

# Endogenous Altruism in Buyer-Seller Relations and its Implications for Vertical Integration \*

Julio J. Rotemberg

This draft: October 8, 2006

## Abstract

This paper considers a standard buyer-seller relation where the seller can take non-contractible actions that raise the value of the good to the buyer. This relationship can either take place inside a firm - so that the buyer can give orders to the seller - or across firm boundaries. Both the buyer and the seller can, if they wish, become altruistic towards one another. Becoming altruistic is costly and leads individuals to care about the other individual's payoffs *ex post*. Still, its observability can lead it to arise endogenously in buyer-seller transactions. Under plausible conditions, altruism from seller to buyer arises more easily for outside contractors than for employees. The result is that endogenous altruism can be a force that leads to disintegration. Altruism from buyers to their supplying contractor can also arise. As suggested by the empirical literature, it increases the frequency of purchases. (JEL: D2, L2)

---

\*Harvard Business School, Soldiers Field, Boston, MA 02163. Email: jrotemberg@hbs.edu. I wish to thank George Baker, Bob Gibbons, Oliver Hart, Ramon Casadesus Masanell and Rakesh Khurana for helpful conversations.

Sociologists of organizations such as Granovetter (1985) and Uzzi (1997) have emphasized that many economic transactions are “embedded” in social relations or, more particularly, are carried out between personal friends. Uzzi (1997), for example, contains vivid descriptions of friendship between executives at apparel “manufacturers” (buyers) and executives at “contractors” (the firms that actually make the garments).<sup>1</sup> Friendship ties also exist within firms, though frequency of interactions at work is only loosely related to the strength of these ties,<sup>2</sup> and I am not aware of any study showing warm feelings between people engaged in transactions across the divisions of a single firm. There is, by contrast, evidence that many inter-divisional transactions occur in an atmosphere of conflict and acrimony. Eccles and White (1988) give several examples of this conflict and say that, as a result of it “Most managers interviewed in the field study expressed the view that internal transactions were more difficult and costly than external ones” (p. S40). They quote one manager as saying “The internal guy, whether as supplier or as user, is never treated as well” (p. S47) and discuss a case in the semiconductor industry where “both buyer and seller would have preferred external transactions” (p. S43).<sup>3</sup>

Inspired by these contrasts, this paper studies conditions under which altruism is more likely to arise between people engaged in transfer of goods and services across firms than in similar transfers between people transacting within a firm. In this formulation, altruism captures a particular element of friendship, namely the tendency to provide more help to friends than to others. In Uzzi (1997), for example, suppliers who have special relationships with their customers make extra efforts to supply high quality goods. Uzzi (1997, p. 47) describes a “special” contractor that cut a dress “to different sizes depending on the dye color used because the dye color affected the fabric’s stretching. The manufacturer who made the

---

<sup>1</sup>Uzzi (1997, p. 42) quotes a manager as saying “It is hard to see for an outsider that you become friends with these people - business friends. You trust them and their work. You have an interest in what they are doing outside of business”

<sup>2</sup>Burt and Knez (1996) report that, when asked to name the business contact that they perceived as most selfish and untrustworthy, 3% of the managers in their sample named someone they interacted with daily.

<sup>3</sup>These difficulties with internal transactions are reflected in Walker and Poppo’s (1991) questionnaire study of a large buyer’s perceptions. This buyer claimed to have somewhat more difficulty reaching agreement about the allocation of engineering and cost changes when he was dealing with an internal profit center than when he was dealing with an outside supplier.

order didn't know that the dress sizes had to be cut differently to compensate for the dying. If the contractor had not taken the initiative to research the fabric's qualities, he would have cut all the dresses the same way - a costly mistake for the manufacturer and one for which the contractor could not be held responsible. Both the manufacturer and the contractor reported that this type of integration existed only in their embedded ties because their work routines facilitate troubleshooting and their 'business friendship' promoted expectations of doing more than the letter of a 'contract.' The manufacturer explained 'When you deal with a guy you don't have a close relationship with, it can be a big problem. Things go wrong and there is no telling what will happen' ”.

Given these benefits of dealing with an altruistic supplier, one obvious question is why firms don't arrange matters so that all their suppliers, including their employees, are altruistic. In the model I propose, where this altruism arises endogenously as in Rotemberg (1994), the reason is that altruism has costs as well as benefits. The particular setting in which transactions are carried out then determines whether the costs exceed the benefits or not.<sup>4</sup>

One difference between purchase transactions carried out within firms and purchase transactions across firms is the ease with which the buyer can impose his own preferred changes in his order even when friendship ties are absent. In the case of transactions within firms, the customer can induce changes by enlisting the help of a top executive who then orders to supplying division to make the change. As a manager in Eccles and White (1988, p. S47) put it, “an in-house guy may say he needs more, and if he doesn't get them he complains to his boss.” That CEO's sometimes order last-minute changes in the goods supplied by their divisions is a commonplace (see Freeland 2001, p. 246 for an example from General Motors). This capacity of managers to give orders to employees is broadly consistent with both Simon's (1961) and the law of agency's distinction between employees and outside

