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James E. Anderson
Leslie Young

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ABSTRACT

Without the rule of law, traders who incur trading costs can be held up by counter-parties who are stronger in anarchic bargaining. The favourable terms which the latter extract can overcrowd that side of the market, dissipating the benefits. We establish plausible necessary and sufficient conditions for a move from anarchy toward the rule of law to benefit all traders. The rule of law might be delayed, not only by the difficulties of setting up legal institutions, but by monopolistic traders that have meantime emerged to address the inefficiencies of anarchic trade. These monopolistic traders must also guarantee atomistic traders against holdup.

James E. Anderson
Economics Department
Boston College
Chestnut Hill, MA 02467
and NBER
Tel: 617-552-3691
james.anderson.1@bc.edu

Leslie Young
APIB
Chinese University of Hong Kong
Shatin, Hong Kong
Tel: 852-2609-7421
leslie@baf.msmail.cuhk.edu.hk

Efficient trade requires reliable enforcement of the agreements governing the exchange. The institutional underpinnings of trade have been addressed by game-theoretic analyses of the motivation of individual traders to help enforce trade agreements.[1] We complement this research by comparing the implications of different institutional settings for the entire set of traders, differentiated by their exposure to contract violations and their bargaining power when it occurs. The extremes of institutional development are:

(a) anarchy, where prior agreements cannot be enforced and disputes are settled according to the balance of coercive power, given the default options of the disputants;

(b) the rule of law, where prior agreements are enforced by an objective authority, insulated from local power holders, whose procedures disputants acknowledge to be legitimate.

The side that fears that it would be weaker in anarchic bargaining would appear likely to support the rule of law. We make this intuition precise and consider when the rule of law would be supported by the stronger side, even if confident of their strength.

Sections 1-3 develop a model of trade under the rule of law and under anarchy. Our analysis starts from the trading costs that a trader incurs to position himself to make an exchange, for example, the maritime merchant's costs of buying a ship and paying sailors. Agreements reached before these trading costs were incurred would be upheld by the rule of law. In its absence, trading costs that are sunk by the time the exchange takes place expose a trader to "holdup" by a counter-party seeking to extract better terms. Suppose that a seller can extract very favourable terms from a buyer in anarchic negotiations, e.g., because the seller has a better default option or can better tolerate protracted bargaining. Then few buyers would incur trading costs to come to any exchange meeting, so sellers who have incurred trading costs have only a low probability of meeting a buyer, other sellers having meantime been attracted by the favourable terms that each could extract in bilateral bargaining. By crowding into the market in pursuit of the benefits of anarchic holdup, rival sellers dissipate these benefits by reducing each other's probability of

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[1] Milgrom, North and Weingast (1990), Grief (1992, 1993), Greif, Milgrom and Weingast (1994).

selling, i.e., they exert a negative externality on each other. In these circumstances, all sellers might be better off if they jointly bind themselves from holding up individual buyers, thereby eliminating the excess supply. This could be achieved by extending the protection of a legal system impartially to buyers.

Section 4 develops a restriction on the distribution of trading costs across traders which is necessary and sufficient to ensure that all traders prefer the rule of law to anarchy, whatever the balance of bargaining power in anarchic trade. This restriction is not onerous, suggesting that in broad historical circumstances, the gains from trade would motivate support for the rule of law, even from the powerful. Indeed, the development of the rule of law within a jurisdiction might be driven, in part, by its appeal to foreigners who offer novel gains from trade but have little access to the local power structure. Thus, trade which is international has long been important for Europe, given its diverse geography and political fragmentation. This could help explain the early development within European jurisdictions of the rule of law. By contrast, trade with foreigners was of little importance to classical China, which comprised an equally diverse area, but usually enjoyed a unified jurisdiction. Facing few of the imperatives of international trade, China's high level of order was achieved via an efficient, all-encompassing bureaucracy rather than via the application of rules by a judicial system independent of the power structure. Only in the last two decades have there been significant attempts to institute the rule of law within China — as it seeks to foster international commerce and investment.

Even given the economic pre-conditions for broad support for the rule of law, the requisite public institutions and social attitudes could take a long time to develop. This leaves room for private institutions to emerge more quickly to garner the gains from trade. European history records an array of monopolistic trading institutions, such as guilds and coalitions of merchant adventurers. As noted in Sections 5 and 6 respectively, a monopolistic middleman or a trading coalition can facilitate trade by (i) internalizing the negative externalities that its atomistic counterparts would have exerted on each other by crowding into the market in pursuit of the benefits of anarchic holdup; (ii) having a long-term corporate identity and interests, so that it can

make a credible commitment to refrain from holding up atomistic traders. The sunk costs of setting up a monopoly could serve as such a commitment; a government anxious to facilitate trade could sanction the monopoly and thereby lower its setup costs while constraining holdup by threatening to withdraw government sanction. Section 7 points out that a trading coalition might also seek to overcome counterparties' fear of holdup by supporting their formation of a countervailing trading coalition, a possible interpretation of the actions of the East India Companies.

Our analysis highlights another pitfall in the path toward the rule of law: a monopolistic trader which had arisen to facilitate trade in the absence of the rule of law might obstruct its development to protect its monopoly rents. That this is a serious problem can be seen in the capital markets of modern East Asian countries, across which Claessens, Djankov, and Lang (2000, p.36) find strong negative correlations between the share of the fifteen largest families in market capitalization and indices of judicial efficiency and of the rule of law. Section 8 notes that the rule of law can also be obstructed by vested interests when each side of the market is dominated by a trading coalition. Section 9 summarizes our conclusions on the implications of trade for institutional development.

1. The Traders

Our model of international trade distinguishes between:

(i) the domestic zone of each of the two countries, where the goods to be traded internationally can be bought or sold at a fixed price by a resident of that country;

(ii) the trading zone, where buyers and sellers from the two countries meet to trade. This could be located in either country or in a third location. Traders must incur trading costs to enter this zone.

The following description of traders uses demand and supply curves to summarize the implications of the distribution of trading costs across traders. Throughout, we assume risk neutral traders. Our convention is that, except for "d" and "s" which denote demand and supply,

if a letter is used to denote a variable associated with buyers, then the next letter of the alphabet denotes the corresponding variable for sellers.

All buyers can buy or sell the good in their domestic zone at price b, but they differ in the cost t of entering the trading zone.[2] At market price p, let d(p) be the number of buyers with trading cost t such that $p \leq b - t$, so that they find it worthwhile buying from foreigners. d(p) defines the trading demand curve **D**. The height p of **D** when demand is d equals the marginal buyer's gross revenue per unit b, less his trading cost t(d), i.e., $p = b - t(d)$ when $d = d(p)$.

All sellers can buy or sell a unit of the good in their domestic zone at cost c, but they differ in the cost u of entering the trading zone. At price p, let s(p) be the number of sellers with trading cost u such that $p \geq c + u$, so that they gain from selling to foreigners. s(p) defines the trading supply curve **S**. The height p of **S** when supply is s equals the total costs of the marginal seller with trading cost u(s), i.e., $p = c + u(s)$ when $s = s(p)$.

