = \int_{nt \in I_{gc}} E[\alpha + \varepsilon + df] + \int_{nt \in I_g} \left[y(n) + d_x \max \left(1, \frac{1}{\gamma} f, 1, \frac{1}{\gamma} v^M \right)\right].$$

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 legibility, 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 maximize the discounted sum of the utility stream across all periods. Therefore, we introduce the aggregate welfare function as follows:

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

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

$$v^M_t = v^M(n_t, \sigma_t, f).$$

Let $h_t$ denote the history of $\sigma$-shocks up to 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 $v^M_t$ on the basis of the initial parameters of the game and the history of $\sigma$-shocks $h_t$. Hence, we write

$$n_t = \tilde{n}_t(n_0, \sigma_0, f; h_t)$$

$$v^M_t = \tilde{v}^M_t(n_0, \sigma_0, f; h_t).$$

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

$$w_t = w\left(\tilde{n}_t, \sigma_t, \tilde{v}^M_t, f\right).$$

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

$$\frac{\partial W}{\partial f} = E \sum_{t=0}^{\infty} \beta^{t-1} \left( \frac{\partial w}{\partial \tilde{n}_t} \frac{\partial \tilde{n}_t}{\partial f} + \frac{\partial w}{\partial \sigma_t} \frac{\partial \sigma_t}{\partial f} + \frac{\partial w}{\partial v^M_t} \frac{\partial v^M_t}{\partial f} \right).$$

The differential equation in (17) captures all the welfare-effects of a legal reform that renders the formal law more favorable to the marginalized 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 favorable 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(i))). 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 $X(.)$, $g(.)$ and $y(.)$. 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),

\[ w(n_t, \sigma_t, v^M_t, f) = (1 - n_t) \left[ \sigma_t + \delta f \right] + \frac{1}{2} \left( 1 + n_t \right) + n_t \left[ y(n_t) + \delta G(f, v^M_t) \right]. \]  

(18)

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

\[ \frac{\partial w}{\partial f} = (1 - n_t) \delta + n_t \left[ y'(n_t) \frac{\partial n_t}{\partial f} + \frac{\partial G}{\partial f} \right]. \]  

(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 \( y'(.) \) 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 \( \sigma_t + \epsilon \).

Those with the highest values of \( \epsilon \) (the heterogeneous 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 (behavior which can be represented by a sharply increasing cost function \( g_i(.) \)), 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.

Given that this last eventuality cannot be analytically proven in a fully rigorous way, we explore this effect using numerical simulations.

3.2 Simulations

We make the following assumptions for the simulations. The customary authority has the prestige function \( X(\hat{a}) = (2\hat{a} - \hat{a}^2) \) where \( \hat{a} = 1 - \alpha \) 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) \( g_2(x) = \frac{1}{2} x^2 \) if \( x < 0.3 \) and \( g_2(x) = 2x^2 - 0.15 \) 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 \( \epsilon \) 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 \( \frac{7}{10} \) and 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 \( U^n(n, \sigma) \) is computed using an iterative process based on the Contraction Mapping Theorem (Theorem 3.2 by Stokey et al., 1989). Fig. 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 \( g_i(x) \) 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(ii). 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(ii).

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. Fig. 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, favoring the commoner, is optimal for any social welfare function we may consider. This is because the utility plotted in Fig. 2 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 favorable 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. Fig. 3 plots the verdict in the informal court, $v^M$, as $f$ varies from 0 to 1, as in Fig. 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 Fig. 4.

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 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 antagonize 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 two directions. While we do not model these extensions explicitly, we discuss the robustness of our main results to these changes (given that the applicability of our model for policy purposes depends on it).

4.1. 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; 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 unfavorable to women and the statutory law, which tends towards giving equal recognition to women’s rights, is the most favorable (the Islamic law is somewhere in between). In deciding which law should apply to a particular case, courts tend to base their judgment 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). 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”, the judge 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 the Verse 12 of Sourate IV of the Qur’an). 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).

Third, even in cases where there is a unique body of statutory laws, interpretation problems may create uncertainty. This point is 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 is 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 favorable 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. For example, conservative judges of Tetouan assert that polygamy is ‘a divine right prior to all human legislation’ and cannot, therefore, be expected to strictly follow the new law. In practice, they tend to grant men’s right to polygamy as soon as the husband can prove that he earns sufficient income (Elharras and Serhane, 2006). In the same vein, Mouaqt (2007) concludes from his interview with a group of 35 Moroccan judges that whenever the terms of the law are not exactly precise, there is a tendency to confuse law and ethic. In Ghana, likewise, judges have some flexibility in applying the 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). For instance, moving to rules might help to reduce the judicial bias or to reduce the chance 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 consists of reducing the uncertainty of the formal verdicts. We leave the exploration of this interesting issue of legal design for future work.

4.2. 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 behavior 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

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9 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).

10 We thank a referee for suggesting this alternative.
verdicts. His objective function would thus include two elements: law abidingness and the extent to which his verdict differs from his preferred judgment. 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 judgment.