---

<sup>4</sup>While not directly related to this paper because it involves friendship among managers carrying out similar tasks in competing organizations rather than friendship among managers that sell to one another, Ingram and Roberts (2000) provides further evidence that the nature of business transactions affects these ties. They show that friendship is more likely among managers of competing hotels, that have more opportunities for enhancing each other's performance, than among other hotel managers.

contractors.<sup>5</sup>

Interestingly, the law of agency also provides a reason why textbook forms of renegotiation are often not sufficient to induce non-altruistic contractors to provide high quality goods to buyers. Contractors who provide goods and services are covered by the uniform commercial code. This code requires the contractor to be conscientious and “reasonable”. Moreover, the first substantive paragraph of this code says “The effect of the provisions of this Act may be varied by agreement, ... except that the obligations of good faith, diligence, reasonableness and care prescribed by this Act may not be disclaimed by agreement...” This rules out certain holdups that might otherwise lead contractors to seek quality enhancements. This law implies that a contractor who reveals that he knows a superior way of producing a product which does not entail important additional costs must use this superior method and is unable to extract additional compensation by threatening to revert to the inferior method of production.

While it might be desirable to derive this lack of price renegotiation as well as the increased capacity of buyers to give direct orders to in-house sellers from more fundamental assumptions, this is largely beyond the scope of this paper. Rather, the aim here is show that the additional scope for intervention in the case of in-house supply can reduce the altruism of in-house suppliers relative to that of external contractors. Thereby, a feature of in-house supply that Simon (1951) regarded as having an advantage can turn into a disadvantage.

The reason altruism can be affected in this way is that these interventions reduce its value. There is no particular reason to expect the changes demanded by buyers, which are often made at the last minute, to be consistent with changes that an altruistic seller discovers to be useful for raising quality. Indeed, the complications involved in making changes in highly interdependent systems usually imply that the implementation of one change precludes the implementation of others that were developed independently. The result is that the value of the quality-enhancing innovation discovered by the seller is generally lower when the buyer

---

<sup>5</sup>The Law of Agency p. 488 states that an employee differs from other agents because an employee is “subject to control as to the manner in which he performs the acts that constitute the execution of his agency.”

also has a change he would like to implement.

This has two implications, which are drawn out in propositions 2 and 3 below. First, external contractors can expect a higher reward from becoming altruistic because their suggestions are more valuable, and this means that they are more willing to incur the cost of gaining this altruism. Second, the minimum level of altruism that is sufficient for the contractor to offer valuable suggestions is lower than the minimum level of altruism that is needed for the worker to do so. Thus, if smaller levels of altruism are less costly, only external contractors become altruistic.

Friendships, and the altruism that goes with them, develop over time. I capture this in a simple way by treating altruism as a costly investment. While this is crude, it is worth noting that the “investment model” in social psychology predicts that friends are more committed to one another the larger are their earlier investments in the relationship, and this model has received support also in non-romantic relationships (Rusbult 1980). The social-psychology literature also stresses that friendships are cemented through time-intensive activities such as self-disclosure. A particularly relevant study is Collins and Miller (1994). They show that, in controlled experiments,  $a$ 's disclosure of personal information to  $b$  (an activity  $a$  generally views as costly) leads  $a$  to like  $b$  more. There are two reasons why this finding is particularly relevant for the current paper. First, while the idea that altruism is a choice variable may strike some readers as fanciful, the idea that people choose how much information they disclose to others should be uncontroversial. Second, the model requires that people know who feels altruistic towards them. The Collins and Miller (1994) evidence suggests that  $b$  can use evidence of self-disclosure by  $a$  as indicative that  $b$  is liked by  $a$ . “Liking” need not be identical to altruism. On the other hand Carnevale *et al.* (1982) show that subjects that have been manipulated into liking an experimenter's confederate are also more likely to help this confederate.

The simplest model I consider has agents first determine their altruism (the investment phase) and then having access to one potential transaction. I also consider a setting where the purchaser buys the good repeatedly. I do this both because friendship usually develops over

time, so that one would expect it to be more likely to arise when interactions are repeated and because it might be thought that this repetition obviates the need for altruism.

In the setting I consider, high quality can indeed be produced without altruism because, as in Klein and Leffler (1981), Shapiro and Stiglitz (1984) and Baker, Gibbons and Murphy (2001), there exist equilibria where suppliers keep quality high to ensure that they earn rents from future sales. Altruism nonetheless ends up playing a big role. With supplier altruism, the provision of high quality requires fewer rents because suppliers have an incentive to seek improvements in the product. Thus, suppliers that compete in their altruism drive down the level of rents and become altruistic in equilibrium.