To relate the demand and supply elasticities to the distribution of trading costs across traders, let t_0 be the trading cost of the least-cost buyer. Let $F(\tau)$ be the number of buyers whose trading costs exceed t_0 by no more than τ, so that they would buy at a price which ensured gross profits (i.e., profits before subtracting trading costs) of $b - p > \tau + t_0$. To simplify exposition, we assume that the number of buyers is large enough to be represented by a continuous variable and that the distribution of trading costs is smooth enough that $F(\tau)$ has a positive derivative in the interior of its support. The number of buyers at price p is $d(p) = F(b - t_0 - p)$, so the demand elasticity is:

$$(1) \qquad -pd_p(p)/d(p) = pF_\tau/F = \kappa p/(b - t_0 - p)$$

where differentiation with respect to a variable is indicated by a subscript and $\kappa \equiv \tau F_\tau/F$ is the elasticity of $F(\tau)$ with respect to τ. If $\kappa(\tau) = 1$ for $0 \leq \tau \leq \tau_1$, then trading costs have a uniform distribution over this interval: each 1% increase in trading costs in excess of the minimum t_0 leads to a 1% increase in the number of buyers.

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[2] For simplicity, trade is assumed to be otherwise secure. The sunk costs are thus understood to include defensive expenditure to prevent theft by traders from the other side of the market.

Similarly, let u_0 be the trading cost of the lowest-cost seller. The number $G(\tau)$ of sellers whose trading costs exceed u_0 by no more than τ is also assumed to have a positive derivative in the interior of its support. Let λ be the elasticity of $G(\tau)$ with respect to τ. The number of sellers at price p is $s(p) = G(p - u_0 - c)$, so the supply elasticity is:

(2) $$ps_p(p)/s(p) = pG_\tau/G = \lambda p/(p - u_0 - c)$$

2. The Trading Mechanism Under the Rule of Law,

We distinguish between (a) the negotiating period when trades can be negotiated between traders from different countries who can costlessly recontract and (b) the trading period when the trades are executed by traders who incur trading costs to enter the trading zone. During the negotiating period, traders freely recontract until the best alternative price for a seller equals the best alternative price for a buyer, these being the prices for the marginal buyer and seller respectively. Thus, the equilibrium price p^e is determined by the intersection of the demand and supply curves:

$$d(p^e) = s(p^e).$$

We shall suppose that $b - t_0 > c + u_0$, so that there is an equilibrium price p^e at which trade takes place and yields positive profits to inframarginal buyers and sellers. This price maximizes the aggregate profits of sellers and buyers. The profit of an active seller with selling cost u is $p^e - u - c$. The profit of an active buyer with buying cost t is $b - p^e - t$.

After traders have completed negotiations and contracted to trade at the equilibrium price p^e, they incur trading costs to enter the trading zone. The rule of law requires traders who default to pay a penalty equal to their partner's trading cost. In principle, traders could default and renegotiate the contract during the trading period, but, in equilibrium, renegotiation never pays; the penalty deters default. Thus, when traders incur trading costs, the rule of law prevents traders from converting a competitive situation in the negotiating period into one of bilateral monopoly in the trading period, where

they could exploit their more favorable default options and/or greater tolerance of bargaining delays. This point is highlighted by the following model of trade in the absence of the rule of law.

3. The Trading Mechanism Without the Rule of Law

Without the rule of law, there is no point to negotiating before entering the trading zone: the negotiated agreements cannot be enforced. Thus, negotiation takes place only after traders have incurred trading costs. Sellers who enter the trading zone are then matched with buyers by a random process during the trading period. If there are more sellers than buyers in the zone, then each buyer is matched just once with a seller, whereas a seller's probability of matching just once with a buyer equals the ratio of buyers to sellers in the trading zone. Reverse remarks apply if there are more buyers than sellers.[3]

The price p* emerging from a negotiation between a buyer and a seller who have been matched within the trading zone depends on:

(i) the seller's bargaining power ω relative to the buyer's bargaining power $1-\omega$;

(ii) their default options were they to walk away with no trade.

We assume that the default options are independent of the trader's trading costs, which are fixed at the time of the negotiation. The seller's default option is to sell the good back into his domestic zone at price c; the buyer's default option is to buy the good in his domestic zone at the price b. For example, p* could be modelled by the Nash bargaining price:

$$p^*(\omega,b,c) = \omega b + (1-\omega)c \tag{3}$$

which solves:

$$\max_{p} (p - c)^{\omega}(b - p)^{1-\omega}$$

Since $b > c$, p* is high if sellers are powerful relative to buyers, so that they can extract a high price which leaves buyers with little net benefit. However, at this high price, there may be few buyers willing to trade, so that not all active sellers achieve a sale. The reverse problem arises for

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[3] We reduce search to a matching model for simplicity. Ongoing search would have to be analyzed simultaneously with the alternative of continued bargaining.

buyers if they are relatively powerful. If there are more sellers than buyers, then the probability π of a seller selling his unit is less than 1. In line with our rationale for the determination of the price p* under bargaining, we assume that a seller who pays c in his domestic zone to obtain a good for trade and fails to find a buyer can re-sell the good in his domestic zone for price c. Under this assumption, a seller bringing a unit into the trading zone at cost u has expected gross profit $(p^*-c)\pi$ and expected net profit $(p^*-c)\pi - u = (p^*-c)\pi + c - u - c$. This is the same as if he faced a certain price $(p^*-c)\pi + c$. Since sellers are risk neutral, the number of sellers who find trading profitable is given by the supply curve as $s((p^*-c)\pi + c)$. An excess supply equilibrium arises under beliefs about π which are confirmed by the actual ratio of demand to supply, i.e., for a π^* satisfying:

(4) $$\pi = d(p^*)/s((p^*-c)\pi + c).$$

If there are more buyers than sellers, then a buyer coming to the trading zone at cost t has a probability $\pi < 1$ of buying a unit at price p* and selling it for b. Its expected profit is $(b - p^*)\pi - t = b - t + (b - p^*)\pi - b$. This is the same as a buyer with trading cost t who faces a deterministic price $b - (b - p^*)\pi$. An excess demand equilibrium arises under beliefs about π which are confirmed by the actual ratio of supply to demand, i.e., for a π^* satisfying:

(5) $$\pi = s(p^*)/d(b - (b - p^*)\pi).$$

In the Appendix, we prove:

Proposition 1 (Existence of equilibrium under anarchy)

(A) If $p^* > p^e$, then there is a unique anarchic excess supply equilibrium.

(B) If $p^* < p^e$, then there is a unique anarchic excess demand equilibrium.

(C) If $p^* = p^e$, then anarchy and the rule of law have the same outcome.