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 take into consideration not only the reaction of the customary authority but also that of the formal judge. 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 judgment. These judges would respond by ceasing to follow the written law and shifting, instead, to their preferred judgment. If their proportion 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. A similar argument has been made by Kahan (2000) with respect to the US laws about date rape, domestic violence, sexual harassment, drugs and drunk driving. Expanding liability for these crimes did not have the expected effect because police became less likely to arrest, prosecutors to charge, jurors to convict, and judges to sentence severely. Lawmakers would therefore be more effective by applying ‘gentle nudges’ rather than ‘hard shoes’.

Finally, 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 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, there are four possible configurations. 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). Bearing in mind that the ‘magnet’ effect of an increase in the value of the formal law is equivalent to an improvement of outside opportunities, we may now present our empirical evidence.

5.1. Inheritance

Our main illustration of the above theory consists of a dynamic story with succeeding stages corresponding to different outcomes in terms of Table 1. The story concerns women’s rights of land inheritance in the Senegal river valley where one of the authors did fieldwork in the late 1990s (Platteau et al., 1999). In this area, the entire population is Muslim and this affiliation dates back to several centuries. As field interviews conducted in a sample of sixteen villages located in the delta area (department of Dagana) and the Middle valley (departments of Podor and Matam) revealed, local inhabitants have a good knowledge of the Qur’an and they are aware that it contains provisions dealing explicitly with inheritance, particularly the prescription according to which women should inherit half of the share of their brothers. Despite this Qur’anic injunction, they have generally and until recently followed the customary principle providing that women ought not to inherit any land from their father. Behind this rule prevailing in patriarchal societies lies the fear that ancestral lands might fall into stranger hands or be excessively split, especially when marriage practices follow the rule of virilocal exogamy (Goody, 1976).

The fact of the matter is that, in this initial situation, the opportunity cost of referring to the formal law (the Qur’an, in this instance) and appealing to the formal judge (the local marabout) is sufficiently high, and the outside options sufficiently unattractive, to prevent any woman from venturing into questioning traditional norms. In other words, the formal law does not confer bargaining power upon rural women as a result of which the custom does not change, the community does not shrink, and there are no appeals to the formal law. The main reason why the opportunity cost of referring to the Qur’an and appealing to the marabout is initially so high for local Senegalese women is that by antagonizing their male relatives they would lose important social protections they have traditionally enjoyed under the custom. Under the customary land tenure system, indeed, women are insured against various contingencies, in particular the prospects of separation/divorce and unwed motherhood. When such events occur, the custom typically grants them the right to return to their father’s land where they are allowed to work and subsist till they find a new husband (Platteau et al., 1999; see also Cooper, 1997, for similar observations in the case of Niger). Moreover, the psychological cost of taking a land dispute to the (formal) religious authority 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; see also Gedzi, 2009, for Ghana; and Henrsson and Joireman, 2009, for Kenya).

When they become widows, they are traditionally entitled to cultivate the land of their deceased husband until their male children reach adulthood.

Table 1

<table>
<thead>
<tr>
<th>Magnet effect and community size when a ‘progressive’ legal reform is enacted (or, equivalently, an improvement in outside opportunities occurs).</th>
</tr>
</thead>
<tbody>
<tr>
<td>No exit from the community</td>
</tr>
<tr>
<td>The custom does not change (no ‘magnet’ effect)</td>
</tr>
<tr>
<td>The custom evolves (‘magnet’ effect at work)</td>
</tr>
</tbody>
</table>
Over the last decades, however, the value attached by women to their participation in the social game of their village community, in particular, the value of the customary system of social protection, has fallen as a result of an increase in female education and an expansion of non-agricultural employment opportunities available to them. As predicted by our theory, under such circumstances of improved outside opportunities, the custom has started to evolve and a number of women are leaving their community. There is no evidence, though, that the custom has gone so far as adopting the above Islamic prescription (daughters should inherit half the share of their brothers).

What we observe, instead, 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 evolution has been detected in Niger where women, in recognition of their ownership rights, may receive part of the crop harvested on the family land by their brothers under an arrangement known as aro (Cooper, 1997). It is also interesting to note that women who have completed their primary schooling and those who have a non-agricultural occupation (even after excluding the marketing of agricultural products) have a tendency to express negative opinions about customary practices such as arranged marriages, bride price payments, and the levirate system whereby a widow is remarried to a brother of her deceased husband (Gaspart and Platteau, 2010). Such a change of attitudes and beliefs reflects an increasing readiness of these ‘progressive’ women to challenge the custom.

It bears emphasis that, in the above example, the situation of women has improved despite the absence of a change in the formal law (as a written code, the Qur’an is immutably fixed): it is thanks to the availability of new outside options for women that the custom is induced to change under the impact of a (constant) law. By serving as a ‘magnet’, the law incites the informal judge to bend the custom in a progressive direction lest too many (marginal) members of the community should leave his jurisdiction or challenge his verdicts. 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, so that women’s bargaining power is enhanced.

5.2. Divorce, marriage, and widowhood

Our second example comes from a tribal state of India (Jharkhand) and illustrates 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). The SPTA law was intended to protect these 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 against such aggressive moves. Two lessons from the SPTA initiative deserve special attention. First, as a consequence of the law, customary authorities have modified the custom in a direction favorable to women. It is apparently because of some sort of prestige considerations – they want “to present themselves as fair and just” – that village elders have responded to the new legislation by adopting a more gender-progressive stance: in terms of our model, the ‘magnet’ effect of the law is triggered by the preoccupation of village elders to maintain their authority and to retain enough potential claimants within the purview of their informal jurisdiction.

