The Freedom to Contract and the Free-Rider Problem

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We present an economic argument for restraining certain voluntary agreements. We identify a class of situations where single individuals or parties may use the freedom to contract to subtly manipulate large groups of individuals by offering them contracts that promote free-riding behavior. We provide three examples where placing restrictions on the freedom to contract may prove beneficial. The first example provides a rationale for the prohibition of exclusionary contracts. We point to the role most favored nation clauses may play in facilitating such inefficient exclusionary practices. The second example provides justification for prohibiting employers from proposing to compensate workers for committing not to join a labor union. The third example provides a rationale for the ban against vote trading.

1. Introduction

A basic tenet of libertarian thinking is that society's affairs can be organized by either the dictates of a coercive central authority or by freely arrived at contracts between individuals who agree to transfer to one another their rights in exchange for monetary compensation or other rights. While the former approach is denounced by many libertarians and economists as unjustified, the latter is hailed as an approach that is not only justified but also "inspiring and maximizes liberty, justice and utility."[1] Nevertheless, even dogmatic libertarians agree that not all freely arrived at contracts promote efficiency.[2] For example, contracts that impose significant negative external effects on third parties might be extremely inefficient. But since almost every conceivable economic action imposes a negative externality on some third party, a criterion that determines

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1. See Ryan's (1987:36) paraphrase of Nozick (1974:ix). Among economists, those who subscribe to this view tend to be associated with the "Chicago School of Economics." See e.g. Friedman and Friedman (1979) and Mitchell (1989).

2. See, e.g., Epstein (1984) and Trebilcock (1993).

when an externality is severe enough to render a contract socially undesirable has to be defined. [For a number of possible such criteria see, e.g., Trebilcock (1993) and the references therein.]

The purpose of this article is to supplement the argument for restraining the freedom to contract by presenting a rationale for constraining certain voluntary agreements. We identify a class of situations where single individuals or parties may use the freedom to contract to subtly manipulate large groups of individuals by offering them contracts that promote free-riding behavior. This can be done in a way that favors the interests of those who propose the contract but undermines the interests of those individuals to which the contract is offered. For each single individual, accepting the contract is beneficial, but for the group as a whole, the situation where many of its members have entered the contract might be significantly less advantageous. We argue that in such situations, where the freedom to contract might be abused and large groups of individuals might be maneuvered into disadvantaged positions, it may be in the interest of society to restrain the freedom to contract.

We provide three examples where placing restrictions on the freedom to contract may prove beneficial. The first example provides a rationale for the prohibition of exclusionary contracts. If exclusionary contracts are enforceable, a monopolist can prevent entry into its market by offering consumers to enter contracts where they commit not to buy from any future competitor in return for a discount. We show that a monopolist can obtain the agreement of many of the consumers to such a contract, thereby eliminating competition, by offering an arbitrarily small discount. The second example shows that an employer can guarantee to itself the entire surplus generated by its workers by offering them an arbitrarily small bonus if they commit never to join a labor union. While it is in the interest of each single worker to enter the contract and collect the bonus, if many do, they lose the protection of the labor union and the employer can pay them no more than their reservation wages. The third example provides a rationale for the ban against vote trading. We show that if votes are traded in a market, a single individual may purchase everybody else's votes for an arbitrarily low price and implement a policy that is socially undesirable.

What distinguishes these three examples is that the negative externality that is imposed on others by any *single* individual who enters the proposed contract is negligible. Indeed, prominent economists (cited below in Sections 4 and 6) have argued in favor of legalizing such contracts, presumably because they believe this externality to be insignificant. We show, however, that it is very likely that *many* individuals will enter the contract and that the overall damage to society may be considerable.

The logic underlying the three examples above is identical to the logic that implies that voluntary provision of public goods falls short of achieving full efficiency. The divergence between individuals' personal gains and gains to society creates a situation where individuals enjoy the benefits of entering the contract (or not contributing to the public good and free-riding), but do not realize the full extent of the social consequences of their actions. In the particular examples analyzed in this article, the situation is even worse. Even though there exist Pareto efficient equilibria where the public good is provided, the freedom to contract allows the introduction of "destabilizing" contracts that change individuals' incentives such that the only resulting equilibrium is where everybody free rides.

Our results apply to the discussion among regulators and practitioners[3] regarding the competitive effect of "most favored nation" (MFN) clauses. Below we demonstrate that MFN clauses may be instrumental in facilitating inefficient exclusionary practices. Our analysis thus strengthens the case against the competitiveness of MFN clauses.

Most favored nation clauses are contractual clauses that guarantee purchasers they will not pay more than the lowest price a seller is charging from any of its costumers. Supporters of MFN clauses point to a long list of their supposed benefits.[4] On the other hand, critics argue they have two principal anticompetitive effects. First, widespread use of MFN clauses may facilitate collusion among sellers by reducing the incentives of firms to deviate from coordinated pricing.[5] However, as Edlin (1997) argues, MFN clauses could in fact be procompetitive since rivals of a firm that adopted a MFN clause may be tempted to cut their prices "because they have a diminished fear of being matched and so can dramatically increase market share" (p. 552). Second, according to some commentators, MFN clauses may also help entrench dominant firms by raising rivals' costs.[6] For example, a firm with some measure of purchasing power may demand MFN protection from the seller of its inputs in order to stamp out selective discounts offered to its rivals.

The article proceeds as follows. In the next section, we provide an intuitive explanation of our arguments in the context of the case of exclusionary contracts. In the third section, we present a general argument that explains the difficulty associated with efficient voluntary provision of public goods. We then apply these results to the discussion of the desirability of exclusionary contracts in Section 4, to labor negotiations in Section 5, and to the discussion about the desirability of vote trading in Section 6. Section 7 concludes. All proofs are relegated to the appendix.