In an excess supply equilibrium at price p* ($> p^e$) the expected gross profits per seller are:

$$y = (p^* - c)\pi^* = (p^* - c)d(p^*)/s((p^* - c)\pi^* + c) \text{ by (4)}$$

At price p*, aggregate seller's gross profits are:

(6) $$Y(p^*) \equiv (p^* - c)d(p^*) = ys(y + c)$$

Thus, aggregate gross profits equals y, the expected gross profits per seller, times the number of sellers s(y+c). Since ys(y + c) is increasing in y, the impact of p* on each seller's expected gross profits y has the sign of its impact on aggregate profits Y(p*). If aggregate gross profits are concave in aggregate sales, then an increase in p* increases aggregate gross profits if and only if p* is less than the price p^s that maximizes aggregate sellers' gross profits.

In an excess demand equilibrium at price p* (< p^e) the expected gross profits per buyer are:

$$x = (b - p^*)\pi^* = (b - p^*)s(p^*)/d((p^* - b)\pi^* + b) \text{ by (5).}$$

Aggregate gross buyer's profits at price p* are:

(7) $$X(p^*) = (b - p^*)s(p^*) = xd(b - x)$$

Thus, aggregate gross profits equals x, the expected gross profits per buyer, times the number of buyers d(b - x). Since xd(b - x) is increasing in x, the impact of p* on each buyer's expected gross profits has the sign of its impact on aggregate profits X(p*). If aggregate gross profits are concave in total purchases, then an increase in p* increases aggregate gross profits if and only if p* is less than the price p^b which maximizes aggregate buyer's gross profits. We have proved:

Proposition 2

(A) In an excess supply equilibrium, an increase in sellers' bargaining power decreases expected gross profits per seller if and only if it decreases aggregate sellers' gross profits. If aggregate sellers' gross profits are concave in total sales, then this will be true if and only if p*> p^s.

(B) In an excess demand equilibrium, an increase in buyers' bargaining power decreases expected gross profits per buyer if and only if it decreases aggregate buyers' gross profits. If aggregate buyers' gross profits are concave in total purchases, then this will be true if and only if p* < p^b.

A seller who extracts a high price p* in anarchic negotiation in excess supply equilibrium can see those benefits dissipated as other sellers crowd in to enjoy them also, thereby reducing his probability of selling, i.e., sellers exert a negative externality on each other. Proposition 2 shows that an increase in seller bargaining power is counter-productive when p* > p^s, because the direct

benefits of an increase in the price are outweighed by the greater negative externalities which sellers, attracted by the higher price, exert on each other. This creates a need for institutions which can internalize these externalities. In Section 2, we saw that the rule of law achieves this by ensuring that the sellers adhere to agreements made during the negotiation period when markets clear. Later sections will consider monopolies which also serve to internalize the externalities, albeit at the cost of other inefficiencies. Similar conclusions hold for an excess demand equilibrium.

4. Rule of Law vs. Anarchy

The argument of this section is as follows. Active traders on the excess side of the market prefer a move from anarchy to the rule of law if this increases gross expected profits per trader. Proposition 3 points out that this can be inferred from the impact of the move on the aggregate gross profits of traders on that side of the market via the monotonic relationships (6) and (7) between expected gross profits per trader and aggregate gross profits. Proposition 4 infers that the move toward the rule of law will be preferred by all traders, given wide discrepancies in the bargaining power of buyers and sellers under anarchic trade. Proposition 5 replaces this requirement by restrictions on the prices p^s and p^b that maximize the aggregate gross profits of sellers and buyers. Proposition 6 relates these restrictions to hypotheses on the underlying distributions of trading costs across traders.

Proposition 3

(A) An anarchic excess supply equilibrium at price $p^* > p^e$ is worse for each active seller than the rule of law if and only if aggregate sellers' gross profits are lower at p^* than at p^e.

(B) An anarchic excess demand equilibrium at price $p^* < p^e$ is worse for each active buyer than the rule of law if and only if aggregate buyers' gross profits are lower at p^* than at p^e.

At an excess supply equilibrium where p^* is close to $b - t_0$, $d(p^*)$ is close to 0, as are aggregate sellers' gross profits $(p^* - c)d(p^*)$ and the expected gross profits per seller. Therefore,

sellers who were active under the excess supply equilibrium are better off under the rule of law. The sellers who become active under the rule of law are also better off, as are buyers, who face lower prices. A similar argument holds for excess demand equilibria when p^* is close to $c + u_0$, leading to:

Proposition 4: All traders prefer the rule of law to anarchy, not only when their bargaining power in anarchic negotiations is relatively low, but also when it is relatively high, i.e., whenever there are large discrepancies in bargaining power between buyers and sellers.

At an excess supply equilibrium, $p^e < p^*$, so if $p^s \leq p^e$, and aggregate sellers' gross profits are concave in aggregate sales, then aggregate sellers' gross profits are higher at p^e than at p^*. Proposition 3A now implies that all sellers who are active under the anarchy prefer the rule of law. Clearly, so do sellers who would be inactive under anarchy. Buyers are always better off under the rule of law when $p^e < p^*$. Thus, the condition $p^s \leq p^e$ is sufficient to ensure that all traders prefer the rule of law to any excess supply equilibrium.

To show that the condition $p^s \leq p^e$ is necessary for this conclusion when aggregate sellers' gross profits are concave in aggregate sales, suppose that it does not hold, i.e., that $p^e < p^s$. Then for p^* such that $p^e < p^* \leq p^s$, aggregate sellers' profits are higher under the excess supply equilibrium than under the rule of law.[4] Proposition 3A now implies that active sellers would prefer the excess supply equilibrium to the rule of law. Thus, if the condition $p^s \leq p^e$ is violated, then there exists an excess supply equilibrium which some traders prefer to the rule of law. We have proved part (A) of the following proposition. The proof of (B) is similar.

Proposition 5: Suppose that aggregate sellers' gross profits are concave in aggregate sales and aggregate buyers' gross profits are concave in aggregate purchases.

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[4] For $p^* > p^s$, further analysis is required to rank aggregate sellers' profits under the excess supply equilibrium and under the rule of law. However, our conclusion requires only that we establish that aggregate sellers' profits are higher for some excess supply equilibria, i.e., for some values of $p^* > p^e$.

(A) All traders prefer the rule of law to any excess supply equilibrium if and only if $p^s \leq p^e$.

(B) All traders prefer the rule of law to any excess demand equilibrium if and only if $p^e \leq p^b$.

Consequently, all traders prefer the rule of law to any anarchic equilibrium which results in a price which differs from the competitive price under the rule of law if and only if $p^s \leq p^e \leq p^b$.

The following Lemma (proven in the Appendix) shows that the requisite curvature conditions on aggregate gross profits hold, for example, if $\kappa(\tau)$ and $\lambda(\tau)$ are non-increasing in τ.