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. To understand this point, it must be borne in mind that the SPTA represents the gharjawae as an adopted son who inherits the land of his in-law family, thereby avoiding to suggest that land may be bequeathed to daughters. It is thus far away from the Hindu Succession Act (1956) which provides equal inheritance rights to both sons and daughters (Rao, 2007; in the same vein, see Fafchamps and Quisumbing, 2002, for Ethiopia). Even more revealingly, the SPTA was inspired by a practice born in the area itself of the fathers’ desire to keep the land of the family 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 struggled to bend decisions of village elders in their favor. The enactment of the Act and the registering procedure that it provides have thus had the effect of counteracting a regressive evolution of the custom in favor of men’s interests. Such regression was itself induced by a change in the economic environment (resource endowment).

5.3. Land rights

Our last example concerns the evolution of land rights for immigrant farmers in lineage-based societies. They traditionally enjoyed long-term use rights over the land granted by local customary authorities. As land pressure increases, however, these rights become increasingly precarious and immigrant farmers even face a serious risk of eviction, leading to socially explosive situations. Original settlers, indeed, come to realize that land may be lacking for their children or grandchildren, or they simply want to reappropriate land that has become more valuable as a result of improvements made by their occupants (Laurent, 1998). The state may then choose to intervene with a view to counteracting exclusionary practices and reducing opportunities for conflict. In Côte d’Ivoire, for example, land scarcity had sparked acute tensions which eventually degenerated into the wild expulsion of foreign immigrants (mainly from Burkina Faso and Mali). It is in this context that in December 1998 the Ivorian government passed a law (Law N° 98–750) providing that all landholdings cultivated by immigrants henceforth become state lands leased to them for a period of 99 years (Aka, 2007).

Here is a vivid illustration of how the formal law can compel customary practices to evolve in conditions where they are, or have become, inefficient (immigrants are typically dynamic farmers) and inequitable (immigrants have occupied Ivorian land for several generations). Public intervention has proved successful because the state was clever enough not to opt for a radical solution: stopping short of granting full ownership rights to immigrants, it conferred upon them a transitory status more acceptable to indigenous village communities. Following a tradition inherited from colonial and post-independence times, the state actually re-asserted its own right of bare ownership of the country’s rural lands, which entitles it to grant use rights to individuals or communities. The ire of the original inhabitants was thus placated and land relations stabilized thanks to the effective enforcement of the new law which ultimately depends on the cooperation of local informal authorities. A more radical pro-immigrant law would have harmed this vulnerable group since it would have stirred up resentful and antagonistic feelings within the host communities. This is, therefore, a clear case in which too strong a departure from the preferred judgment of the customary authorities (precarious rights for immigrants) would have been self-defeating.

6. Related literature

One important approach to the role of modern law when solutions imposed by legislative fiat tend to produce dismal results is grounded in the common law process. The central idea is that customary rules are more likely to change if they are allowed to evolve and modernize themselves by being gradually assimilated by the law through successive court decisions rather than through one-shot acts of the
In our approach, the modern law is conceived as a ‘magnet’ that is able to pull the custom in a ‘progressive’ direction. 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 a sense, the custom may be said to evolve ‘in the shadow of the law’ when the ‘magnet’ effect operates. Yet, this sense is somewhat different from that used by Chakravarty and Macleod (2009) or Mnookin and Kornhauser (1979). For Chakravarty and Macleod, transactors take account of judicial rulings in the way they arrange a formal contract. In their framework, the court enforces the contracts and hears all arising disputes, but the effect of the law on contracts is prior to the emergence of a potential dispute. In our model, by contrast, we look at the influence of the modern law on the actual outcomes of the informal judicial process. In Mnookin and Kornhauser’s paper, the legal system has an impact on negotiations and bargaining that occur outside the courtroom since legal rules indicate the particular allocation a court will impose if the parties fail to reach an agreement. Unlike what we consider, there is no informal agency operating parallel to the formal court.

The existing literature of the economic analysis of law (see Cooter and Ulen, 2004, and Posner, 1998, for reviews) has so far not devoted much attention to the evolution of customary law induced by the introduction of, or changes in the formal law. In particular, 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 (opusio iuris). This said, 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), 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.

Finally, one 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). 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.

7. 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 impact 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 favorable to the commoners (understood in a wide sense allowing for any change that favors disadvantaged sections of the population) crucially depends upon the incentives of the customary authorities to keep their people within the fold. These, in turn, depend on several factors: the social prestige derived by these authorities from dispute adjudication, the cost of deviating from their preferred judgment, the degree of progressiveness 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 generally insufficient 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, a 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.

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.

The suggestive evidence discussed in this paper confirms that, contrary to a widespread view, modern laws may have an effect on customary rules and that moderate laws may be more effective than radical ones. Clearly, more systematic empirical work is needed. As we see it, the main merit of our endeavor is to provide a conceptual framework for thinking about the effect of formal laws in the presence of informal authorities that act strategically.