2. A Motivating Example

Suppose that a firm (the entrant) is considering whether to enter into a market that is served by an incumbent monopolist. If it enters into the market, it competes with the incumbent monopolist and the resulting price in the market is p^D. If it does not enter, the incumbent monopolist charges the monopolistic price $p^M > p^D$. Suppose further that it is commonly known that the entrant

3. See, e.g., Kattan and Stempel (1996) and the references therein.

4. For example, Kattan and Stempel (1996) argue that MFN clauses may (1) help buyers protect themselves against paying more than their competitors, (2) help reduce buyers' search costs, (3) help reduce buyers' renegotiation costs, (4) help facilitate sharing of sellers' cost saving among buyers, and finally, (5) may be used as price adjustment mechanisms.

5. See Salop (1986), Hay (1982), and Kattan and Stempel (1996).

6. See Kattan and Stempel (1996) and the references therein.

needs to establish a market share of at least $\alpha \in (0, 1)$ in order to survive in the market without suffering losses and that absent any additional restrictions on the form of competition between the two firms, the entrant is expected to capture this market share.

Thus if exclusionary contracts are not allowed, the entrant will enter into the market thereby lowering the price paid by consumers from p^M to p^D. If, on the other hand, exclusionary contracts are allowed, the incumbent monopolist may offer just a little over $1 - \alpha$ of the consumers the following contract: "commit to only buy from me. In return you will receive a small discount of ε from the current price and a guarantee that the future price you will pay will be lower by at least ε from the price paid by any of my costumers." That is, the incumbent monopolist offers those consumers who enter the contract a discount off the prevailing price right now, and a guarantee that the future price they will pay will be lower than the price charged by the monopolist to any of the consumers who did not enter the contract. The monopolist relies on an MFN clause in a way that commits it to match the price offered by any future entrant to the market. This is because if at any point in the future, a competitor enters the market, the market price for those consumers who did not enter the contract with the monopolist drops to the duopolistic price p^D. It suffices then that at least one of those "free" consumers will buy from the monopolist to guarantee that all of the monopolist's consumers will pay the duopolistic price p^D. Thus the monopolist may rely on an MFN clause as a mechanism to facilitate price matching.[7]

It is important to emphasize that as far as individual consumers are concerned, unless the very fact that an individual consumer enters the contract proposed by the incumbent monopolist deters the entrant from entering into the market, the consumer will never regret having entered such a contract with the monopolist. We refer to consumers who have the power, individually, to affect the entrant's decision about whether or not to enter into the market, as being "pivotal." Thus, unless a consumer believes he is pivotal, he will never regret having entered the contract offered by the monopolist. Below we argue that indeed, the only plausible equilibrium is such that individual consumers' actions do not discourage entry into the market. Consequently, the incumbent monopolist can take advantage of the fact that it can credibly commit to an exclusionary contract before a potential entrant has even appeared. The monopolist can offer consumers a contract that, individually, they would be better off entering, deter entry into the market, and continue to charge the monopolistic price p^M in every period.

An intuitive explanation for why this is the case is the following. The utility to an individual consumer from entering or declining to enter the exclusionary contract offered by the incumbent monopolist depends on the number of other consumers who have entered the contract. If this number is small, then the

7. The anticompetitive effect of price-matching practices are well known. Edlin (1997:552) argues that while challenges to price-matching practices could be raised under current antitrust law, challenges to MFN clauses would be more difficult to substantiate.

entrant enters and the consumer pays the duopolistic price, p^D, in every future period if he did not enter the contract with the monopolist, and a little less if he did. But if the number of other consumers who have entered the contract with the monopolist is large, the entrant stays out of the market and the consumer pays the monopolistic price, p^M, in every future period. As before, he pays a little less if he entered the contract with the monopolist. More precisely, if we let $\overline{a}$ denote the proportion of consumers who have entered the contract with the incumbent monopolist, then the entrant enters the market if $\overline{a} \leq 1 - \alpha$, but stays out of the market otherwise.[8]

It can be readily verified that only two types of consumers' decisions are consistent with equilibrium behavior. Either (i) all the consumers enter the contract with the monopolist, or (ii) a proportion close to α of the consumers do not enter the contract with the monopolist but all the rest do. The first equilibrium is straightforward. If all other consumers have entered the contract with the monopolist, a single consumer cannot benefit from refusing to enter the contract. Since he acts alone, the consumer cannot induce the entrant to enter the market by refusing to enter the contract with the monopolist, and furthermore, he would lose the discount offered by the monopolist. The second equilibrium is more interesting. Each one of the consumers who did not enter the contract with the monopolist refuses to enter the contract because he is pivotal. Had he entered the contract, then the potential market share of the entrant would have decreased below α and consequently, the entrant would have been deterred from entering into the market. As a result, in spite of losing the discount offered by the monopolist, the consumer is better off since he pays the lower duopolistic price p^D rather than the higher monopolistic price p^M. As for the other consumers, they are not pivotal. In fact, by entering the contract with the monopolist they "free ride" on the pivotal consumers and enjoy the lower duopolistic price together with the small discount offered by the incumbent monopolist.

As will become clearer below, we frame the argument between those who support and those who oppose imposing restraints on the freedom to contract as an argument about which of the two equilibria described above is more plausible. The second equilibrium where the entrant enters and consumers pay the lower duopolistic price p^D is more efficient, but the first, less efficient, equilibrium is a lot more plausible. This is because the second equilibrium hinges on coordinating the actions of a large number of consumers—*exactly* α of the consumers need to refuse to enter the contract offered by the incumbent monopolist. The second equilibrium is therefore susceptible to the following type of deviations.

8. Note that we implicitly assume here that as long as a proportion α or more of the consumers did not enter the contract with the monopolist, the entrant enters. This assumption is only made for simplicity. It is straightforward to adapt the argument to the case where the entrant enters only if a larger proportion $1 > \alpha' > \alpha$ or more of the consumers did not enter the contract with the monopolist.