Lemma 1: (A) Aggregate sellers' gross profits are concave in aggregate sales if and only if:

$$1+ \kappa > \tau\kappa_\tau/\kappa$$

(B) Aggregate buyers' gross profits are concave in aggregate purchases if and only if:

$$1 + \lambda > \tau\lambda_\tau/\lambda.$$

We next relate p^e, p^s and p^b to structural parameters. Consider the number of buyers when they pay a margin τ below the price $b - t_0$ required to attract the minimum-cost buyer. Let $\gamma(\tau)$ be the factor by which τ must be increased to attract an equal number of sellers by offering them a margin $g(\tau) \equiv \tau\gamma(\tau)$ over the price $c + u_0$ required to attract the minimum-cost seller, i.e.:

$$F(\tau) = G(g(\tau)) = G(\tau\gamma(\tau)) \tag{8}$$

For example, if $\gamma(\tau)$ is a constant over the support of F(.), then the distributions of buyers' and sellers' trading costs differ only by a location and a scale parameter (e.g., both distributions are uniform). The equilibrium price p^e under the rule of law ensures price margins for buyers and sellers which attract equal numbers so:

$$p^e - u_0 - c = g(b - t_0 - p^e) = (b - t_0 - p^e)\gamma(b - t_0 - p^e))$$

$$p^e = \frac{(b - t_0)\gamma^e + c + u_0}{1 + \gamma^e} \quad \text{for } \gamma^e \equiv \gamma(b - t_0 - p^e) \tag{9}$$

Thus, under the rule of law, the equilibrium price incorporates the trading costs of buyers and sellers: the locations of the cost distributions are incorporated via the parameters u_0 and t_0; their relative spreads via the parameter γ^e. By contrast, the outcome (3) of anarchic Nash bargaining:

$$p^* = \omega b + (1-\omega)c$$

incorporates only the default values b and c of the traded good to buyers and sellers.

p^s is determined by the first-order condition:

$$0 = Y_p(p) = d + (p - c)d_p(p) = d(p)\{1 - \kappa(p - c)/(b - t_0 - p)\} \text{ by (1)}$$

so:

(10) $$p^s = \frac{\kappa^s c + b - t_0}{1 + \kappa^s} \text{ where } \kappa^s \equiv \kappa(p^s - c - u_0)$$

u_0 and γ^e have a positive impact on the expression (9) for p^e, but do not appear in the expression (10) for p^s, whereas κ^s has a negative impact on the expression (10) for p^s, but does not appear in (9). Consequently, $p^s \leq p^e$ if κ^s, u_0 and/or γ^e are sufficiently large for given values of the other parameters. Similar remarks apply to the comparison of p^e with:

(11) $$p^b = \frac{\lambda^b b + c + u_0}{1 + \lambda^b} \text{ where } \lambda^b \equiv \lambda(b - t_0 - p^b)$$

Clean rankings of p^e against p^s and p^b can be stated in terms of:

$$\gamma^s \equiv \gamma(b - t_0 - p^s) \text{ and } \gamma^b \equiv \gamma(p^b - c - u_0)$$

i.e., the ratio of the seller's to the buyer's required price margin when buyers face respectively the price p^s which maximizes sellers' aggregate gross profits and the price p^b which maximizes buyers' aggregate gross profits. In the Appendix, we prove:

Proposition 6: Suppose that the hypotheses of Lemma 1 hold, so that aggregate sellers' profits are concave in aggregate sales and aggregate buyers' profits are concave in aggregate purchases.

(A) $p^s \leq p^e$, so that all traders prefer the rule of law to all excess supply equilibria, if and only if:

(12) $$\frac{u_0}{b - c - t_0 - u_0} \geq \frac{1 - \gamma^s \kappa^s}{(1 + \gamma^s)\kappa^s}$$

(B) $p^e \leq p^b$, so that all traders prefer the rule of law to all excess demand equilibria, if and only if:

(13) $$\frac{t_0}{b - c - u_0} \geq \frac{\gamma^b - \lambda^b}{(1 + \gamma^b)\lambda^b}$$

Consequently, all traders prefer the rule of law to anarchy, whatever the balance of anarchic bargaining power, if and only if both (12) and (13) hold.

Thus, all traders always prefer the rule of law if trading costs are high relative to the gross gains from trade, b – c, and the traders that would be stronger in anarchic bargaining (so that they end up on the excess side of the market) are highly elastic to price margins and/or they require absolute price margins which are large relative to those required by the weaker side. Although the move to the rule of law may well yield considerable efficiency gains in these circumstances, this is not why it would be preferred by the stronger side. Instead, the rationale in the case of strong sellers (excess supply equilibria), for example, is that highly elastic supply and/or a high ratio of the sellers' to the buyers' required price margin would imply excess demand at the price p^s which maximizes sellers' aggregate gross profits, so market forces under the rule of law would drive the equilibrium price p^e above p^s. Anarchic bargaining by strong sellers would drive the price even higher, lowering their aggregate gross profits, hence net expected profits per seller. Therefore, sellers would benefit from the the rule of law, which restrains anarchic bargaining.

To see how onerous are the conditions (12) and (13), consider the case where the buying and selling costs are each uniformly distributed, resulting in linear demand and supply curves. Then $\kappa^s = \lambda^b = 1$ and γ is a constant, equal to the ratio of the absolute slopes of the supply and demand curves. (12) and (13) would hold, whatever the trading costs, if $\gamma \equiv 1$, so that the demand and supply curves have the same absolute slope. (12) and (13) would also hold, whatever the slopes of the demand and supply curves, if $u_0, t_0 > b - c - u_0 - t_0$, i.e., the trading costs of the least-cost traders exceed their net gains from trade. The closer the absolute slopes of the demand and supply curves, the wider the acceptable range of trading costs. For example, if $\gamma = 3$, then it suffices if the minimum buying cost exceeds half the net gains from trade between the minimum-cost traders; $\gamma = 2$, then it suffices if the minimum buying cost exceeds one-third of their net gains from trade.[5]

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5 (12) is automatically satisfied in these circumstances, so we only have to address (13).

5. Monopolistic Middleman

The rule of law requires large-scale institutional changes: smaller-scale institutions may arise in its absence and reap some of the gains from trade. A monopolistic middleman provides an individualistic solution to the problem of holdup, requiring only that one agent have the resources to build and sustain a monopoly position.[6] In our model, the middleman incurs a cost V to enter the trading zone with monopoly power, but thereafter a zero marginal cost to meet another atomistic trader, an assumption which would be reasonable if the trading zone were small. The middleman meets in turn each seller in the zone to negotiate the price that it pays, then meets in turn each buyer in the zone to negotiate the price which it charges. The middleman's default option in any negotiation is to trade with another atomistic trader.

For the middleman to address the holdup problem, atomistic traders must believe that it will not hold them up after they have entered the trading zone. This would be true in the following case:

(A) Traders can return to anarchic trade, even after they have entered the trading zone.

In this case, the middleman could credibly announce that it will trade at the prices which maximize its profits subject to the constraint that atomistic traders on at least one side of the market have no incentive to return to anarchic trade. The details of the middleman's profit-maximizing policy in these circumstances are relegated to Proposition 14 in the Appendix. Let M^B be the highest profits that the middleman can achieve and let S^B be the quantity that it trades.