Appendix A

In this section, we prove Lemma 1, and Propositions 1 and 2. The proofs involve the first derivatives of \( \tau(f, v^M) \), \( \gamma(f, v^M) \), \( \alpha(f, v^M) \) and \( m_\alpha(f, \alpha, n, v^M) \) 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.**

\[
\frac{f-v^M}{p} = \gamma_{\text{min}}. \]

**Condition 2.**

\[
\frac{f-v^M}{p} = \gamma_{\text{max}}. \]

**Condition 3.**

\[
\alpha_t + \delta(f-1) = y(1) + \delta G(f, v^M_t). \]

**Condition 4.**

\[
\alpha_t + 0 + \delta(f-1) = y(0) + \delta G(f, v^M_t). \]

**Condition 5.**

\[
\alpha_t + 1 + \delta(f-1) = y(1) + \delta G(f, v^M_t). \]

**Condition 6.**

\[
\alpha_t + 0 + \delta(f-1) > y(0) + \delta G(f, v^M_t). \]

We proceed by computing the first derivatives. From the definition of \( \tau(f, v^M) \), we have

\[
\frac{\partial \tau(f, v^M)}{\partial v^M} = \begin{cases} 
-\frac{1}{p} & \text{if } \frac{f-v^M}{p} \leq \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} \\
0 & \text{if } \frac{f-v^M}{p} < \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} 
\end{cases} \]  

(20)

\[
\frac{\partial \gamma(f, v^M)}{\partial f} = \begin{cases} 
1 & \text{if } \frac{f-v^M}{p} \leq \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} \\
0 & \text{if } \frac{f-v^M}{p} < \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} 
\end{cases} \]  

(21)

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

From the definition of \( \tau(f, \alpha, v^M) \) in (6)--(8), we have

\[
\frac{\partial \tau(f, \alpha, v^M)}{\partial v^M} = \begin{cases} 
\frac{\delta}{p} \ln \gamma_{\text{max}} - \ln \tau(f, v^M) & \text{if } \tau \in (0, 1) \\
0 & \text{if Condition 5 or 6 holds} 
\end{cases} \]  

(22)

\[
\frac{\partial \tau(f, \alpha, v^M)}{\partial f} = \begin{cases} 
\frac{\delta}{p} \ln \tau(f, v^M) - \ln \gamma_{\text{max}} & \text{if } \tau \in (0, 1) \\
0 & \text{if Condition 5 or 6 holds} 
\end{cases} \]  

(23)

Note that \( \frac{\partial \tau(f, \alpha, v^M)}{\partial v^M} \) and \( \frac{\partial \tau(f, \alpha, v^M)}{\partial f} \) are undefined under **Conditions 3 and 4.**

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

\[
\frac{\partial \alpha(f, v^M)}{\partial v^M} = \begin{cases} 
\frac{\delta}{p} & \text{if } \frac{f-v^M}{p} \leq \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} \\
0 & \text{if } \frac{f-v^M}{p} < \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} 
\end{cases} \]  

(24)

\[
\frac{\partial \alpha(f, v^M)}{\partial f} = \begin{cases} 
\frac{\delta}{p} & \text{if } \frac{f-v^M}{p} \leq \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} \\
0 & \text{if } \frac{f-v^M}{p} < \gamma_{\text{min}} \text{ or } \frac{f-v^M}{p} > \gamma_{\text{max}} 
\end{cases} \]  

(25)

Similarly,

\[
\frac{\partial m_\alpha(f, \alpha, n, v^M)}{\partial v^M} = \begin{cases} 
0 & \text{if } n < \tau(f, \alpha, v^M) \text{ or } \tau = 0 \text{ or } \tau = 1 \\
-\tau(f, \alpha, v^M) & \text{if } n > \tau(f, \alpha, v^M) 
\end{cases} \]  

(26)

\[
\frac{\partial m_\alpha(f, \alpha, n, v^M)}{\partial f} = \begin{cases} 
0 & \text{if } n < \tau(f, \alpha, v^M) \text{ or } \tau = 0 \text{ or } \tau = 1 \\
-\tau(f, \alpha, v^M) & \text{if } n > \tau(f, \alpha, v^M) 
\end{cases} \]  

(27)
Similarly,

$$\frac{\partial m_e(f, \alpha, n, v^M)}{\partial f} = \begin{cases} 0 & \text{if } n < \pi(f, \alpha, v^M) \text{ or } \pi = 0 \text{ or } \pi = 1 \\ \frac{\delta \ln \gamma(f, v^M) - \ln \gamma_{\text{max}}}{1 - y'(\pi)} & \text{if } n > \pi(f, \alpha, v^M) \end{cases}$$  \hspace{1cm} (28)

Note that $\frac{\partial m_e(f, \alpha, n, v^M)}{\partial \alpha}$ is undefined if $\pi(f, \alpha, v^M) = n$. Finally, if $\hat{n}(f, \alpha, n, v^M) = n - m_e(f, \alpha, n, v^M)$, we obtain

$$\frac{\partial n(f, \alpha, n, v^M)}{\partial \alpha} = -\frac{\partial m_e(f, \alpha, n, v^M)}{\partial \alpha}$$