Suppose that there is some small uncertainty with respect to consumers' behavior. In this case, those consumers who have refused to enter the contract offered by the incumbent monopolist, or the pivotal consumers, may suspect that they are not really pivotal. They may believe that besides themselves, not enough consumers have refused to enter the contract offered by the monopolist. They may therefore be wary that the entrant would not be able to capture a large enough market share to justify entry, and would prefer to stay out of the market. But in this case, they would have been better off had they entered the contract with the monopolist so that they could at least have enjoyed the discounts it promised them. Alternatively, the pivotal consumers may believe that the number of other consumers besides themselves who have refused to enter the contract with the monopolist is large enough to induce the entrant to enter into the market. But, again, in this case, the pivotal consumers would have been better off had they entered the contract with the monopolist since in that case they would have paid the lower duopolistic price and on top of that would have enjoyed the discount offered by the monopolist. As we establish formally below, if the number of consumers is large, then the existence of even a very small degree of uncertainty about consumers' behavior implies that the likelihood that any consumer would consider himself to be pivotal is small. But, if only a few consumers perceive themselves to be pivotal, the great majority of consumers must be free riding. It follows that the more efficient equilibrium where the entrant enters into the market cannot be sustained.

On the other hand, the first equilibrium where all the consumers enter the contract offered by the monopolist and none are pivotal is not subject to this type of instability. Even if a consumer suspects that some other consumers have declined to enter the contract offered by the monopolist, it is still in his best interest to enter the contract himself.

The notion of instability described above can be thought of as a failure of robustness of equilibrium behavior with respect to incomplete information. In the next section we formalize this intuition in the context of a more general "public good" model. We then apply our results to the examples mentioned in the introduction.

3. The General Argument

We consider the following game where n individuals may voluntarily contribute to the provision of a public good. Individuals have to make a decision whether to contribute to a public good by choosing the action "0," or not contribute to the public good (free ride) by choosing the action "1." For example, in the context of the example presented in the previous section, declining to enter the contract offered by the incumbent monopolist is equivalent to contributing to a public good, while entering the contract is equivalent to free riding. We denote individual i's action by a_i and let a denote a profile of individuals' actions.

When individuals choose a profile of actions a, the payoff to individual i is given by

$$u_i^{\Delta}(a) = f(\overline{a}) + a_i \cdot \Delta,$$

where $\overline{a} = \frac{1}{n}\sum_{j=1}^{n} a_j$ denotes the “average” action of the individuals, $\Delta > 0$ is the personal benefit the individuals obtain from free riding, and the function $f\colon [0, 1] \to \mathbb{R}$ describes the quantity of the public good provided when the average contribution is $\overline{a}$. We assume that the higher the number of individuals who choose to free ride, the lower the level of public good provided. Formally, we require the function f to be differentiable from the left, and (weakly) decreasing such that $f(0) > 0$ and $f(1) = 0$. Individuals may also randomize between contributing to the public good and free riding. Extending the definition of individuals’ payoffs to allow for profiles of mixed actions is standard and is omitted.

We have thus described a strategic form “public good” game. Individuals have to decide whether they prefer to contribute to the public good and receive a payoff $f(\overline{a})$, or whether they prefer to free ride on others’ contributions, decrease the level of public good provided, but increase their personal payoff by Δ.

Proposition 1. For every $\Delta > 0$ and large enough n, the public good game described above has two types of pure strategy equilibria:

(1) where all the individuals free ride,
(2) where some of the individuals contribute to the public good and some free ride. In this case, the individuals’ average action $\overline{a}$ lies at a distance less than $\frac{1}{n}$ to the left of a point $d \in (0, 1)$ which is a point of discontinuity of f where

$$\lim_{a \searrow d} f(a) \leq f(d) - \Delta.$$

That is, $\overline{a} \in \left(d - \frac{1}{n}, d\right]$, where d is a point of discontinuity of f that satisfies the inequality above.

Thus the public good game has two types of pure strategy equilibria. One where all the individuals free ride and the other where some individuals free ride and some contribute to the provision of the public good. The second equilibrium, where some of the individuals free ride and some do not, is supported by the discontinuity of the function f. The individuals that contribute to the public good do not free ride because they are pivotal. The loss that they will experience through the reduction in the quantity of the public good if they switch to free riding will outweigh the benefit they will receive by canceling their contribution. More formally, this is expressed as follows.

Definition. An individual i in the public good game described above is pivotal given a profile of actions a if it is in his interest to contribute to the public good. That is, if

$$f\left(\frac{1}{n}\sum_{\substack{j=1\\ j\neq i}}^{n} a_j\right) > f\left(\frac{1}{n}\sum_{\substack{j=1\\ j\neq i}}^{n} a_j + \frac{1}{n}\right) + \Delta.$$

Note that the discontinuity of f is necessary for the second type of equilibria to exist. If f is continuous, then it is straightforward to show that for every $\Delta > 0$ and a large enough number of individuals, the unique equilibrium of the game is where everybody free rides.

As explained above, we frame the argument between those who support and those who oppose imposing restraints on the freedom to contract as an argument about which of the two equilibria described in Proposition 1 is a more likely prediction of the outcome of the public good game. Both equilibria are strict and therefore satisfy various refinement criteria.[9] We argue, however, that the first equilibrium where all the individuals free ride and the quantity of the public good provided is zero is far more likely to be played. As explained in the context of the example above, the second equilibrium where some individuals contribute to the public good and some do not hinges on coordinating the actions of a large number of players. It is therefore more susceptible to the following type of deviations. Those individuals who contribute to the public good may suspect that their contribution may be wasted because besides themselves not enough people contribute to the public good, they will therefore prefer to free ride. Alternatively, they may believe that enough people already contribute to the public good so that their contribution is not necessary. Again, this will lead them to free ride. The equilibrium where everybody free rides is not susceptible to this type of instability. Even if a player suspects that some other players contribute to the public good, it is still in his best interest to free ride. This notion of instability can be formalized as a failure of robustness of equilibrium behavior with respect to incomplete information. The presence of even a small degree of uncertainty about other players' strategies dramatically affects equilibrium play in a way that renders it implausible.

We formalize this intuition by explicitly introducing some uncertainty about players' willingness to contribute to the public good. We assume that players may be of one of the following three types. A player may be altruistic and contribute to the public good regardless of the actions of other players. A player may be egotistic and prefer to free ride regardless of the actions of other players. Or a player may be "regular" and choose the action that maximizes u_i^Δ. We assume that each player is altruistic with probability $\eta > 0$, egotistic with probability $\nu > 0$, and regular with probability $1-\eta-\nu$, independently of other players. We refer to this modified public good game as a public good game with uncertainty. Such a game is characterized by the number n of individuals or players, the benefit Δ they obtain from free riding, and the "technology" f for producing the public good. We suppress the dependence on f, and denote such a game by $\mathcal{B}_n^\Delta$. We have the following proposition.