Holdup by the middleman would be possible if it were difficult for the atomistic traders to co-ordinate a joint return to anarchic trade, leaving each with no option but to trade with the middleman once they have entered the trading zone. This situation is captured by the following assumption:

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[6] For historical counterparts, see Fernand Braudel (1979), especially p.320 on the putting out system, and p. 412 - 419 'Competition Without Competitors'. p.413 points out that monopolistic middlemen arose "in response to the heavy regulation of public trade which was aimed at preserving fair competition in the market and the interest of the urban consumer." In our terms, they arose in response to the costs of operating the rule of law.

(B) Traders must choose between trading with the middleman and trading anarchically before they enter the trading zone.

In this case, if the middleman had only a one-period horizon, then it would announce the prices which would maximize its one-period profits subject to the constraint that atomistic traders on at least one side of the market have no incentive to choose anarchic trade, i.e., the same prices as in case (A). However, after the atomistic traders had entered the trading zone, its optimal policy would be to set prices equal to their default options, thereby garnering operating profits (i.e., profits before deducting its cost of entering the trading zone):

$$(b - c)S^B > M^B$$

Thus, in a one-period game, the middleman's price announcements at the beginning of the period would not be credible. We therefore suppose that the one-period game is repeated over an infinite horizon and that if the middleman violates the prices it announced at the beginning of any period, then the atomistic traders would never deal with the middleman in subsequent periods (for fear that they would again be held up). Anticipating this response, the middleman would honour its announced prices, provided that the present value of the resulting operating profit stream exceeds its operating profits from holding up traders in the current period, i.e., provided that:

(16) $$M^B/(1 - \Delta) > (b - c)S^B$$

where Δ is the middleman's discount factor. Moreover, the middleman can make a net profit after incurring the fixed cost V of entering the trading zone, provided that:

(17) $$M^B/(1 - \Delta) > V.$$

We have proved:

Proposition 7. Under assumption (B) above, suppose that $p^* \neq p^e$ and (16) and (17) hold. Then there is an equilibrium of the infinite-horizon repeated game in which traders trade through the middleman and it honors the prices that it announces at the beginning of each period, which are the prices that would maximize its profits under assumption (A).

The atomistic traders might find it difficult to determine whether condition (16) was satisfied, i.e., whether the middleman would honour its announced prices out of self-interest. For example, traders might find it difficult to estimate its discount factor Δ. However, even limited information might permit the traders to judge that:

(18) $\qquad (b - c)S^B < V$

i.e., that the middleman's fixed cost V of entering the trading zone is larger than its one-period operating profits from holding up all the traders. In that case, the traders could conclude that the middleman would have entered only if (17) held, from which (16) can then be inferred. Thus, the middleman's own fixed cost of entering the zone can make its price announcements credible: traders would judge that large fixed costs can be recouped only by staying in business over many periods, which requires the middleman not to damage its reputation by holdup attempts.

These considerations throw some light on the relationship between monopolies and the state. Although monopoly is the traditional villain in microeconomic analyses that implicitly assume the rule of law, history records many examples of the state sanctioning a monopoly, by granting or selling it a charter. One reason for this, suggested by our analysis, is that monopolies addressed the holdup problem at a lower overhead cost to the state than setting up a legal system. In terms of our model, state sanction reduces the cost V of entering the trading zone as a middleman with monopoly power, facilitating the satisfaction of condition (17). If state support drives V substantially below than $M^B/(1 - \Delta)$, then the state could extract some of the monopoly profits by selling the monopoly charter for H where $V+H < M^B/(1-\Delta)$. Our analysis reveals another reason for the state to do this: by driving up the total cost of entry so that both (18) and (17) were satisfied when V is replaced by V+H, the state could not only extract revenue but could also reinforce the credibility of the monopolist's commitment to refrain from holdup. The state could also do this directly by writing in and enforcing an anti-holdup provision in the monopoly charter itself.

To summarize, in the absence of the rule of law, a monopolistic middleman addresses the holdup problem in two ways:

(i) It internalizes the externalities that its atomistic counterparts on each side of the market would have inflicted on each other by crowding in to pursue the benefits of anarchic holdup.
(ii) By having a corporate identity and interests which extend beyond one period, as evinced by incurring the fixed cost of entering the trading zone with monopoly power, it facilitates trade by making a credible commitment to refrain from holding up atomistic traders.

Although state sanction of monopolistic middlemen can address the holdup problem at a lower overhead cost than setting up a legal system, this parsimony has a downside: the deadweight loss due to the exercise of monopoly power. A profitable middleman must offer sellers a price lower than p^e, for otherwise it could dispose of its purchases only at a loss. The profitable middleman must also offer buyers a price higher than p^e for otherwise it could meet their demands only by purchasing at a loss. We therefore have:

Proposition 8. All atomistic traders prefer direct trade under the rule of law to trading through the middleman.

Since the evolution of the rule of law would permit atomistic traders to bypass the middleman and erode its profits, the middleman has a vested interest in hampering that evolution. Atomistic traders would gain more than the middleman loses so, in principle, they could muster more resources to support the rule of law, but they would face free rider problems in so doing.

5. Trading Coalitions

The holdup problem can also be addressed by a coalition of the traders on one side of the market who build social and economic ties to form a collective monopoly, possibly facilitated by a state monopoly grant. Its members refrain from holdup in their collective self-interest, while using collective action to guard against holdup by counter-parties. The coalition trading mechanism is as follows. Individual traders have the same costs as before. Buyers jointly incur a fixed cost v to form a coalition, which thereafter incurs a zero marginal cost to meet each

atomistic seller in turn to negotiate a price. Like the monopolistic middleman, the buyer coalition can set a price unilaterally in negotiations in the trading zone.

Suppose that the buyer coalition credibly announces the price that it shall offer to sellers, thereby attracting into the zone all sellers who would find trade profitable at that price. Its aggregate cost of buying s units is $T(s) \equiv \int_0^s t(d')dd'$ where t(d') is the trading cost of the marginal buyer when total demand is d'. When total supply is s, the buyer coalition pays c+ u(s) per unit, where u(s) is the trading cost of the marginal seller. Therefore aggregate buyers' operating profits (i.e., profits before deducting the cost of forming the coalition) are:

$$m(s) \equiv bs - T(s) - (c + u(s))s$$

Since $T_s(s) = t(s)$, the first order condition determining the buyer coalition's choice of $s = s^B$ is:

$$b - t(s) = c + u(s) + su_s(s) \tag{19}$$

Sellers receive a price that yields zero profits to the marginal seller:

$$q^B = c + u(s^B) \tag{20}$$

This is given by the point on the supply curve **S** below the intersection of the marginal revenue curve of the buyer coalition (which coincides with the demand curve **D** of atomistic buyers) and the marginal cost curve **MC** facing the buyer coalition (which is to the left of the supply curve **S** facing atomistic buyers). The equilibrium price p^e under the rule of law is determined by the intersection of **D** and **S** so:

$$q^B < p^e$$

In the Appendix, we prove:

Proposition 9: A buyer coalition faces atomistic sellers and can credibly announce a price to sellers which maximizes its aggregate profits.