Because altruistic contractors obtain larger vicarious gains from quality improvements than altruistic workers, altruism is more effective at reducing contractor rents than worker rents. This again provides a reason for transacting across firm boundaries. There is also a more direct reason to expect altruism to arise only with contractors when purchases are repeated. For a variety of reasons, it is easier to stop transacting with a contractor than with a worker. One reason for this difference is that many laws and regulations bear on the employment relation. Firms face firing costs for employees in many jurisdictions; even unemployment insurance taxes are generally “experience rated” so that tax rates are higher for employers who fire more frequently.

If it is relatively difficult to fire workers, an integrated firm that can give efficient orders to its worker may forego the mechanism that ensures high effort by promising future rents. The reason is that these rents have to be quite large if the probability of firing is low. As shown in Rotemberg (1991), integration may still be profitable in this case - even if it is socially inefficient - because it avoids giving rents to a contractor. What I show here is that this scenario is one where only contractors tend to become altruistic in equilibrium as they compete down the flow of rents.

One problem with the equilibrium where the firm buys repeatedly from a contractor and pays him more than his marginal cost of production is that the firm has an insufficient incentive to make purchases. This leads to inefficiency if demand is variable and the firm

does not make purchases every period. A solution to this problem is for the purchaser to become altruistic towards his contractor.

Such altruism is consistent with observations in Uzzi (1997 p.55) who reports that a manufacturer who was permanently moving his operations to Asia did not disclose his proposed move to his “arm’s-length” suppliers but personally notified his “special” contractors so they could adapt to the loss of his business. More generally, and exactly in line with the model’s predictions, buyers that have “special” relationships with sellers seem to try to maintain their purchases from these sellers in downturns. As a manager told Uzzi (1997 p. 54) “when we are not so busy, we try to find work for that time for our key contractors. We will put a dress into work to keep the contractor going. We’ll then store the dress in the warehouse.” Similar ideas are expressed in Lorenz (1988). He reports on close relationships among small and medium French engineering firms, which he describes as involving two-sided trust. According to him, these buyers trust that the seller will produce high quality while the sellers expect that “the client firm will make every effort to guarantee a level of work” (p. 206).

This paper is related to Kranton and Minehart (2000) who build a model where buyers can either procure goods in-house or incur costs to establish relations with external sellers. The models differ, however, because Kranton and Minehart (2000) suppose that the only benefit of incurring the costs of building external relations is that external sellers are more flexible; they can more easily redirect their output to different buyers depending on the randomness of individual demand. With a constant level of purchases, their model implies that internal supply is superior. Insofar as buyers succeed in keeping the level of orders from their “key” sellers relatively stable, the Kranton and Minehart (2000) model seems more applicable to the relationship of buyers with “arm’s-length” rather than with “special” suppliers.

The paper proceeds as follows. Section 1 studies contractor and employee altruism in one-shot interactions. Section 2 analyzes repeated interactions with constant demand while Section 3 focuses on demand fluctuations and buyer altruism. Section 4 concludes.

# 1 One shot make-or-buy choice

I consider a manufacturer who resells a unit of output that he obtains from a contractor or an employee. In the absence of altruism, potential contractors, employees and the manufacturer care only about what I call their material payoffs, which depend on their own income and effort. The key difference between workers and contractors is that the manufacturer can give orders to the former which, when followed, increase the value of output.

As discussed above, this fits with the legal definition of the employment relation. One reason for this asymmetry could be that, as in Wernerfelt (1997), compensation cannot be readjusted when these instructions are issued. Given that the contractor is entitled not to follow these instructions, he might choose not to do so if these are given after his compensation is set. Another reason could be that the manufacturer obtains the information that is needed to issue these productive orders only if his agent is an employee. This, in turn, could be due to two reasons. The first is that there is a complementarity between the actions which ensure that orders are obeyed and the acquisition of information about which orders would be useful. For example, both of these activities might benefit from having the employee work in close proximity of his supervisor. Second, manufacturers are more likely to own the assets used by employees than those used by contractor. This naturally leads manufacturers to take a closer interest in the way the employees uses these assets and provides an additional incentive for the employer to seek information about how these assets ought to be used.

The timing of decisions is the following. First, the manufacturer decides whether to be integrated or not. This decision is costless and determines whether the manufacturer employs a single worker or a single contractor. If he chooses integration, the manufacturer identifies a single worker drawn from a pool of identical workers while, otherwise, he identifies a single contractor. Second, the worker or contractor that have thus been identified decide whether to become altruistic. Third, there is a bargaining stage in which the manufacturer signs a contract with either the worker or contractor. These contracts are required to be

be extremely simple. In the employment contract, the firm pays a wage  $p^w$  in exchange for having the worker follow the manufacturer's instructions for one period. To simplify, the worker can produce a single unit in this time period. In the case of an outside contractor, the contract can only specify the price  $p^c$  that the manufacturer pays on delivery of one unit. I suppose that the  $p^w$  and  $p^c$  are determined by Nash bargaining between the agent and the manufacturer where failure to reach agreement leads the agent to earn his reservation value and allows the manufacturer to hire an outside agent by paying him the amount that leaves him indifferent between working for the firm and remaining independent of the firm. After these contracts are signed, the worker or contractor produce output which, at the end, the manufacturer sells at a price  $z$  that depends on the good's quality. Contracts between the firm and either the worker or the contractor cannot depend on  $z$ .