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 with respect to $v^M$ throughout (11), we obtain

$$-y'(\gamma) \frac{\partial n}{\partial \alpha} \frac{\partial m_e}{\partial \alpha} + X'(\gamma) \left( \frac{\partial \alpha}{\partial \alpha} \right) \frac{\partial^2 \alpha}{\partial (v^M)^2} - X'(\gamma) \frac{\partial^2 \alpha}{\partial (v^M)^2}$$

Note that $\frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2}$ is undefined under Conditions 3 and 4. From (22), we obtain $\frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2} \geq 0$ if defined. Therefore, we obtain from (34), under Assumption 8, $\frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2} \leq 0$ if defined. From (26), we obtain

$$\frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2} = \begin{cases} 0 & \text{if } n < \pi(f, \alpha, v^M) \text{ or if Condition 5 or 6 holds} \\ \frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2} & \text{if } n > \pi(f, \alpha, v^M) \end{cases}$$  \hspace{1cm} (35)

Note that $\frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2}$ is undefined at $n = \pi(f, \alpha, v^M)$ and under Conditions 3 and 4. Since $\frac{\partial^2 m_e(f, \alpha, n, v^M)}{\partial (v^M)^2} \leq 0$ if defined, we obtain, using (35), that $\frac{\partial^2 m_e}{\partial (v^M)^2} \geq 0$ if $n < \pi(f, \alpha, v^M)$ or if Condition 5 or 6 holds. From (24), we obtain

$$\frac{\partial^2 \alpha}{\partial (v^M)^2} = 0.$$  \hspace{1cm} (36)

Note that $\frac{\partial^2 \alpha}{\partial (v^M)^2}$ 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, $y'(\gamma) > 0$, $y''(\gamma) < 0$. Under Assumption 6, $X'(\gamma) > 0$, $X''(\gamma) < 0$. Under Assumption 7, $g''(\gamma) > 0$. From (30), $\frac{\partial n}{\partial \alpha} \geq 0$.

From (27), $\frac{\partial m_e}{\partial (v^M)^2} \leq 0$. Furthermore, it can be shown that $\frac{\partial^2 ELM}{\partial (v^M)^2} \leq 0$. Thus we obtain, from (33), that $\frac{\partial MU}{\partial \alpha} > 0$ wherever defined.

We identified five conditions, 1–4, and $n = \pi(f, \alpha, v^M)$, under which one or more of the terms in (33) are undefined. Note that, given parameters $f, \alpha, n$, 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. Therefore, there are at most four points at which $\frac{\partial MU}{\partial \alpha}$ is undefined. □

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

$$\frac{\partial \pi}{\partial (v^M)^2} = \begin{cases} \frac{\delta y'(\gamma)}{1 - y'(\pi)} \frac{\ln \gamma_{\text{max}} - \ln \gamma(f, v^M)}{1 - y'(\pi)} & \text{if } \pi \in (0, 1) \\ 0 & \text{if Condition 5 or 6 holds} \end{cases}$$  \hspace{1cm} (34)

Recall that $\gamma_{\text{max}} \geq \pi(f, v^M) \geq \gamma_{\text{min}}$. Therefore, the maximum value that the first term can take is $\frac{1}{\gamma_{\text{min}}}$ Using Assumption 8, we have $\gamma_{\text{max}} = \frac{1}{f}$. And, under Assumption 2, we have $1 - y'(\gamma) < 1$. Therefore, the maximum value that the second term can take is $\frac{1}{\gamma_{\text{min}}} - \ln f + \ln y'(\gamma)$. Therefore, the following is a sufficient condition for $\frac{\partial \pi}{\partial (v^M)^2} \geq 0$:

$$\frac{1}{\gamma_{\text{min}}} + \frac{1}{\gamma_{\text{min}}} - \ln f + \ln y'(f, v^M) \leq 0$$

The restriction on $y'(f, v^M)$ in Assumption 8 ensures that this last condition is satisfied.

15 Note that $\frac{1}{\gamma_{\text{min}}} \leq \frac{1}{\gamma_{\text{min}}}$ and Assumption 8 implies that $\frac{1}{\gamma_{\text{min}}}$.
Lemma 1 enables us to characterize 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 $n$.

Lemma 2. If the optimal strategy of the customary authority is given by $M(U^M(f,\sigma, n, v^M) = 0)$, then $\partial U^M / \partial n = 0$ and $\partial^2 U^M / \partial (n)^2 = 0$. Otherwise, if $n = \pi(f, \sigma, v^M(f, \sigma, n))$ and $M(U^M(f,\sigma, n, v^M(n,\sigma, f)) \neq 0$ (specifically, $M(U^M(f,\sigma, n, v^M(n,\sigma, f))$ is undefined) then $\partial U^M / \partial n > 0$ and $\partial^2 U^M / \partial (n)^2 \geq 0$.

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

\[
M\left(f, \sigma, n, v^M(n, \sigma, f)\right) = 0.
\]

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

\[
-\alpha'(n) \frac{\partial n}{\partial n} = -\alpha'(n) \frac{\partial n}{\partial m} \frac{\partial m}{\partial n} + \alpha(n) \frac{\partial \alpha}{\partial n} \frac{\partial m}{\partial n} + X(n) \frac{\partial X}{\partial n} \frac{\partial m}{\partial n} + \frac{\partial \alpha}{\partial n} \frac{\partial m}{\partial n}.
\]

Note that any term involving $\partial m / \partial n$ is equal to zero given (26) and (32). Therefore, $\partial U^M / \partial n = 0$. Consequently, $\partial^2 U^M / \partial (n)^2 = 0$.