(A) The buyer coalition secures higher operating profits than under an anarchic equilibrium.

(B) The atomistic sellers secure higher profits than under anarchic negotiations that lead to a price p* which is either very low or very high.

(C) The atomistic sellers secure lower profits than under anarchic negotiations that lead to values of p^* in the neighborhood of p^e.

However, if the buyer coalition had only a one-period horizon, then after the atomistic sellers had incurred the costs of entering the zone, its optimal policy would be to hold each of them up by setting a price equal to their default option c, thereby securing higher profits than if it honored its announcements:

$$(b - c)s^B - T(s^B) > bs^B - T(s^B) - (c + u(s^B))s^B = m(s^B)$$

Thus, the buyer coalition's announcement of q^B would not be credible in a one-period model.[7] Therefore, we suppose that traders anticipate that the above one-period game will be repeated over an infinite horizon and that buyer violations of the price announcement in any period cause sellers to refrain from re-entering the trading zone in subsequent periods. Then the buyer coalition would honor its announced prices if the present value of the resulting operating profit stream exceeds its operating profits from holding up traders in the current period, i.e., if:

(21) $$m(s^B)/(1 - \delta) > (b - c)s^B - T(s^B)$$

where δ is the buyer coalition's discount factor.

The buyer coalition will secure a higher present value of net profits, after incurring the fixed cost v of coalition formation, provided that:

(22) $$m(s^B)/(1 - \delta) - v > m^*/(1 - \delta)$$

where m^* is the aggregate net profits of buyers under anarchy. Proposition 9A implies that this will always hold when v is sufficiently low. Thus, we have:

Proposition 10: In the infinite-horizon repeated game, suppose that (21) and (22) hold. Then there is an equilibrium in which the buyer coalition honors its announcement at the beginning of each period to pay sellers q^B.

Section 5's comments on the roles of the state and of the monopolist's fixed costs in making its

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[7] There is no counterpart to the middleman case (A), since held up sellers cannot revert to anarchic trade so long as the buyer coalition maintains cohesion.

announcements credible apply also to the trading coalition.

We next compare the rule of law with the outcome when a trading coalition is price leader. When the buyer coalition is price leader, its profits m(s) are higher at the level s^B which maximizes m(s) than at $s = s(p^e)$. Each seller receives a price $q^B < p^e$, so its profits are lower. A similar argument holds when the seller coalition is the price leader. We have proved:

Proposition 11: A coalition which is the price leader of atomistic traders secures profits which are higher than under the rule of law, while the atomistic traders secure profits which are lower.

Thus, the formation of a trader coalition to address the inefficiencies of anarchic trade can leave a damaging legacy: the coalition would seek to retain its monopoly rents by maintaining the cohesion originally necessitated by the absence of the rule of law. Indeed, it would be motivated to resist the evolution of the rule of law because this would facilitate individualistic trade and undermine coalition cohesion.

7. Bilateral Monopoly of Trading Coalitions

Tracy (1991, p.19) reports intriguing behaviour by two leading trading coalitions from history, the East India Companies of Britain and the Netherlands. They typically sought exclusive trading agreements with local princes who were given some military power. In terms of our model, the buyer coalition fostered a seller coalition. Why?

One reason may have been that, although refraining from holdup could have been in the buyer coalition's long-term interests, as discussed above, this point could have been lost on sellers unversed in strategic commercial calculations. Then the buyer coalition might seek to attract sellers by strengthening their bargaining position under the feared holdup by fostering a seller coalition which could depart collectively from the trading zone. In any reasonable model of direct bargaining between the two coalitions, there will be a range of parameters such that both would emerge with positive profits, i.e., such that a buyer coalition that could not otherwise make credible a commitment not to hold up individual sellers, would gain by fostering a seller

coalition. [8]

A second reason for fostering a seller coalition is that, in a dispersed trading zone, such as that faced by the East India Companies, the buyer coalition could face a positive marginal cost of finding another atomistic seller in the zone, even after incurring the cost of entering the zone, leaving its local representative vulnerable to holdup by sellers — effectively a return to anarchic negotiations. This situation could be modelled by reverting to the assumption that a buyer (coalition) can meet only one seller each time it incurs the cost of entering the trading zone, so that one-on-one encounters between buyer and sellers result in anarchic negotiations which lead to the price p^*. In these circumstances, the buyer coalition might foster a seller coalition that would constrain its members from individual holdup attempts out of collective self interest. The seller coalition could do so, however, only if the buyer coalition's policy left sellers better off than under the anarchy to which sellers could unilaterally force a return. Such a buyer policy can always be found because the two coalitions can share in the gains from internalizing the negative externalities amongst the traders on the side of the market which would be crowded in an anarchic equilibrium. In the Appendix, we prove:

Proposition 12. Suppose that a coalition controlling buyer entry into the trading zone fosters a coalition which controls seller entry and accepts the buyer coalition's price leadership. Then the buyer coalition can set a price which ensures that the aggregate expected operating profits of both coalitions are higher than under anarchy which leads to $p^* \neq p^e$.

8. Collective Bargaining Between Trading Coalitions

In a bilateral monopoly of trading coalitions, the price follower might aspire to price leadership. The ensuing struggle could be modelled as direct Nash bargaining between the coalitions, which we assume to involve the volume traded, as well as the price. The profits of the buyer and the seller coalitions are:

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[8] In a similar vein Greif, Milgrom and Weingast (1994, p. p.772-3) argue that medieval rulers in Europe may have fostered coalitions of foreign merchants to make credible a commitment to secure their trading rights.

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$$I(S,P) \equiv bS - T(S) - PS - v \text{ and } J(P,S) \equiv PS - cS - U(S) - w$$

where $U(s) \equiv \int_0^S u(s')ds'$ is the aggregate cost of selling s units and v (w) is the cost of forming the buyer (seller) coalition. We assume that their default options if no agreement is reached are zero. The outcome (S*,P*) of Nash bargaining between the coalitions is the solution to:

$$\max_{(S,P)} I(S,P)^{1-\Omega} J(P,S)^{\Omega}$$

where the constant Ω ($0 < \Omega < 1$) parametrizes the bargaining power of the buyer coalition. In the Appendix, we prove:

Proposition 13: Collective Nash bargaining leads to the same volume of trade S^e as the rule of law; it leads to a price $P^* \begin{matrix} > \\ = \\ < \end{matrix} p^e$ if:

$$\frac{1-\Omega}{\Omega} \begin{matrix} > \\ = \\ < \end{matrix} \frac{I(p^e,S^e)}{J(p^e,S^e)}. \tag{24}$$

This result sharply illustrates the difficulties in the approach to the rule of law through intermediate 'private' institutions. Collective bargaining leads to the volume of trade that maximizes aggregate profits, leaving no efficiency gains to smooth the transition toward the rule of law. This transition would generally change the division of profits, so it would be opposed by the losing coalition. Proposition 13 shows that collective bargaining would reproduce the outcome of the rule of law only if a coalition's relative bargaining power equals its relative share of profits under the rule of law. This would occur only if the coalitions were equally effective at taxing their members' profits and translating the proceeds into bargaining power. Contrariwise, differences in effectiveness would lead to a bargaining equilibrium where one coalition would block the move toward the rule of law. Thus, the formation of trading coalitions in response to the inefficiencies of anarchic bargaining could lead into an historical cul de sac which long delays the rule of law.