This price equals  $z_0$  if workers or contractors incur the level of effort that they prefer, namely  $e_0$ . I suppose that both workers and contractors have a reservation value of  $r$  for this effort. One reason workers may increase their effort is that employees must obey certain orders issued by the employer.<sup>6</sup> This is captured by supposing that, in the employment relation, there is a probability  $\phi_1$  that the manufacturer discovers a way of producing output with a value of  $z_1$  rather than  $z_0$ . For this increase in value to materialize, the worker must exert effort  $e_1$ , which costs him  $\delta_1$  more than effort  $e_0$ . The firm is entitled to require this effort of its employee and, indeed, the firm cannot waive this right. Following Simon (1951) there is no renegotiation with respect to the effort  $\delta_1$ . In the case where  $z_1 - z_0 > \delta_1$  this has limited effect on the equilibrium allocation since the employee would still make effort  $e_1$  if this renegotiation were allowed. Note that, for the purpose at hand it is not important why buyers cannot obtain a good of value  $z_1$  from contractors, though one possible reason for this is that the act of supervising workers allows the buyer to learn this.

There is also a second way in which either the employee or the contractor can raise the

---

<sup>6</sup>A simple, and somewhat realistic, formal model that yields this limited obedience consists of allowing the employer to garnish his employee's salary for one period if this employee fails to follow his instructions. More realistically, employees who fail to follow instructions are fired and, because this imposes a cost on the worker, outside agents (including co-workers, unions and the courts) help determine whether the cause for this firing is "reasonable".

value of output. By incurring effort  $e_2$  which costs the equivalent of  $\delta_2$  units of income, the worker or contractor have a probability  $\phi_2$  to find a method to raise the value of output to  $z_2$ . This effort is made at the discretion of the worker or contractor, it cannot be compelled even by the employer. If this effort yields a valuable idea, the value of output rises if the idea is implemented. To simplify the analysis, suppose that this implementation requires no additional effort and that the method that raises output to  $z_2$  still has social value when the firm can increase output to  $z_1$ , so that

$$z_2 > z_1 - \delta_1. \quad (1)$$

Because the wage does not depend on whether  $e_1$  is carried out, the manufacturer prefers  $z_1$  to  $z_2$  even if (1) is satisfied as long as  $z_1 > z_2$ . Choosing  $z_1$  is socially inefficient in this case, however. While this set of parameters is of some interest, I focus on situations where the firm implements  $z_2$  when it is available.

Given (1), the effort  $e_2$  is efficient as long as

$$\phi_2(z_2 - z_0 - \phi_1(z_1 - z_0 - \delta_1)) > \delta_2. \quad (2)$$

In this one period case, the wage (or price to the contractor) is independent of the good's quality. The result is that, since  $e_2$  cannot be compelled and is costly to the agents,  $z_2$  cannot be obtained when the agents are selfish. Moreover

**Proposition 1.** *If agents are selfish, the firm integrates if*

$$z_1 - z_0 \geq \delta_1 \quad (3)$$

*and remains non-integrated otherwise*

**Proof.** Consider first the selfish contractor. Nash bargaining between this contractor and the firm implies that the contractor earns his reservation wage  $r$  and the manufacturer receives a good of value  $z_0$ . The reason is that the contractor can earn  $r$  by not working for the firm and the firm can obtain  $z_0 - r$  by using an alternate selfish contractor.

Consider now a selfish worker. Whether the firm keeps the original worker or not,  $z_1 > z_0$  implies that there is a probability  $\phi_1$  that the firm obtains a good with value  $z_1$ . Assuming Nash bargaining over the wage before the firm forces the worker to exert effort of  $e_1$ , the wage offered to the inside worker is his reservation wage, namely  $r + \phi_1 \delta_1$ . The worker accepts no less because he knows the firm will insist on an effort of  $e_1$  and he gets no more because the firm can obtain this outcome from any of the other available workers. This means that, the firm is better off integrating if (3) holds. *Q.E.D.*

Note that integration leads to more valuable output for the firm *ex post* as long as  $z_1 > z_0$ , which is weaker than (3). However, as in Simon (1951), the lack of recontracting after the firm finds out a method for raising the value of output implies that, when (3) is violated, the firm must pay the worker such a high wage *ex ante* that it is better off remaining non-integrated.

