Simultaneous Community and Court Enforcement
Supplement to Section 2.4 of Masten and Prüfer, "On the Evolution of Collective Enforcement Institutions: Communities and Courts"

The following provides a more formal analysis of the scope of enforcement where courts and communities both exist. We begin by defining X' as the scope of cooperation supported by communities if courts exist and are effective, and posit the following strategy, specified for $\theta > 0$. (The case $\theta < \theta^*$ follows analogously.)

Community & Court Enforcement (CCE) Strategy. For player i matched with partner x: In every period t,

- transactor i transacts and cooperates with partner x if the distance between i and x, $X \in [\Phi,\Gamma]$.
- For $X \in [0, X']$ and for $X \in [\Gamma, \Gamma']$, transactor i transacts and cooperates with partner x *unless* player i has received news that his current match x defected in period $t - 1$, or if player i himself defected in period $t - 1$ and his match x learned about it. In these cases, transactor i does not interact with x.
- For $X \in [X', \Phi]$ and for $X > \Gamma'$, transactor i does not interact with x.

For transactions where courts are effective independently (*i.e.*, between Φ and Γ), a transactor using the CCE strategy trades cooperatively with the support of courts alone, implying that behavior in the former period is irrelevant. If courts are not competent enough to obtain cooperative trade for all high-value transactions (*i.e.*, if $\Gamma < 1$), the joint availability of court and community enforcement leads to more cooperation than with courts alone ($\Gamma' > \Gamma$) for some transactions if both transactors did not defect in the former period.

> **Proposition 3 (Cooperation under community & court enforcement)** Assume $\theta > 0$. (i) There exists a Markov-perfect equilibrium in which all players play the CCE-Strategy. (ii) This equilibrium is characterized by mutual transaction and cooperation for matches at distances $X \in [0, X']$ and for $X \in [\Phi, \Gamma']$, whereas players matched at all other distances do not transact.

The proof of Proposition 3 follows the structure of the proofs of Propositions 1 and 2. Therefore, we focus on the differences to those proofs here. For transactions in the interval $X \in [\Phi,\Gamma]$, for which courts in isolation sustain cooperation, the additional availability of community sanctions has no effect: Under the conditions set out in Proposition 2, filing suit is individually rational in this region, and the threat of court enforcement is sufficient to support cooperation without the addition of community enforcement.

For $X > \Gamma > X^*$, neither courts nor communities alone could sustain cooperation. However, in this region the expected punishment for defecting is the sum of L_i and $\tau(h - l)e^{\theta X} + g$: Filing suit against a defecting trading partner is individually rational (because $X > \Phi$) but enforcement is insufficiently accurate (τ is too low; hence $X > \Gamma$) and, therefore, the expected court sanction is too small to deter cheating for high-value transactions. However, for distances above but close to Γ, namely, for $X \in [\Gamma, \Gamma']$, the addition of community sanctions will be enough to make defection unprofitable.

Finally, consider player *y*, at distance $Y \in [\Phi,\Gamma]$ from player *i*, who is matched with player *i* in period t+1 and who receives news from player *x*, who was matched to player *i* in period *t*, that *i* defected. The CCE strategy dictates that the partners transact and cooperate, because courts can effectively deter defection for transaction at these ranges. Player *y* is strictly better off ignoring the information about player *i*"s defection in the previous period *t*. If he transacts and cooperates, he can expect *y* to do so as well (because of the credible option to file a suit if he defects), yielding each player a positive payoff instead of the zero payoff to not transacting. By backward induction, when player *i* is matched with player *x* in period *t* at distance *X*, both have the same expectations about this behavior of players *i* and *y* in period *t+1* (and symmetrically for player *x* and his next match). Therefore, they know that the punishment from community enforcement, L_i, is reduced to $L_i' < L_i$. For example, if $\Phi < \{X \text{ or } (1- X)\} < \Gamma$:[1]

$$L' \equiv \delta[\int_0^{\Phi} \frac{e^{-Y_1}}{2(1-e^{-1})} \kappa e^{-(X-Y_1)} h e^{\theta Y_1} dY_1 + \int_{\Gamma}^{1} \frac{e^{-Y_2}}{2(1-e^{-1})} \kappa e^{-(Y_2-X)} h e^{\theta Y_2} dY_2$$
$$+\int_{\Gamma}^{1} \frac{e^{-Y_3}}{2(1-e^{-1})} \kappa e^{-(2-X-Y_3)} h e^{\theta Y_3} dY_3 + \int_0^{\Phi} \frac{e^{-Y_4}}{2(1-e^{-1})} \kappa e^{-(X+Y_4)} h e^{\theta Y_4} dY_4]. \quad (1)$$

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Because of the effect of lower L_i on X^* (see the proof of Proposition 2), we can state the following corollary to Proposition 3 without formal proof.

Corollary 1 (Supplement and Crowding out) (i) The availability of community enforcement supplements court enforcement: $\Gamma' > \Gamma$, for $\theta > 0$. (ii) The effectiveness of community enforcement decreases in the effectiveness of court enforcement: $X' \leq X^*$; and $\partial X'/\partial \Phi > 0$, $\partial X'/\partial \Gamma < 0$.

[1] Different relations among Φ, Γ, and X yield different boundaries intervals in L_i', but the comparative statics results remain.