(ii) Suppose, instead, that the solution is given by $n = \pi(f, \sigma, v^M(n, \sigma, f))$.

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

\[
1 = \frac{\partial C}{\partial n} \frac{\partial U^M}{\partial n}.
\]

Assuming $\pi(n, \sigma, f) \equiv (0, 1)$, we have

\[
\frac{\partial U^M}{\partial n} = \frac{1 - y'(\pi)}{\ln \pi(n) - \ln \pi(f, v^M)}.
\]

By Assumption 3, $1 - y'(\pi) > 0$ and, from Assumption 8, it follows that $\pi(f, v^M) < \pi(n)$. Therefore, $\partial U^M / \partial n > 0$. Differentiating throughout (40) with respect to $n$, we obtain

\[
0 = \frac{\partial^2 U^M}{\partial (n)^2} \left(\frac{\partial^2 M}{\partial n^2}\right)^2 + \frac{\partial U^M / \partial n}{\partial U^M / \partial (n)^2}.
\]

If $\pi(n, \sigma, f) \equiv (0, 1)$, we have, using (22), $\frac{\partial C}{\partial \sigma} > 0$. Moreover, using (34) and Assumption 8, we have $\partial^2 U^M / \partial (n)^2 \leq 0$. Therefore, from (41), we obtain $\partial^2 U^M / \partial (n)^2 \geq 0$.

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

\[
\frac{\partial^2 U^M}{\partial (n)^2} = \sum_{i=1}^{\infty} \left[ y'(n_i) \frac{\partial n_i}{\partial n} - \left\{ X'(1 - \alpha(f, v^M)) + g'(v^M - l) \right\} \frac{\partial^2 m_i}{\partial (n)^2}\right] j.
\]

First, consider the case where $\pi(f, \alpha, v^M) = n_t$ and $\pi(f, \alpha, v^M) \geq n_t$ for each $\tau < t$. Then, using (32), we obtain $\partial n_t / \partial n = 1$ and $\partial^2 n_t / \partial (n)^2 = 0$. Furthermore, using Lemma 2, we have $\partial^2 U^M / \partial (n)^2 > 0$.

Second, consider the case $\pi(f, \alpha, v^M) < n_t$ for some $\tau \leq t$. Then, using (32), we obtain $\partial n_t / \partial n = 0$ and $\partial^2 n_t / \partial (n)^2 = 0$. Furthermore, $\partial^2 U^M / \partial (n)^2 = 0$ and $\partial^2 U^M / \partial (n)^2 = 0$. Therefore, $\partial^2 U^M / \partial (n)^2 = 0$.

Finally, consider the case $\pi(f, \alpha, v^M) \geq n_t$ for each $\tau < t$ and $\pi(f, \alpha, v^M) > n_t$. Then, using (32), we obtain $\partial n_t / \partial n = 0$ and $\partial^2 n_t / \partial (n)^2 = 0$. Furthermore, $\partial^2 U^M / \partial (n)^2 = 0$. Then, it is straightforward to verify that $\partial^2 U^M / \partial (n)^2 < 0$. □

In summary, $\partial^2 U^M / \partial (n)^2 \leq 0$.

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

\[
g'(v^M) \frac{\partial^2 U^M}{\partial f^2} = \frac{\partial n_t}{\partial f} \frac{\partial^2 m_t}{\partial f} \left( y'(n_t) + \beta \frac{\partial E U^M}{\partial f} \right) - \frac{\partial^2 m_t}{\partial f^2} \left( y'(n_t) + \beta \frac{\partial E U^M}{\partial f} \right) + X'(1 - \alpha(f, v^M)) \frac{\partial \alpha}{\partial f} \frac{\partial \alpha}{\partial f}.
\]


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

$$
\frac{\partial^2 \nu^M(f, \alpha, \nu^M)}{\partial v^M \partial f} = \begin{cases} 
- \frac{1}{1 - y^{(\nu)}} \left[ c^2 \nu^{(\nu)} \left[ \frac{\nu^{(\nu)} \partial \nu^M}{\partial v^M} \right] \right] \text{ if } \nu = (0, 1) \\
0 \text{ if Condition 5 or 6 holds.} 
\end{cases}
$$

(45)

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

$$
\frac{\partial^2 m_n(f, \alpha, \nu^M)}{\partial v^M \partial f} = \begin{cases} 
0 \text{ if } n = \nu^M(f, \alpha, \nu^M) \text{ or } \nu = 0 \text{ or } \nu = 1 \\
- \frac{\partial^2 \nu^M(f, \alpha, \nu^M)}{\partial v^M \partial f} \text{ if } n > \nu^M(f, \alpha, \nu^M). 
\end{cases}
$$

(46)

Note that $\frac{\partial^2 m_n(f, \alpha, \nu^M)}{\partial v^M \partial f}$ is undefined if $\nu^M(f, \alpha, \nu^M) = n$ or if $\frac{\partial^2 \nu^M(f, \alpha, \nu^M)}{\partial v^M \partial f}$ 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 $\frac{\partial^2 m_n(f, \alpha, \nu^M)}{\partial v^M \partial f} \leq 0$ if defined. Furthermore, from (24), we obtain $\frac{\partial^2 m_n}{\partial v^M \partial f} = 0$ if defined.