I now show that endogenous altruism can lead the firm to use an outside contractor even if (3) holds. My model of endogenous altruism is the following. A single agent (be it an employee in the integrated case or a contractor in the non-integrated one) can become altruistic towards the manufacturer by incurring a disutility which costs him the equivalent of  $g$  units of income. This cost need not be interpreted as a cost of becoming altruistic but, rather, can be a cost of providing credible proof of one's altruism by, for example, an appropriate choice of gifts (see Camerer 1988) . Alternatively, a side effect of becoming altruistic is that one spends time with the object of one's altruism (either because one enjoys it or, again, as a way of demonstrating one's altruism) and the cost is then the opportunity cost of the alternative uses of this time.<sup>7</sup>

Becoming altruistic is beneficial in my model only if this altruism is observable. While the observability of sentiments has been suggested before (see Homans 1950 p. 39) there is no direct evidence for the observability of altruism or empathy. On the other hand, there is evidence about a related sentiment, namely affect or "liking". There have been many

---

<sup>7</sup>Another opportunity cost of altruism can arise if the agent has a limited capacity to help different people. In this case, an individual who becomes altruistic towards many people may start feeling a great deal of guilt.

studies where people who know each other are asked whether they like one another. In some of these studies, they have also been asked their opinion about the extent to which they believe that others like them. In a study of college roommates Levesque (1997) asked both these questions on a seven point scale.<sup>8</sup> His subjects did not differ appreciably in the average affect they reported for others not in the average perception of others' affect for them. There was considerable variance, however, in the extent to which any particular subject liked different individuals and the extent to which any individual expected to be liked by different roommates. At the same time, the correlation between the liking of  $a$  for  $b$  and the extent to which  $b$  perceived that  $a$  liked him (or her) was an impressive .85. Thus, these roommates perceived liking by others very accurately.<sup>9</sup>

I thus suppose that, once the agent has incurred the cost  $g$ , his altruism becomes apparent to the manufacturer. Moreover, an altruistic agent no longer chooses his actions to maximize his own material payoffs. Instead, his actions maximize a utility function that equals the sum of his own material payoffs and  $\bar{\lambda}$  times the material payoffs of the manufacturer. For example, when the contractor faces choices concerning his level of effort, the part of the manufacturer's payoff that depends on this effort is simply given by  $z$ . Thus, the altruistic contractor exerts effort  $e_2$  instead of  $e_0$  if

$$\bar{\lambda}\phi_2(z_2 - z_0) \geq \delta_2. \quad (4)$$

If the agent becomes altruistic, he must do so before he signs any contract with the manufacturer. This captures the idea that becoming altruistic takes time while also ensuring that the manufacturer cannot buy an agent's altruism. After the agent becomes altruistic, however, the manufacturer prefers to hire the altruistic agent over hiring alternate agents. At this stage, the manufacturer and the altruistic agent negotiate over  $p^c$  or  $p^w$ . If the manufacturer fails to reach agreement he gets to negotiate with a selfish agent where this

---

<sup>8</sup>Levesque (1997) also provides references for a few previous studies that looked at similar questions.

<sup>9</sup>The perception of being liked may also have had an effect on people. While the extent to which  $a$  liked  $b$  had a correlation of .82 with the extent to which  $b$  liked  $a$  (so that liking was reciprocated), the correlation of the extent to which  $a$  liked  $b$  with  $a$ 's perception of  $b$ 's liking for  $a$  was an even bigger .91. Thus the perception of being liked appears to be a trigger for liking others.

agent is a worker if the manufacturer is integrated and is a contractor otherwise.

I suppose that  $p^c$  and  $p^w$  are determined by Nash bargaining over material payoffs. In the non-integrated case this means that the transfer from the manufacturer to the contractor maximizes the product of the two material payoffs net of what they can obtain outside of the relationship.<sup>10</sup> Since outsiders are not altruistic towards the manufacturer, this means that the expected gains from altruism are shared equally by the two parties. If the manufacturer reaches agreement with the altruistic contractor, the manufacturer earns  $z_0 + \phi_2(z_2 - z_0) - p^c$  where  $p^c$  is what this contractor receives while the manufacturer earns  $z_0 - r$  if no agreement is reached. Similarly, the contractor earns  $p^c - \delta_2$  if he reaches an agreement and earns  $r$  otherwise. Thus, Nash bargaining leads to a value of  $p^c$  equal to

$$p^c = r + \frac{\phi_2(z_2 - z_0) + \delta_2}{2}.$$

Now consider the stage where the manufacturer must decide whether to become altruistic or not. I suppose this decision maximizes the contractor's material payoffs. As discussed in Rotemberg (1994), a variety of reasons can be given for this assumption. The simplest is that altruism is chosen by a "rational self" which maximizes material payoffs and uses altruism as a commitment device.