Proposition 2. For every $\Delta > 0$, every sequence of public good with uncertainty games $\left\{\mathcal{B}_n^\Delta\right\}_n$, and every sequence of individuals' strategies, the probability that any regular individual is pivotal converges to zero as the number of players increases.

9. For example, both equilibria are perfect, proper, and stable. [See, e.g., Myerson (1991).]

The proof of the proposition relies on the following argument. A regular individual may be pivotal only if the average play of the other individuals is close to a discontinuity point of the function f. Denote this discontinuity point by d. The fact that individuals are uncertain about other individuals' types implies that they believe that average play is random and that it is distributed around d. The central limit theorem implies that when the number of individuals is large, individuals believe that average play is approximately normally distributed. Now, as the number of individuals increases, two things happen: first, the (approximately) normal random variable that describes individuals' beliefs about average play becomes more and more concentrated around the discontinuity point d; but second, as the number of individuals increases, the likelihood that an individual is pivotal decreases. That is, the interval $\left(d - \frac{1}{2n}, d\right]$ that describes the region around d where an individual is in fact pivotal becomes smaller. In the formal proof of the proposition that is presented in the appendix, we show that the rate at which the region where individuals are pivotal decreases faster than the rate at which the distribution that describes average play becomes more concentrated at the discontinuity point. As a consequence, the probability that an individual is in fact pivotal decreases to zero as the number of individuals increases, regardless of the strategies employed by other individuals.

As a consequence, we have the following corollary.

Corollary. For every $\Delta > 0$, there exists a large enough integer N such that for all $n \geq N$, in the unique equilibrium of the public good with uncertainty game $\mathcal{B}_n^{\Delta}$, all regular players free ride.

The corollary above describes yet another context where the presence of noise, or asymmetric information, implies that the number of pivotal players must become vanishingly small in large groups. This insight has been extensively discussed in the economic theory literature. See especially Al-Najjar and Smorodinsky (1996), Levine and Pesendorfer (1995), Mailath and Postlewaite (1990) and the references therein.

4. Exclusionary Contracts

We apply the analysis of the previous section to the question of whether efficiency is enhanced by the legalization of exclusionary contracts. The argument against banning exclusionary contracts is that the mere fact that they are offered is an indication of their efficiency. To wit, if the cost in consumer surplus as a consequence of preventing entry into the market exceeds the potential profit to the excluding firm, the firm cannot hope to make a profit by proposing such a contract. This argument was first made by Director and Levi (1956) and then repeated more recently by Posner (1976:212) and Bork (1978:309). For example, Posner criticizes the decision in the case *United States v. United Shoe Machinery Corporation* by writing that, "The point I particularly want to emphasize is that the costumers of United would be unlikely to participate in a campaign to strengthen United's monopoly position without insisting on being compensated for the loss of alternative and less costly (because competitive) sources of supply" (Posner, 1976:203). The analysis presented in the previous section shows that this argument is incorrect.[10]

Recall the scenario described in the motivating example presented in Section 2. The utility to an individual consumer from entering the exclusionary contract offered by the monopolist depends on the number of consumers who enter the exclusionary contract and on whether he enters the contract himself. It is given by

$$u_i^{\Delta}(a) = f(\overline{a}) + a_i \cdot \Delta,$$

where $a = (a_1, \ldots, a_n) \in \{0, 1\}^n$ denotes the profile of consumers actions, $a_i = 0$ indicates that consumer i refused to enter the contract and $a_i = 1$ indicates that he did, and where f is given by

$$f(\overline{a}) = \begin{cases} u & \overline{a} \leq 1 - \alpha \\ 0 & \overline{a} > 1 - \alpha. \end{cases}$$

Note that consumers' utilities are normalized such that the present value of their utility from paying a price p^M in every period is 0, the present value of their utility from paying a price p^D in every period is $u > 0$, and the present value of the proposed discount that is offered by the incumbent monopolist is Δ. Note also that in equilibrium the monopolist would offer the exclusive contract to the smallest possible number of consumers required for successful exclusion, just above $1 - \alpha$.

The analysis of the previous section shows that consumers may behave in either one of the following two ways in equilibrium. (1) They may all enter the contract offered by the monopolist and pay a price $p^M - \varepsilon$ in every period, or (2) exactly $\lfloor (1 - \alpha) n \rfloor$ of the consumers enter the contract and pay a price of $p^D - \varepsilon$ in every period while other consumers who did not enter the contract pay a price p^D.[11] The analysis of the previous section suggests that the former equilibrium is more likely, especially when the market is large and there is some uncertainty regarding whether consumers will enter the contract or not. Note that this last conclusion does not depend on the size of the discount ε. Thus it follows that the incumbent monopolist can in fact exclude other firms from entering into its market by incurring a negligibly small cost.

Similar arguments that point to the potential inefficiency of permitting exclusionary contracts were made recently by Aghion and Bolton (1987) and Rasmusen, Ramseyer, and Wiley (1991).[12] Both models are more elaborate than ours and impose a number of specific assumptions. Aghion and Bolton

10. For recent developments in antitrust policy with respect to exclusive dealing see Steptoe and Wilson (1996). Of interest, Steptoe and Wilson report that, in 1993, when Assistant Attorney General Anne Bingaman withdrew previous vertical restraint guidelines that reflected the belief that exclusionary practices are not inefficient, she said that her action was "based on the belief that the Guidelines unduly elevate theory at the expense of factual analysis and reflect a continued resistance to case law that, at this point in our history, is inappropriate" (Steptoe and Wilson, 1996:25).

11. $\lfloor x \rfloor$ denotes the largest integer smaller or equal to x.

12. For a particularly lucid presentation of the ideas presented in Aghion and Bolton (1987) as they apply to contract and antitrust law, see Brodley and Ma (1993).

