Thesis Abstract

This dissertation explores the nature and consequences of bilateral contests between unequal opponents in diverse contexts. Three essays present game-theoretic models of contests in three distinct environments, in each of which an *a priori* weak contestant is pitted against an *a priori* strong contestant (a *contestant* being either an individual or a well-knit community of individuals). The following kinds of questions are addressed: Which, if any, of the two agents gains from the conflict? Is the *ex post* asymmetry in outcomes for the two agents 'better' (in some specific sense) than the *ex ante* asymmetry between them, or is it worse? What are the social consequences of such contests, and how do these consequences depend upon the initial asymmetry between the contestants?

The first essay, "Value Creation *vs*. Appropriation and Choice of Property Rights", studies the interaction between endogenously established property rights and subsequent appropriative conflicts. We model two (pre-modern) communities located in *anarchy* with unequal resources. We study a scenario where the communities (which are the decision-making units) have opportunities to (*a*) costlessly *improve* their (common) property rights regime by mutual consent, (*b*) then allocate their resources towards value creation *vs*. appropriation, and (*c*) finally engage in appropriative conflicts. It might be expected that the communities will always choose to strengthen property rights as they should realize that weak property rights over 'own fruits of labor' will lead to appropriative conflicts causing resource-misallocation and value-destruction. However, we show that whether (and by how much) the communities choose to improve the property rights regime depends on the resource inequality between them. A key feature of the two-community equilibrium is that the resource-poorer community *always* has a weaker incentive to improve property rights as opposed to the resource-richer community. This is a consequence of the *Hirshleiferian paradox of power* that holds in our model – given an imperfect rights regime, *ex post* consumption inequality is less severe than the *ex ante* resource inequality. But above and beyond this fact, we establish the following result: When the *ex ante* resource asymmetry between the two communities is sufficiently high, their endogenous preferences over property rights diverge completely, and the resource-poorer community strictly prefers a *weakening* of property rights. As a

result, the initial state of *anarchy* persists, and there is maximal aggregate resource diversion (across the two communities) towards value-appropriation. The resource-poorer community gains from the resultant appropriative conflict while the other community incurs (possibly substantial) losses. In establishing these results, we study two regimes: one in which the communities can conclude peace treaties to avoid conflict and can *credibly commit* to the terms of such treaties (the Credibility Regime), and another in which they cannot credibly commit to the terms of any peace treaty (the No-credibility Regime). We show that the resource-poorer community's preferred property rights regime is anarchy for a much larger set of the parameter values of our model in the Credibility Regime than in the No-credibility Regime. This result informs on the Coase Theorem in the context of our model by proving that the possibility of *ex post* Coasian bargaining in an imperfect property rights environment dilutes *ex ante* incentives to strengthen said property rights.

The second essay, "The Bowerbirds' Mating Contest: Analysis and an Application", is motivated by the following *mating contest* that has been extensively documented in the evolutionary biology literature: With the aim of wooing mates, male satin bower-birds spend considerable time and effort in creating and decorating their bowers, and also attempt to destroy the bowers of rival males; female bower-birds, in turn, select their mates on the basis of the relative attractiveness of their surviving bowers. A game-theoretic model of this mating contest is studied, where two male birds of distinct strengths engage in competitive signaling followed by signal sabotage, in an environment where a female-bird infers a male-bird's strength by observing the quality of his surviving bower. It is established that the possibility of sabotage can improve the outcomes for both male-birds, while harming the outcome for the female-bird. The former happens because the anticipated threat of sabotage depresses each male-bird's incentive to engage in costly signaling, and the latter because sabotage introduces *noise* in the female-bird's selection process.

We then study a principal-agent model that is similar in structure to the bower-birds' contest: A principal cares about the best among the outputs created by two agents, and is in a position to design a tournament with suitably chosen order-of-moves and prizes. In a setting where (*a*) produced outputs need to be *stress-tested* to determine their durability (here, stress-testing is similar to mutual sabotage in its analytics, though not in its intent), and (*b*) outputs can only be evaluated in relation to other outputs or an exogenous benchmark, it is shown that if the two agents are not too

asymmetric then a tournament is strictly better for the principal than individually contracting with a single agent; if no external benchmark is available then for limited agent-asymmetry, the optimal output-selection mechanism is a *simultaneous tournament* with the maximal feasible winning prize.

The third essay, "Contests with Foot-Soldiers under Contingent Compensations", models the interaction between two asymmetric contestants (politicians) – an *ex ante underdog* and an *ex ante favourite* – who attempt to engage *foot-soldiers* (unemployed youth) to fight for them in their aim to win a contest (election). In this setting, each of the contestants is likely to gain access to significant economic resources and power *if and only if* she wins the contest. As a result, the contestants are initially compelled to offer *win-contingent compensations* to their foot-soldiers – either in private goods like cash, or in excludable public goods like power and access. Further, the foot-soldiers are likely to be (at least partially) *mercenary* in that higher compensation offers will induce them to switch allegiance away from a *like-minded* contestant. The equilibria of such contests are shown to possess the following key properties in a large set of circumstances (e.g., for compensations in private or in public goods): Contestants' offers of contingent compensation force potential foot-soldiers to choose their allegiance on the basis of *predicted winners* – and that act, in and of itself, enables the *ex ante* favourite contestant to extend her initial lead (in the chance of winning) over the *ex ante* underdog. The underdog offers compensation at least as high as that offered by the favourite, but still manages to attract a smaller army of foot-soldiers and thus falls farther behind in the race. In some cases, the underdog is *doubly disadvantaged* – the contestants' opportunity of foot-soldier recruitment causes her to fall farther behind in the race, but she has to pay a higher foot-soldier bill *if* she happens to win the contest (so that her *net win payoff* is smaller than what would accrue to the favourite had she won) . In every version of our contest model, *contesting with foot-soldiers* is necessarily *dissipative* for at least one of the contestants, implying that at least one contestant would be strictly better off under an externally-imposed ban on foot-soldier recruitment. In this respect, the *ex ante underdog* is more likely to be the sufferer, while the *ex ante favourite* can actually benefit from *contesting with foot-soldiers* when her initial lead is significant. With regard to the welfare effects of such contests on the economy, our presumption is that (some of) the actions of the foot-soldiers as well as a part of the compensation paid to them (especially in-kind compensations like political access) are detrimental to societal welfare. In that vein, we identify contest equilibria in which *all agents* in an economy (with the possible exception of the *winning* foot-soldiers) would gain from an exogenously-imposed ban on the use of foot-soldiers.