If (4) holds, the altruistic contractor's material payoffs are  $p^c - \delta_2$  so that the contractor benefits by spending  $g$  and becoming altruistic if

$$\frac{\phi_2(z_2 - z_0) - \delta_2}{2} - g > 0. \quad (5)$$

With this altruism, the manufacturer's profits,  $\pi^c$ , are  $z_0 + \phi_2(z_2 - z_0) - p^c$  or

$$\pi^c = z_0 - r + \frac{\phi_2(z_2 - z_0) - \delta_2}{2}. \quad (6)$$

Now consider the integrated firm. Since the firm implements the worker's method when it leads to  $z_2$ , a worker who exerts effort  $e_2$  reduces the probability that he will have to exert

---

<sup>10</sup>Similar results can be obtained by letting the transfer maximize the product of the "psychological payoffs," which include the vicarious enjoyment of the manufacturer's utility by the contractor. The analysis is more complex, however.

effort  $e_1$  from  $\phi_1$  to  $\phi_1(1 - \phi_2)$ . A worker who becomes altruistic thus exerts effort  $e_2$  if

$$\bar{\lambda}\phi_2[z_2 - z_0 - \phi_1(z_1 - z_0)] \geq \delta_2 - \phi_2\phi_1\delta_1. \quad (7)$$

Both this condition and the corresponding condition for contractors (4) require that  $\bar{\lambda}$  be greater than some threshold. If  $\delta_1$  is zero, (7) requires a higher  $\bar{\lambda}$  because the more muted effect of  $e_2$  on profits under integration implies that workers get less vicarious utility from  $e_2$ . On the other hand, increases in  $\delta_1$  reduce the degree of worker altruism required to carry out  $e_2$  because workers are less likely to be asked to do  $e_1$  if  $e_2$  succeeds.

Supposing an integrated firm reaches agreement with an altruistic worker and (7) holds, the firm earns  $\phi_2z_2 + (1 - \phi_2)(z_0 + \phi_1(z_1 - z_0)) - p^w$ . If it fails to reach this agreement, the firm earns  $z_0 + \phi_1(z_1 - z_0 - \delta_1) - r$ . The worker's material payoff is  $p^w - \delta_2 - \phi_1(1 - \phi_2)\delta_1$  if he reaches agreement while he again earns  $r$  if he earns his reservation wage elsewhere. With Nash bargaining,  $p^w$  ensures that the expected increases in material payoffs are divided evenly so that

$$p^w = r + \phi_1\delta_1 + \frac{\phi_2[(z_2 - z_0) - \phi_1(z_1 - z_0)] + \delta_2 - \phi_1\phi_2\delta_1}{2}$$

and profits with an altruistic worker are

$$\pi^w = z_0 - r + \phi_1(z_1 - z_0 - \delta_1) + \frac{\phi_2[z_2 - z_0 - \phi_1(z_1 - z_0)] - \delta_2 + \phi_1\phi_2\delta_1}{2}.$$

Using the formula for  $\pi^c$  in (6), this becomes

$$\pi^w = \pi^c + \phi_1 \left(1 - \frac{\phi_2}{2}\right) \frac{z_1 - z_0 - \delta_1}{2}. \quad (8)$$

The worker benefits from becoming altruistic if  $p^w - r - \delta_2 - \phi_1(1 - \phi_2)\delta_1$  exceeds  $g$  or if

$$\phi_2(z_2 - z_0) - \delta_2 - \phi_1\phi_2(z_1 - z_0 - \delta_1) > 2g. \quad (9)$$

If  $z_1 - z_0 > \delta_1$ , condition (9) is more stringent than condition (5). The left hand sides of these conditions are, respectively, the amounts that worker and contractor receive for their

altruism. These differ because the firm pays less for worker altruism as a result of its access to  $e_1$ .<sup>11</sup>

This difference in the private rewards to altruism lead to the first set of sufficient conditions for the firm to prefer to be non-integrated even when (3) holds so that the manufacturer would integrate both in the absence of altruism and if he could simply buy an agent's altruism by paying him  $g$ . This is

**Proposition 2.** *If (4) holds while, at the same time*

$$1 - \frac{\phi_2}{2} < \frac{2g}{\phi_2(z_2 - z_0) - \delta_2} < 1, \quad (10)$$

*there exists a strictly positive range of values for  $\phi_1(z_1 - z_0 - \delta_1)$ , namely*

$$\frac{\phi_2(z_2 - z_0) - \delta_2 - 2g}{\phi_2} < \phi_1(z_1 - z_0 - \delta_1) < \frac{\phi_2(z_2 - z_0) - \delta_2}{2} \quad (11)$$

*such that the manufacturer prefers to be non-integrated.*

**Proof.** Multiplying the first two expressions in (10) by  $2[\phi_2(z_2 - z_0) - \delta_2]$  and rearranging, one obtains

$$2[\phi_2(z_2 - z_0) - \delta_2 - 2g] < \phi_2[\phi_2(z_2 - z_0) - \delta_2],$$

which establishes that values for  $\phi_1(z_1 - z_0 - \delta_1)$  exist in the range given by (11).