(1987) show that buyers may agree to sign an exclusionary contract proposed by a seller despite the fact that the contract is inefficient. In their model, the excluding firm and the consumers collude in order to extract rents from the potential entrant, there is a positive probability that the entrant will enter in equilibrium, and the transfer from the excluding firm to the consumers is considerable. The analysis of Rasmusen, Ramseyer, and Wiley (1991) is more similar to ours. They identify two equilibria, one in which all consumers enter the exclusionary contract and the other where none do. They suggest that the former is more plausible due to coordination difficulties among consumers. However, they do not provide a formal argument that explains why this is so.[13]

The standard critique against the argument presented here is that it relies on restricting the scope of economic competition. Specifically, if the potential entrant is allowed to counter the incumbent's offer by making an offer of its own, or if consumers form a purchasing alliance and bargain collectively, efficiency can be restored. We show that while economic competition certainly mitigates the extent of inefficiency, it does not completely eliminate it. To see this, denote the difference in the incumbent monopolist's profit between the cases where the entrant does and does not enter into the market by I, the difference in consumer surplus by C, and the potential profits to the entrant if it succeeds in capturing a share of at least α of the market by E. Efficiency requires that the entrant enters the market if (and only if) $E + C > I$. Suppose that the competition between the incumbent and the potential entrant takes the following form: the incumbent proposes to consumers a discount of ε from the market price if they commit not to buy from competitors as described above, the potential entrant counters by offering a subset $\lceil \alpha n \rceil$ of consumers a discount if they do not enter the exclusionary contract, and consumers choose whether to enter the exclusionary contract or not depending on which firm makes them the highest offer. In case of indifference, consumers favor the potential entrant.[14] Note that the monopolist is willing to offer consumers a discount that is not higher than $\frac{I}{n}$ per consumer if they enter the contract and the entrant is willing to offer consumers a discount not higher than $\frac{E}{\lceil \alpha n \rceil}$ per consumer if they refuse to enter the contract. As a consequence, the game has a unique subgame perfect equilibrium: if $\frac{I}{n} > \frac{E}{\lceil \alpha n \rceil}$, the monopolist offers consumers a discount that is just a little more than $\frac{n}{\lceil \alpha n \rceil} E$ (measured in present value) if they enter the exclusionary contract, the entrant does not enter into the market, and all the consumers enter the exclusionary contract. On the other hand, if $\frac{E}{\lceil \alpha n \rceil} \geq \frac{I}{n}$, the monopolist gives up and does not offer consumers any discount, and the

13. In a recent, independently developed article, Segal and Whinston (1998) provide an argument that explains why the exclusionary equilibrium is more likely to be played. Their argument is quite different from the one presented here. It is based on allowing the monopolist to offer a contract that discriminates among the consumers. No such assumption is needed for our results to hold.

14. Note that the fact that the incumbent monopolist has to move first gives the potential entrant an advantage. It can target those consumers who were not sufficiently compensated by the monopolist. Thus, while the incumbent monopolist has to buy the agreement of all the consumers, the entrant needs to buy the agreement of only $n\alpha$ of the consumers.

potential entrant enters the market. While in the case where the entrant does not enter into the market, consumers are guaranteed a discount of at least $\frac{E}{\lceil \alpha n \rceil} > 0$, whereas without competition their discount could have been arbitrarily small, the outcome is inefficient in the likely case where $\frac{n}{\lceil \alpha n \rceil} E < I < E + C$. Notice also that allowing individual consumers to bid up the potential entrant's counteroffer by adding a contribution of $\frac{C}{n \lceil \alpha n \rceil}$ to each counteroffer can improve efficiency even further. But, because when the number of consumers is large the contribution of any single individual is unlikely to make a difference, a critical mass of consumers need to be willing to contribute in order to persuade other consumers to refuse to enter the exclusionary contract. Thus the original problem of organizing a sufficiently large group of consumers reappears.

5. Yellow-Dog Contracts

A tactic that was used by employers in their fight against labor unions in the first decades of the century in the United States was to require workers to commit not to join labor unions as a condition for their employment. Such employment contracts were called "yellow-dog contracts" by labor unions, who claimed that only a yellow dog would agree to such a contract [see, e.g., Mills (1994:185)]. The argument that justifies exclusionary contracts on grounds of promoting efficiency can also be used to justify the claim that allowing for inclusion of a clause in the employment contract that requires workers not to join labor unions enhances efficiency. Because workers commit not to join labor unions voluntarily, the fact that they choose to do so implies that they are sufficiently compensated. The employers' best interest will not be served by proposing such contracts if they did not profit from them as well. Therefore, the fact that such contracts were proposed and accepted proves their efficiency as well as the claim that production is more efficient once workers are prevented from organizing themselves in labor unions. The ability of employers to curb the rise in the power of labor unions was significantly strengthened when the Supreme Court upheld the legality of such contracts in 1917. These contracts disappeared after Congress, in the Norris–LaGuardia act of 1932, declared them unenforceable.

We apply the analysis of Section 3 to this case. Suppose that an employer and a labor union bargain over workers' wages. The stronger the labor union, the higher are workers' wages. The union's strength depends on the proportion of workers who are union members in the following way. Suppose that the employer employs n workers. The marginal productivity of the kth worker, $k \in \{1, \ldots, n\}$, is given by a decreasing function $M \colon \{1, \ldots, n\} \to \mathbb{R}$. Suppose further that the marginal productivity of the nth, or last, worker is $M(n) = 0$. We assume that if the workers are not represented by a labor union then their wages are set equal to their marginal productivity and are therefore equal to zero. If workers are represented by a labor union, then the wages of those workers who are members of the labor union are determined by a bargaining process between the employer and the labor union. Specifically, suppose that if the number of union members is $k \geq 1$, the bargaining process yields a wage of

$$w(k) = \frac{1}{2} \cdot \frac{1}{k} \sum_{i=1}^{k} M(n+1-i).$$

The wage function $w(k)$ expresses the idea that if k workers are unionized then their wage is given by $\frac{1}{2}$ times their average marginal productivity as a group.[15] However, the particular formulation of the wage function is unimportant. Any wage function that is increasing in the number of union members and is equal to the last worker's marginal productivity when the union has only one member would yield the same results.