Now, we are able to sign all the terms on the right-hand side of (44). Under Assumption 2, $y^{(\nu)} < 0$ and $\nu^{(\nu)} > 0$. Under Assumption 6, $X^{(\nu)} > 0$ and $X^{(\nu)} < 0$. Under Assumption 7, $g^{(\nu)} > 0$. From (31), $\frac{\partial n}{\partial f} \leq 0$ if defined. From (27), $\frac{\partial m_n}{\partial v^M} \leq 0$ 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 $\frac{\partial \nu^M}{\partial f} \geq 0$ whenever defined.

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

$$
\nu^M(f, \alpha, \nu^M) \equiv n
$$

(47)

(48)

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

$$
\frac{\partial \nu^M}{\partial f} = - \frac{\partial \nu}{\partial f} / \frac{\partial \nu^M}{\partial \nu^M} \text{ if } \nu \in (0, 1). 
$$

(49)

Then, using (22) and (23), we obtain $\frac{\partial \nu^M}{\partial f} = 1$ if $\nu \in (0, 1)$. If $\nu^M(f, \alpha, \nu^M) = 0$ or 1 and either Condition 5 or 6 holds, then $\frac{\partial \nu^M(f, \alpha, \nu^M)}{\partial f} = 0$. If $\nu^M(f, \alpha, \nu^M) = 0$ or 1 and either Condition 3 or 4 holds, then $\frac{\partial \nu^M}{\partial f}$ is undefined if either Condition 3 or 4 holds. Differentiating throughout (48) w.r.t. $f$, we obtain $\frac{\partial \nu^M}{\partial f} = 1$. Therefore, $\frac{\partial \nu^M}{\partial f} \geq 0$ whenever 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

$$
g^{(\nu)}(\nu^M) \frac{\partial \nu^M}{\partial \sigma} = - \frac{\partial n}{\partial \sigma} \frac{\partial \nu^M}{\partial \nu^M} \left( y^{(\nu)} + \beta \frac{\partial E(U^M)}{\partial \sigma} \right) - \frac{\partial m_n}{\partial \nu^M} \left( y^{(\nu)} + \beta \frac{\partial E(U^M)}{\partial \sigma} \right) \\
+ X^{(\nu)}(1 - \alpha(f, \nu^M)) \frac{\partial \alpha}{\partial \nu^M} \left( \frac{\partial \sigma}{\partial \nu^M} \right) \frac{\partial \nu^M}{\partial \sigma} \\
- X^{(\nu)}(1 - \alpha(f, \nu^M)) \frac{\partial \nu^M}{\partial \sigma} \frac{\partial \sigma}{\partial \nu^M} \left( \frac{\partial \alpha}{\partial \sigma} \right) \\
- \frac{\partial \nu^M}{\partial \sigma} \frac{\partial \sigma}{\partial \nu^M} \frac{\partial \alpha}{\partial \sigma}.
$$

(50)

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

$$
\frac{\partial \nu(f, \sigma, \nu^M)}{\partial \sigma} = \begin{cases} 
- \frac{1}{1 - y^{(\nu)}} \text{ if } \nu \in (0, 1) \\
0 \text{ if Condition 5 or 6 holds.} 
\end{cases}
$$

(51)

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

$$
\frac{\partial m_n(f, \sigma, \nu, \nu^M)}{\partial \sigma} = \begin{cases} 
0 \text{ if } n = \nu \text{ or } \nu = 1 \\
1 \text{ if Condition 5 or 6 holds.} 
\end{cases}
$$

(52)

Using (52) and Assumption 3, we have $\frac{\partial m_n(f, \sigma, \nu, \nu^M)}{\partial \sigma} \geq 0$ whenever defined. From (51), we obtain

$$
\frac{\partial \nu(f, \sigma, \nu^M)}{\partial \sigma} = - \frac{\partial \nu}{\partial \sigma} \left[ 1 - y^{(\nu)}(\nu^M) \right] \text{ if } \nu \in (0, 1). 
$$

(53)

(54)

Using (54), $\frac{\partial^2 m_n(f, \sigma, \nu^M)}{\partial \nu^M \partial \sigma} \leq 0$ if defined. Since $n(f, \sigma, \nu^M) = n - m_n(f, \sigma, \nu, \nu^M)$, we obtain $\frac{\partial n(f, \sigma, \nu^M)}{\partial \sigma} = - \frac{\partial m_n(f, \sigma, \nu^M)}{\partial \sigma}$ and $\frac{\partial E(U^M)}{\partial \sigma}$ are undefined if either Condition 3 or 4 holds.

Furthermore, we can show that $\frac{\partial m_n(f, \sigma, \nu^M)}{\partial \sigma} \geq 0.17$ Then, we can establish, using (50) and Assumptions 2.3.6 and 7, $\frac{\partial^2 m_n(f, \sigma, \nu^M)}{\partial \sigma} \geq 0$.