The rest of the proof proceeds by assuming that (7) holds so that an altruistic worker does indeed carry out effort  $e_2$ . However, if this condition is violated profits under integration are even lower than I suppose, and the worker gains even less by becoming altruistic. Thus, the proof extends readily to the case where (7) is violated.

The first inequality in (11) implies that (9) is violated so the worker does not choose to become altruistic (again even if (7) holds). Given that (4) holds, the second inequality in (10) ensures the contractor becomes altruistic. Thus the manufacturer faces the choice between

---

<sup>11</sup>This may seem somewhat reminiscent of Grossman and Hart (1988) if one looks at the acquisition of altruism as a type of specific investment that is made before compensation is set. One could then say that the contractor receives a higher return on his investment than the worker because the firm does not have access to  $e_1$  in the non-integrated case. Note, however, that unlike an essential attribute in the Grossman and Hart (1988) model, ownership of one particular piece of capital is not sufficient to give access to a good of quality  $z_1$ . Rather, this option arises only if the buyer also gets to direct the actions of the supplier.

an altruistic contractor, which yields the manufacturer  $\pi^c$  and a selfish worker, which yields the firm  $z_0 + \phi_1(z_1 - z_0 - \delta_1)$ . The second inequality in (11) ensures the firm prefers the former. *Q.E.D.*

What is needed for this outcome is that both  $g$  and  $\phi_1(z_1 - z_0 - \delta_1)$  fall in intermediate regions. The surplus from the effort  $e_1$  must be large enough that it reduces sufficiently the social value of the worker's altruism while it must be small enough that the firm does not prefer a selfish worker to an altruistic contractor. When this surplus is in this range, the cost of altruism  $g$  can be small enough that the contractor wishes to become altruistic while being large enough that the worker does not.

The fact that altruism can be less effective at inducing the effort of workers gives rise to a second set of sufficient conditions for non-integration to be optimal even when (3) holds. This is given by the following proposition.

**Proposition 3.** *If*

$$\frac{\delta_1}{z_1 - z_0} < \frac{\delta_2}{\phi_2(z_2 - z_0)} \quad (12)$$

*there exists a positive range of values for  $\bar{\lambda}$  such that  $0 \leq \bar{\lambda} \leq 1$  and*

$$\frac{\delta_2}{\phi_2(z_2 - z_0)} < \bar{\lambda} < \frac{\delta_2 - \phi_1\phi_2\delta_1}{\phi_2(z_2 - z_0 - \phi_1(z_1 - z_0))}. \quad (13)$$

*For  $\bar{\lambda}$  in this range, the contractor is willing to exert effort  $e_2$  while the worker is not (with lower values of  $\bar{\lambda}$  neither does so.) Moreover, for this range of  $\bar{\lambda}$ , if (5) holds while*

$$\phi_1(z_1 - z_0 - \delta_1) < \frac{\phi_2(z_2 - z_0) - \delta_2}{2}, \quad (14)$$

*the manufacturer prefers to be non-integrated.*

**Proof.** Inequality (12) implies that

$$-\delta_2(z_1 - z_0) < -\delta_1\phi_2(z_2 - z_0).$$

Multiplying both sides by  $\phi_1\phi_2$ , adding  $\delta_2\phi_2(z_2 - z_0)$  to both sides and rearranging yields

$$\delta_2\{\phi_2[z_2 - z_0 - \phi_1(z_1 - z_0)]\} < \phi_2(z_2 - z_0)[\delta_2 - \delta_1\phi_1\phi_2].$$

This implies that positive values of  $\bar{\lambda}$  can be found that satisfy (13). At the same time, (2) implies that the left hand side of (13) is smaller than 1 so this inequality is also consistent with  $\bar{\lambda} \leq 1$ .

The first inequality in (13) ensures that (4) holds so that, since (5) holds as well, the contractor becomes altruistic and makes the effort  $e_2$ . The second inequality in (13) implies that, instead, (7) fails to hold so that workers do not make the effort  $e_2$  even if they become altruistic. This means that workers remain selfish and the firm confronts once again the choice between a selfish worker and an altruistic contractor. The inequality in (14), which is the same as the second inequality in (11), ensures that the manufacturer prefers the former. *Q.E.D.*

The inequalities in (13) ensure that the altruism parameter  $\bar{\lambda}$  is sufficient to induce cooperation by contractors but not sufficient to ensure it on the part of workers. There is, in a sense, a tension between (14) and (12). The former requires that the net benefits of  $e_2$  be large relative to those of  $e_1$  while the latter requires that the *ratio* of benefits to costs be larger in the case of  $e_1$  than in the case of  $e_2$ . In other words, the benefits of  $e_1$  must be small enough that the firm prefers an altruistic contractor who makes the effort  $e_2$  but the benefits of  $e_1$  must also be large enough that they reduce sufficiently the worker's vicarious enjoyment from making effort  $e_2$ . Because (12) involves ratios, it can be satisfied with low net benefits for  $e_1$  as long as the cost  $\delta_1$  is low. If  $\delta_1$  is zero, for example, one can find values of  $\bar{\lambda}$  that satisfy (13) for any positive value of  $z_1 - z_0$ .