Suppose that the employer proposes the following contract to the workers: commit not to join the union and in return you are guaranteed a union wage and a small bonus $\varepsilon > 0$. In this case, workers' utilities are described by the function

$$u_i^{\varepsilon}(a) = w(n(1-\overline{a})) + a_i \cdot \varepsilon,$$

where $a = (a_1, \ldots, a_n) \in \{0, 1\}^n$ denotes the profile of workers' actions, $a_i = 0$ indicates that worker i refused to enter the contract, and $a_i = 1$ indicates that the worker commits not to join the union. If M is continuous so is w. Thus if the number of workers is large, the only equilibrium is where the employer proposes the contract and all the workers accept it. Thus if yellow-dog contracts are allowed, employers can appropriate all the generated surplus by offering workers a meager bonus for not joining the labor union. Furthermore, the more employees the employer hires, the more likely is this tactic to succeed.

As before, it is unlikely that the union can improve the workers' conditions by trying to counteroffer the employer's bonus proposal. In order to finance such a counteroffer, the union has to rely on contributions from union members. But requiring such a contribution from its members would only make the income difference between union members and nonmembers larger.

Finally, note that while allowing the employer to propose contracts where workers commit not to join a labor union, as described above, violates basic notions of fair bargaining, it is not necessarily inefficient. In the simple model described here, union membership affects the distribution of surplus between the employer and the workers but has no efficiency implications. However, in a richer and more plausible model, workers would be able to make an efficiency-enhancing investment in human capital. While ununionized workers cannot benefit from such an investment if it does not change the marginal productivity of the last worker, and therefore will inefficiently prefer not to undertake it, unionized workers are better able to capture some of the gains of such an investment and will be more willing to undertake it.

15. See Stole and Zwiebel (1996) for a more detailed model of wage bargaining that yields a similar wage function.

6. Vote Trading

The issue of vote trading has been a subject of contention since at least the 19th century when most western societies extended the franchise. Supporters of vote trading argue that it can potentially enhance efficiency because it allows for the expression of intensity of preferences rather than just ordinal relationships. Individuals who do not feel strongly about the outcome of the vote can sell their vote to someone who does at a mutually beneficial price. A number of authors have made this point with varying degrees of force. Buchanan and Tulock (1962:272), for example, argue that free exchange in votes may enhance efficiency when capital markets are perfect, but contend that due to capital market imperfections, vote exchanges will be more likely in fact to produce negative external effects and should therefore be prohibited. Others have been more vigorous in their support for free vote exchange. Tobin (1970) writes, "Any good second year graduate student in economics could write a short examination paper proving that voluntary transactions in votes would increase the welfare of the sellers as well as the buyers." [See also the discussion in (Okun 1975:9–12).] Other supporters of vote trading include Anderson and Tollison (1990), Coleman (1966), Koford (1982), and Schwartz (1975).[16]

The buying and selling of votes, although seldom legal, had been a common standard practice in Britain until the passage of the Ballot Act of 1872 (by mandating a secret ballot, the act rendered vote selling transactions unenforceable) and in the United States until the end of the 19th century. Even as late as 1910, no more than 36% of the U.S. population lived in states with an explicit constitutional requirement for secrecy in voting.[17]

The argument made against vote trading is that it may impose external costs on others and allow majority coalitions to exploit minorities. For example, the majority can initiate an income redistribution at the expense of the minority [see, e.g., Buchanan and Tulock (1962:270)]. Note, however, that this argument does not imply that vote trading is necessarily inefficient. Another important argument against allowing vote trading is that it will destroy the value of voting. Okun (1975:13) writes, "If votes were traded at the same price as toasters, they would be worth no more than toasters and would lose their social significance." The inalienability of votes is thus seen as part of a system of restrictions that are imposed on the market in order to preserve a pluralism of values that are not denominated in dollars. Its purpose is to protect egalitarianism in the "sphere" of political power from inequality in the market "sphere" [see Walzer (1983)].

Our argument against vote trading is different. We argue that vote trading may be inefficient because the price of votes need not reflect their true value. In other words, the "market for votes" is prone to market failure. We demonstrate our argument with the following example. Suppose that n voters are to participate in a referendum that will determine whether policy A or policy B is to be

16. In addition, numerous others have used the metaphor of the "market for votes" to describe various aspects of voting behavior without explicitly stating that vote trading enhances efficiency and should be facilitated.

17. See Anderson and Tollison (1990) and the references therein.

implemented. Suppose that unless at least αn, $\alpha \in (0, 1)$, of the voters vote for policy A, policy B is to be implemented. Suppose further that all voters derive a utility 1 if policy A is implemented and a utility 0 if policy B is implemented. A large foreign corporation prefers policy B to be implemented. If vote trading is prohibited, voters will vote for policy A, which will be implemented.[18] The analysis conducted in Section 3 implies that if vote trading is allowed, the corporation can offer to purchase votes at a price of ε per vote. Voters' utilities are then given by

$$u_i^{\varepsilon}(a) = f(\overline{a}) + a_i \cdot \varepsilon,$$

where a denotes the profile of voters' votes, $a_i = 0$ indicates a vote for policy A by voter i, and $a_i = 1$ indicates a vote for policy B. The function f is given by

$$f(\overline{a}) = \begin{cases} 1 & \overline{a} \leq 1 - \alpha \\ 0 & \overline{a} > 1 - \alpha. \end{cases}$$

There are two equilibrium vote profiles: one where all voters sell their votes and vote for policy B, and the other where exactly $\lfloor \alpha n \rfloor$ voters vote for policy A and all the other voters sell their votes and vote for policy B. While the latter equilibrium Pareto dominates the former (note that policy A is implemented), our analysis shows that it is the former that is more likely to emerge as an outcome of the game, especially when the number of voters is large and there is some uncertainty regarding voters' behavior. Moreover, the argument that predicts that all voters will sell their votes and vote for policy B is independent of the value of ε. The corporation can buy all the votes at a negligibly small price.