9. Conclusions

"Trade implies law" because the gains from trade give the side which would be weaker in

anarchic bargaining some leverage on the development of institutions. The rule of law to protect the weak could arise, not from the benevolence of the strong, but from their self interest. We established necessary and sufficient conditions for a move from anarchy toward the rule of law to be preferred by all traders, even those that would be stronger in anarchic bargaining. These conditions, stated in terms of the parameters describing the distribution of trading costs across traders, are not onerous. One explanation for the slow emergence of the rule of law might be the difficulties of setting up legal institutions. Another, suggested by our analysis, is that the monopolistic traders that emerge to address more quickly the inefficiencies of anarchic trade have a vested interest in impeding the rule of law.

We argued that a monopolistic trader can substitute for the rule of law only if atomistic traders have some guarantee against holdup, such as: the option of an immediate return to anarchic trade; a collective organization to redress perceived inbalances in bargaining power, perhaps fostered by the monopolistic trader itself; fixed costs of the monopolistic trader which it could not recoup if it attempted holdup; or the threat of withdrawal of government sanction of their monopoly. Thus, these private substitutes for the rule of law also illustrate, in a more modest way, the “power of the weak” in driving institutional development when they offer gains from trade.

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APPENDIX

Proof of Proposition 1

If $p^* > p^e$, then $d(p^*) < s(p^*)$ so, as π approaches 1, $s((p^*-c)\pi + c)$ approaches $s(p^*)$ and $d(p^*)/s((p^*-c)\pi + c)$ approaches $d(p^*)/s(p^*) < 1$. As π approaches 0, $s((p^*-c)\pi + c)$ approaches 0, so $d(p^*)/s((p^*-c)\pi + c)$ becomes very large. Since $d(p^*)/s((p^*-c)\pi + c) - \pi$ is negative for π close to 1 and is positive for π close to 0, Rolle's Theorem implies that there exists a π^* satisfying (4) such that $0 < \pi^* < 1$. This π^* is unique because $d(p^*)/s((p^*-c)\pi + c) - \pi$ is monotonically decreasing in π. Since $\pi^* < 1$, $d(p^*) < s((p^*-c)\pi + c)$, so π^* indeed defines an excess supply equilibrium. This proves (A). The proof of (B) is similar. Regarding (C), note that if $p^* = p^e$, then $d(p^*) = s(p^*) = s(p^*\pi^*)$ for $\pi^* = 1$, so anarchy leads to the same outcomes as the rule of law.

Proof of Lemma 1

(A) The price p(d) which leads to demand d is defined implicitly by:

(A1) $d = F(b - p(d) - t_0)$

The marginal revenue from aggregate sales d is $p(d)+dp_d(d)$, so aggregate sellers' gross profits $p(d)d - cd$ are concave in d if and only if:

(A2) $0 > 2p_d + dp_{dd}$

To relate the derivatives of p(d) and $F(\tau)$, differentiate (A1) with respect to d:

(A3) $1 = -F_\tau(b - p - t_0)p_d = -\kappa F(\tau)p_d/\tau$

Differentiating (A3) logarithmically with respect to $\tau = b - p - t_0$ and noting that $d_\tau = F_\tau$:

(A4) $0 = \tau\kappa_\tau/\kappa + \kappa - 1 + \tau F_\tau p_{dd}/p_d = \tau\kappa_\tau/\kappa + \kappa - 1 + \kappa dp_{dd}/p_d$

(A2) holds if and only if $dp_{dd}/p_d < -2$ or:

$$\tau\kappa_\tau/\kappa < 1 + \kappa$$

The proof of part (B) is similar.

Proof of Proposition 6

(A) Since $F_\tau > 0$ and $G_\tau > 0$, (8) implies that $g_\tau > 0$. Consequently, $p^e \geq p^s$ is equivalent to:

$$c + u_0 = p^e - g(b - t_0 - p^e) \geq p^s - g(b - t_0 - p^s) = \frac{c\kappa^s + b - t_0}{1 + \kappa^s} - g\left(b - t_0 - \frac{c\kappa^s + b - t_0}{1 + \kappa^s}\right)$$

$$u_0 \geq \frac{b - c - t_0}{1 + \kappa^s} - g\left(\kappa^s \frac{b - c - t_0}{1 + \kappa^s}\right)$$

$$\frac{u_0}{b - c - t_0} \geq \frac{1 - \gamma^s\kappa^s}{1 + \kappa^s}$$ which can be rearranged as (12).

The conclusion now follows from Proposition 5A. The proof of (B) is similar.

The Optimal Policy of the Monopolistic Middleman

If atomistic traders could not switch to anarchic trade, then the middleman would maximize profits by buying for resale the amount S^B which equates (i) the marginal revenue $b - t(s) - st_s$ from selling to the buyers and (ii) the marginal cost $= c + s + su_s$ of buying from the sellers. This would be achieved by the policy:

(a) Sell at the price $Q^B \equiv b - t(S^B)$; buy at the price $R^B \equiv c + u(S^B)$.

Under anarchic trade which leads to an excess supply equilibrium with price $p^* > p^e$, each active buyer receives p^*, while each active seller's expected revenue is $(p^*-c)\pi^* + c$. If $p^* \geq Q^B$, then policy (a) would leave buyers with no incentive to switch to anarchic trade, precluding seller attempts at such trade, so at the price R^B, sellers would supply the S^B units demanded by buyers. If $(p^*-c)\pi^* + c \leq R^B$ then policy (a) would leave sellers with no incentive to switch to anarchic trade, precluding buyer attempts at such trade, so at the price Q^B, buyers would buy the S^B units sold by sellers. Thus, if either $p^* \geq Q^B$ or $(p^*-c)\pi^* + c \leq R^B$, then the atomistic traders on at least one side of the market would not participate in anarchic trade and policy (a) would maximize the middleman's profits.

Now suppose that $R^B < (p^*-c)\pi^* + c < p^* < Q^B$ so that under policy (a) the atomistic traders on both sides of the market would switch to anarchic trade. Then the middleman's profit-maximizing policy would be the more profitable of the following two policies:

(b) Sell at a price just below p*; buy at the price $s^{-1}(d(p^*))$.