---

17 Note that nowhere in $y(f, \nu^M) > \nu$, we have, using (26), $y(f, \nu^M) = 0$. On the other hand, if $y(f, \nu^M) < \nu$, we have, using (32), $\frac{\partial y(f, \nu^M)}{\partial f} = 0$. Then, it follows from (10) that $\frac{\partial E(U^M)}{\partial \sigma} = 0$. Therefore, $\frac{\partial E(U^M)}{\partial \sigma} = 0$. Thus, we obtain $\frac{\partial E(U^M)}{\partial \sigma} = 0$. 


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

\[
\frac{\partial \delta v^M}{\partial \alpha} = \frac{\partial \pi}{\partial \delta} \cdot \frac{\partial \pi}{\partial \delta v^M} \quad \text{if} \quad \alpha \in (0, 1)
\]

\[
\Rightarrow \frac{\partial \delta v^M}{\partial \alpha} = \frac{1}{\alpha \ln \gamma_{\max} - \ln \gamma(f, v^M)} \quad \text{if} \quad \alpha \in (0, 1).
\]

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

**Proof of Proposition 2.** In the following, we use the notation \( m_t = m_t(f, \alpha, n, v^M_t) \).

(i) (a) First, we prove by contradiction that \( \frac{\partial \delta v^M}{\partial \alpha} \leq 1 \). Suppose that \( v^M \) responds to \( f \) one-for-one, i.e., \( \frac{\partial \delta v^M}{\partial \alpha} = 1 \), then, from the definition of \( \pi(f, \alpha, v^M) \) and \( \gamma(f, v^M) \), we obtain \( \frac{\partial \delta v^M}{\partial \alpha} = 0 \) and \( \frac{\partial \delta v^M}{\partial \alpha} = 0 \). Moreover, \( \frac{\partial \delta v^M}{\partial \alpha} = 0 \). Therefore, \( \frac{\partial \delta v^M}{\partial \alpha} \geq 0 \). Since, by Lemma 3, \( U^M(\cdot) \) is weakly concave, \( \frac{\partial \delta v^M}{\partial \alpha} \) is weakly decreasing in \( n_t \) and thus \( \frac{\partial \delta v^M}{\partial \alpha} \) is weakly decreasing in \( n_t \). Furthermore, using the definition of \( \gamma(f, v^M) \), we obtain \( \frac{\partial \delta v^M}{\partial \alpha} < 0 \). Therefore, \( \gamma'(n_t) \) and \( X' \) are weakly decreasing in \( f \). Finally, if \( \frac{\partial \delta v^M}{\partial \alpha} < 1 \) then \( \frac{\partial \delta v^M}{\partial \alpha} \) is increasing in \( f \). Once again, we obtain the result that, following an increase in \( f \), the first-order condition for \( v^M \) will not be satisfied: the expression in (11) will be smaller than zero. Hence, we must have \( \frac{\partial \delta v^M}{\partial \alpha} < 1 \). Then \( \frac{\partial \delta v^M}{\partial \alpha} \geq 0 \).

Also, from the definition of \( \alpha(f, v^M) \), if \( \frac{\partial \delta v^M}{\partial \alpha} < 1 \), it follows that \( \frac{\partial \delta v^M}{\partial \alpha} \geq 0 \).

(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

\[
\frac{\partial \delta v^M(f, \alpha, n)}{\partial \alpha} = 1. \quad \text{Then, from the definitions of} \quad m_c(f, \alpha, n) \quad \text{and} \quad \alpha(f, v^M), \quad \text{we obtain} \quad \frac{\partial m_c}{\partial \alpha} = 0 \quad \text{and} \quad \frac{\partial \alpha}{\partial \alpha} = 0.
\]

(ii) (b) If the initial custom satisfies Condition (47), then \( \frac{\partial \alpha}{\partial \alpha} \leq [n - \pi(f, \alpha, v^M)] = 0 \). Therefore, \( \frac{\partial m_c}{\partial \alpha} = 0 \). Then, from the definition of \( \alpha = \alpha(f, v^M) \), we obtain \( \frac{\partial \alpha}{\partial \alpha} \leq 0 \). If the initial custom satisfies Condition (48), then, since this condition is independent of \( \alpha \) we obtain \( \frac{\partial \alpha}{\partial \alpha} = 0 \). \( \Box \)

**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.** \( Pr(\alpha_{t+1} > \alpha_t) = 0 \) for \( t = 1, 2, \ldots, \infty \).

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 \( \frac{1}{\gamma(f)} \) in period, to appeal to the formal court if and only if \( \gamma(f, v^M) \). 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 \( \gamma(f, v^M) \).

It was also shown that, in the unique equilibrium involving myopic community members, an individual with outside option \( \alpha_i + \varepsilon \) would exit the community if and only if \( \varepsilon > \gamma(f, v^M) \). Considering the case of forward-looking agents, it would be evident that if \( \varepsilon > \gamma(f, v^M) \), 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 \( \varepsilon > \gamma(f, v^M) \), 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 \( \alpha \) 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 \( \varepsilon > \gamma(f, v^M) \), 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.

**References**