As in the case of exclusionary contracts, it is possible to show that introducing economic competition in the market for votes will enhance the efficiency properties of the vote but will not completely prevent inefficient voting outcomes.

7. Conclusion

We have presented a general argument that demonstrates how the freedom to contract can be abused by offering large groups of individuals contracts that promote free-riding behavior. We have discussed three specific examples, but the argument applies more generally as well. In fact, the argument may apply in every situation where a "large" agent interacts with a large number of "small" agents whose actions impose a small externality on one another. [See Segal (1997) for an exhaustive list of such cases.] To the extent that such contracts are protected by stipulated damages clauses, the fact that the ability of each single small agent to affect the outcome is negligible renders *any positive* amount of stipulated damages unconscionable.[19]

18. Note that because voters do not incur a cost of voting, in equilibrium any positive number of voters may vote for policy A.

19. As Brodley and Ma (1993:1180) write, "unconscionability is not well-defined, but the basic concept, involving both procedural and substantive unfairness, appears to focus on uninformed or

Finally, the efficiency and wisdom of placing restrictions on the freedom to contract is an issue where ideology plays a role at least equal in force to that of reasoned argument. In the case of the examples discussed above, prominent thinkers seemed to have overlooked the argument presented here and have taken the opposite position to ours. We therefore wish to emphasize that we do not claim that restricting the freedom to contract necessarily improves efficiency. Our claim is a modest one. We claim that previous arguments that implied that removing restrictions on the freedom to contract may only enhance efficiency are at best one sided. While in some situations the freedom to contract does indeed enhance efficiency, under other circumstances the freedom to contract might be abused in a way that undermines efficiency. Which is the more relevant of these two considerations should be determined on a case-by-case basis.

Appendix

Proof of Proposition 1. Fix a $\Delta > 0$. We show that (1) is an equilibrium for all n large enough. Suppose that $a_i = 1$ for all $i \in \{1, \dots, n\}$. By deviating and playing "0," a player obtains a payoff of $f\left(1 - \frac{1}{n}\right)$. Because f is left-continuous, $\lim_{n\to\infty} f\left(1 - \frac{1}{n}\right) = f(1) = 0 < \Delta$. Hence when the number of players is large enough, (1) is an equilibrium. We show (2) is an equilibrium. Suppose that a is such that $\overline{a} \in \left(d - \frac{1}{n}, d\right]$ lies at a distance less than $\frac{1}{n}$ to the left of a point d, which is a point of discontinuity of f such that $\lim_{a\searrow d} f(a) \leq f(d) - \Delta$. Two kinds of deviations are possible. A player that is playing "1" may want to deviate and play "0," and a player that is playing "0" may want to deviate and play "1." Repeating the previous argument for $\overline{a}$ (instead of 1) implies that no player will deviate and choose "0" instead of "1" when the number of players is large enough. The payoff to a player that plays "0" is $f(\overline{a})$, by deviating and playing "1," the player obtains a payoff of $f\left(\overline{a} + \frac{1}{n}\right) + \Delta$. Because $f\left(\overline{a} + \frac{1}{n}\right) + \Delta$ is bounded from above by $\lim_{a\searrow d} f(a) + \Delta$ this deviation does not increase the player's payoff. Conversely, if $\lim_{a\searrow d} f(a) > f(d) - \Delta$, then a profile of actions a with an average $\overline{a}$ cannot be an equilibrium, because for large enough n individuals who play "0" can increase their payoff by deviating and playing "1." ■

Proof of Proposition 2. Fix a $\Delta > 0$ and a sequence of possibly mixed strategy profiles for the players when they are regular, $\left\{\left(\sigma_i^n\right)_{i=1}^n\right\}_n$. Given a strategy σ_i^n for a regular player i, let A_i denote the random variable that describes player i's action. Let

$$P^n = \left\{p \in \left\{0, \frac{1}{n}, \frac{2}{n}, \dots, \frac{n-1}{n}\right\} : f(p) > f\left(p + \frac{1}{n}\right) + \Delta\right\}$$

denote the set of values of $\frac{1}{n}\sum_{j=1, j\neq i}^{n} a_j$ for which a regular player i in the game $\mathcal{B}_n^{\Delta}$ is pivotal. We show that $\Pr\left(\frac{1}{n}\sum_{i=1}^{n} A_i \in P^n\right) \searrow_{n\to\infty} 0$.

powerless consumers." See also the references therein.

The average contribution to the public good is given by

$$\frac{1}{n}\sum_{i=1}^{n} A_i^n = \frac{1}{n}\left[\sum_{i=1}^{n} S_i^n - \sum_{\left\{i\in\{1,\ldots,n\}:\ S_i^n=1\right\}} C_i^n + \sum_{\left\{i\in\{1,\ldots,n\}:\ S_i^n=0\right\}} E_i^n\right]$$

where for every $i \in \{1,\ldots,n\}$, S_i^n is a random variable that describes i's action in the game $\mathcal{B}_n^{\Delta}$ when i is regular (i.e., $S_i^n = 1$ with probability $\sigma_i^n(1)$ and $S_i^n = 0$ with probability $\sigma_i^n(0) = 1 - \sigma_i^n(1)$); C_i^n is a random variable that determines if i is altruistic ($C_i^n = 1$ with probability η, and $C_i^n = 0$ otherwise); and E_i is a random variable that determines if i is egotistic ($E_i^n = 1$ with probability ν, and $E_i^n = 0$ otherwise) and where $\left\{S_i^n, C_i^n, E_i^n\right\}_{i=1}^n$ are independent random variables for all $n \in \mathbb{N}$.