(c) Buy at a price just above $(p^*-c)\pi^* + c$; sell at the price $d^{-1}(s((p^*-c)\pi^* + c))$

where $s^{-1}(.)$ and $d^{-1}(.)$ are the inverse supply and demand functions. Policy (b) leaves buyers no incentive to switch to anarchic trade, precluding seller attempts at such trade, so at price $s^{-1}(d(p^*))$, sellers would indeed supply the $d(p^*)$ units demanded by buyers. The middleman makes positive profits since $s^{-1}(d(p^*)) < p^*$.

Policy (c) would leave sellers no incentive to switch to anarchic trade, precluding buyer attempts at such trade. Therefore, at the price $d^{-1}(s((p^*-c)\pi^* + c))$, buyers would indeed buy the $s((p^*-c)\pi^* + c)$ units offered by sellers. The middleman makes positive profits if and only if $(p^*-c)\pi^* + c < p^e$ since this ensures that $s((p^*-c)\pi^* + c) < d((p^*-c)\pi^* + c)$ and $d^{-1}(s((p^*-c)\pi^* + c) > (p^*-c)\pi^* + c$. Then, whether (b) or (c) yields higher profits would depend on the demand and supply elasticities. To summarize:

Proposition 14: For the case $p^* > p^e$, the middleman's profit-maximizing would be policy (a) if either $p^* \geq Q^B$ or $(p^*-c)\pi^* + c \leq R^B$. Otherwise, the middleman would choose the more profitable of policies (b) or (c). This would be (b) if $(p^*-c)\pi^* + c > p^e$; otherwise the choice would depend on the demand and supply elasticities. Similar conclusions hold *mutatis mutandis* when $p^* < p^e$.

Proof of Proposition 9

(A) Suppose that $p^* > p^e$ so that $s(p^*) > d(p^*)$ and:

$$p^* = c+u(s(p^*) > c+u(d(p^*).$$

Under anarchy, aggregate buyer profits are:

$$m^* = bd(p^*) - T(d(p^*)) - p^*s(p^*) < bd(p^*) - T(d(p^*)) - [c+u(d(p^*))]d(p^*) = m(d(p^*)) \leq m(s^B)$$

Suppose that $p^* = p^e$ so that $s(p^*) = d(p^*)$. Under anarchy, aggregate buyer profits are:

$m^* = bd(p^*) - T(d(p^*)) - p^*s(p^*) = bd(p^*) - T(d(p^*)) - [c+u(d(p^*))]d(p^*) = m(d(p^e)) < m(s^B)$

Suppose that $p^* < p^e$ so that $d(p^*) > s(p^*)$ and $p^* = c+u(s(p^*))$. Under anarchy, aggregate buyer profits are:

$m^* = bs(p^*) - T(d(p^*)) - p^*s(p^*) = bs(p^*) - T(s(p^*)) - [c+u(s(p^*))]s(p^*) = m(s(p^*)) \leq m(s^B)$

(B) At a high p^* close to $b - t_0$, $d(p^*)$ is close to 0, as are aggregate sellers' gross profits $(p^* - c)d(p^*)$ and the expected gross profits per seller. On the other hand, when $p^* < q^B$, (20) implies that $p^* < p^e$, so anarchy leads to an excess demand equilibrium in which individual sellers receive a lower price (and achieve lower profits) than under price leadership by the buyer coalition.

(C) For p^* satisfying $q^B < p^* \leq p^e$ anarchy leads either to an excess demand equilibrium or to the competitive outcome under the rule of law. In either case, each seller sells its unit at a price p^* which exceeds the price q^B resulting from price leadership by the buyer coalition, so the sellers achieve higher profits under anarchy. This remains true for prices p^* just above p^e since the profits of individual sellers under an excess supply equilibrium are right continuous in p^* at p^e. This completes the proof of (C).

Proof of Proposition 12

The sellers' aggregate cost of supplying s units is:

$$C(s) \equiv cs + U(s)$$

If the buyer coalition sets price p, then, as price follower, the seller coalition chooses s such that:

$$p = C_s(s) = c + U_s(s) = c + u(s)$$

Thus, the seller coalition sells the same amount s(p) as atomistic sellers facing price p.

(A) Suppose that anarchy leads to a price $p^* < p^e$, i.e., an excess demand equilibrium. If the buyer coalition sets a price p^*, then the seller coalition supplies $s(p^*)$ and sellers achieve the same operating profits as under anarchy. However, buyers enjoy higher operating profits: their gross operating profits are $(b - p^*)s(p^*)$, which is the same as under anarchy (see (7)), but their trading costs $T(s(p^*))$ are less than their trading costs $T(d(p^*))$ under anarchy: they no longer

crowd into the market and exert a negative externality on each other. By setting a price just above p* the buyer coalition leaves both sides with higher operating profits than under anarchy.

(B) Suppose that anarchy leads to $p^* > p^e$, i.e., an excess supply equilibrium. If the buyer coalition sets the price $(p^* - c)\pi^* + c$, then gross operating profits per seller are $(p^* - c)\pi^*$, supplies are $s((p^* - c)\pi^* + c)$ and aggregate sellers' gross operating profits are:

$$(p^* - c)\pi^* s((p^* - c)\pi^* + c) = (p^* - c)d(p^*)$$

Thus, at the price $(p^* - c)\pi^* + c$, sellers achieve the same expected sales as under anarchy and the same expected gross operating profits. However, they incur trading costs $U(s((p^* - c)\pi^* + c))$ that are less than their trading costs $U(s(p^*))$ under anarchy: they no longer exert a negative externality on each other through oversupply. Thus, sellers would enjoy higher operating profits than under anarchy. The buyer coalition receives:

$$s((p^* - c)\pi^* + c) = d(p^*)/\pi^* > d(p^*)$$

i.e., it receives more than under anarchy, but pays less, so its operating profits are higher.[9]

Proof of Proposition 13

The first-order conditions for (S*,P*) equate to 0 the derivatives of the maximand in (23) with respect to S and P:

(A5) $$\frac{(1-\Omega)\{b - t(S^*) - P^*\}}{I(S^*, P^*)} = \frac{\Omega\{c + u(S^*) - P^*\}}{J(S^*, P^*)}$$

(A6) $$\frac{(1-\Omega)S^*}{I(S^*,P^*)} = \frac{\Omega S^*}{J(S^*,P^*)}$$

Dividing (A5) by (A6):

(A7) $$b - t(S^*) = c + u(S^*)$$

Thus, $S^* = S^e$, so collective bargaining leads to the level of aggregate sales which is globally efficient, i.e., the same level as under the rule of law. Therefore, (A6) implies that:

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[9] We assume that buyers can costlessly dispose of any supplies in excess of the level $\underline{s}$ such that $b - t(s) = 0$.

$$\frac{1-\Omega}{\Omega} = \frac{I(P^*, S^e)}{J(P^*, S^e)}$$

The second part of Proposition 13 follows immediately.