Given any realization $s^n = \left(s_1^n,\ldots,s_n^n\right)$ of S^n, $\sum_{\left\{i\in\{1,\ldots,n\}:\ s_i^n=1\right\}} C_i^n$ and $\sum_{\left\{i\in\{1,\ldots,n\}:\ s_i^n=0\right\}} E_i^n$ are independent random variables. Consider a sequence $\{s^n\}_n$ of realizations of $\{S^n\}_n$. Define the sequences $\left\{m_C^n\right\}_n$ and $\left\{m_E^n\right\}_n$ as follows: for every $n \in \mathbb{N}$, let $m_C^n = \#\left\{i\in\{1,\ldots,n\}:\ s_i^n = 1\right\}$ and $m_E^n = \#\left\{i\in\{1,\ldots,n\}:\ s_i^n = 0\right\}$. We distinguish among three cases: (1) $\left\{m_E^n\right\}_n$ is bounded from above but $\left\{m_C^n\right\}_n$ is not; (2) $\left\{m_C^n\right\}_n$ is bounded from above but $\left\{m_E^n\right\}_n$ is not; and (3) neither $\left\{m_C^n\right\}_n$ nor $\left\{m_E^n\right\}_n$ are bounded from above.

Consider case (1) first. Suppose that $\left\{m_E^n\right\}_n$ is bounded from above but $\left\{m_C^n\right\}_n$ is not. By the central limit theorem, when m_C^n is large, $\frac{1}{n}\sum_{\left\{i\in\{1,\ldots,n\}:\ s_i^n=1\right\}} C_i$ is distributed approximately as a normal random variable with expectation $\frac{m_C^n}{n}\eta$ and variance $\frac{\eta(1-\eta)m_C^n}{n^2}$. It follows that

$$\Pr\left(\frac{1}{n}\sum_{\left\{i\in\{1,\ldots,n\}:\ S_i^n=1\right\}} C_i^n = k \,\middle|\, S^n = s^n\right) \approx \frac{1}{\sqrt{2\pi\frac{\eta(1-\eta)m_C^n}{n^2}}}\int_{k-\frac{1}{2n}}^{k+\frac{1}{2n}} e^{-\frac{\left(x-\frac{m_C^n}{n}\eta\right)^2}{2\frac{\eta(1-\eta)m_C^n}{n^2}}}\,dx$$
$$\leq \frac{1}{\sqrt{2\pi\eta(1-\eta)m_C^n}} \searrow_{m_C^n\to\infty} 0 \quad \text{(A.1)}$$

for every $k \in \left\{0, \frac{1}{n},\ldots,\frac{n-1}{n}\right\}$. Because $\left\{m_E^n\right\}_n$ is bounded from above

$$\frac{1}{n}\sum_{\left\{i\in\{1,\ldots,n\}:\ S_i^n=0\right\}} E_i^n \searrow_{n\to\infty} 0.$$

Similarly, in case (2),

$$\Pr\left(\frac{1}{n}\sum_{\left\{i\in\{1,\ldots,n\}:\ S_i^n=0\right\}} E_i^n = k \,\middle|\, S^n = s^n\right) \searrow_{m_E^n\to\infty} 0 \quad \text{(A.2)}$$

and

$$\frac{1}{n}\sum_{\left\{i\in\{1,\ldots,n\}:\ S_i^n=1\right\}} C_i^n \searrow_{n\to\infty} 0$$

and in case (3), both (A.1) and (A.2) hold.

The next lemma implies that

$$\Pr\left(\frac{1}{n}\left(\sum_{i=1}^{n} S_i^n - \sum_{\{i\in\{1,\dots,n\}:\ S_i^n=1\}} C_i^n + \sum_{\{i\in\{1,\dots,n\}:\ S_i^n=0\}} E_i^n\right) = k \,\middle|\, S^n = s^n\right)$$
$$\leq \max_{k'\in\left\{0,\frac{1}{n},\dots,\frac{n-1}{n}\right\}} \left\{\Pr\left(\frac{1}{n}\sum_{\{i\in\{1,\dots,n\}:\ S_i^n=1\}} C_i^n = k' \,\middle|\, S^n = s^n\right)\right\} \qquad \text{(A.3)}$$

for all $n \in \mathbb{N}$, $k \in \left\{0, \frac{1}{n}, \dots, \frac{n-1}{n}\right\}$ and $s^n \in \{0,1\}^n$.

Lemma 1. Let X and Y be random variables that assume values in the finite sets $\mathcal{X} \subseteq \mathbb{R}$ and $\mathcal{Y} \subseteq \mathbb{R}$, respectively. Suppose that conditional on a random variable Z, X and Y are independent. Then $\Pr(X+Y=k\,|\,Z) \leq \max_{k'\in\mathcal{X}} \Pr\left(X=k'\,|\,Z\right)$ for all $k \in \mathcal{X}+\mathcal{Y}$.

Proof.

$$\begin{aligned}\Pr(X+Y=k\,|\,Z) &= \sum_{y\in\mathcal{Y}} \Pr(X=k-y\,|\,Z)\Pr(Y=y\,|\,Z)\\ &\leq \sum_{y\in\mathcal{Y}} \max_{k'\in\mathcal{X}} \Pr\left(X=k'\,|\,Z\right)\Pr(Y=y\,|\,Z)\\ &= \max_{k'\in\mathcal{X}} \Pr\left(X=k'\,|\,Z\right). \qquad \blacksquare\end{aligned}$$

To finish the proof of the proposition, note that (A.1), (A.2), and the fact that (A.3) holds for all $n \in \mathbb{N}$, $k \in \left\{0, \frac{1}{n}, \dots, \frac{n-1}{n}\right\}$ and $s^n \in \{0,1\}^n$ imply that

$$\Pr\left(\frac{1}{n}\left(\sum_{i=1}^{n} S_i^n - \sum_{\{i\in\{1,\dots,n\}:\ S_i^n=1\}} C_i^n + \sum_{\{i\in\{1,\dots,n\}:\ S_i^n=0\}} E_i^n\right) = k\right) \searrow_{n\to\infty} 0$$

for every sequence $\{s^n\}_n$ and $k \in \left\{0, \frac{1}{n}, \dots, \frac{n-1}{n}\right\}$. For every $n \in \mathbb{N}$, the set P^n may contain at most $\frac{f(1)}{\Delta} < \infty$ elements. It therefore follows that the probability that a player is pivotal decreases to zero as the number of players increases. ■

Proof of the Corollary. For any profile of players' strategies, if the probability that player i is pivotal is small enough, his unique best response is to choose not to contribute to the public good and free ride on others' contributions. ■

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