A simple interpretation of Proposition 3 is that, if (12) holds, the minimum altruism that leads the contractor to seek the innovation that raises the value of output to  $z_2$  is lower than the minimum altruism that achieves this for a worker. The reason, again, is that the contractor expects to increase the buyer's material payoffs by more when he makes the effort  $e_2$ . This means that, if the expenditure of  $g$  leads only to a small degree of altruism, the buyer can only expect the contractor to become usefully altruistic.

Formally, this model of altruism is a model of investment. This raises the obvious question of whether identical results could be obtained using a model of investment in physical goods.

What would be required, however, is that this investment actually eliminate the *ex post* cost of providing a good with quality  $z_2$ . Any costs of increased quality would have to be incurred before the buyer and the seller agree to transact at the price  $p^c$  or  $p^w$ .

The essential feature of the model, then, is that altruism from seller to buyer is observed only in situations where there are such *ex post* opportunities to improve quality at a cost. The model then has more specific empirical implications in the plausible case where the maximum altruism  $\bar{\lambda}$  is relatively low and where the cost of carrying out effort  $e_1$  rather than  $e_0$  is negligible (because the worker is simply doing “his job” in either case.) It then follows that altruism from seller to buyer is observed only when the firm uses an independent contractor and that such contractors are used only if the seller’s *ex post* ideas for product improvement are valuable relative to the buyer’s ideas.

## 2 Repeated Purchases in an Unchanging Environment

I now turn to a setting where altruism is not essential for ensuring that high quality goods are produced. Purchases are repeated and, as in Shapiro and Stiglitz (1984) and Baker, Gibbons and Murphy (2001) the purchaser can stop his relationship with the seller in response to poor performance.<sup>12</sup> One reason to study this settings is to understand whether altruism still plays a role at all. This is important because, in practice, altruism tends to arise in settings where interactions are indeed repeated. The second, and related reason is that period-by-period Nash bargaining is not attractive as a mechanism for setting compensation in a repeated setting, and it seems worthwhile to understand whether the earlier results are sensitive to setting compensation in this way. Lastly, the analysis of repeated purchases provides a

---

<sup>12</sup>This approach is also similar to that in the classic article by Klein and Leffler (1981). The main difference with Klein and Leffler (1981) is that they suppose that the delivery of low-quality goods to one customer affect the purchases of others as well. This assumption is very appealing for mass-produced branded products, which are the focus of Klein and Leffler (1981) analysis, since modern manufacturing techniques seek to ensure that the quality of these products is uniform. In the case of customized products or services, however, the connection between the quality provided to different customers is less tight. It is even possible that the provision of low quality to one customer frees up the supplier’s time so he has more time to provide high quality for others. Thus the quality provided to one customer conveys little information to others. This fits with Uzzi (1997) who reports that many suppliers have “special” relationships with some customers while they have “arm’s length” relations with others.

foundation for the later study of buyer altruism in the presence of demand fluctuations.

Suppose the manufacturer buys one unit per period. The discount factor is  $\beta$  and the manufacturer offers a price  $p^c$  to the contractor, or  $p^w$  to the worker, at the beginning of each period. If the contractor accepts, he receives  $p^c$  upon delivery of one unit. Similarly, if the worker accepts, he is paid  $p^w$  if he works that period.

I consider the following strategy for a manufacturer. If he offers a price that exceeds either  $r$  (in the case of a contractor) or  $r + \phi_1 \delta_1$  (in the case of a worker), he continues to offer the same price to the same supplier until something occurs that leads the manufacturer to end to the relationship. If the manufacturer ever deviates and lowers his price, he then keeps the price lower from that point onwards. In the case of the worker or contractor, I consider the strategy of making effort  $e_2$  in every period in which he is offered  $p^c$  (or  $p^w$ ) and reducing this effort to  $e_0$  immediately after the manufacturer offers a lower price.

One important determinant of the equilibrium outcome is the trigger that leads the manufacturer to stop his relationship. Because the cessation of purchases is a drastic punishment and because output can commonly be worth  $z_0$  also when the agent exerts high effort, it does not make sense to punish the agent every time a good worth  $z_0$  is delivered. An alternative, following Radner (1985) would be to let the manufacturer follow a “review strategy” where he periodically looks at the total value of output since the last review and fires the agent only if this total value falls short of a “trigger” level.

I consider a simpler alternative, in which the manufacturer has bounded recall so he only remembers the value of output in the previous period (though he does remember forever whether he has fired a particular agent). At the same time, the manufacturer has access to a crude monitoring technology. Whenever the value of output is  $z_0$ , there is a probability  $\rho^c$  that the manufacturer observes whether the contractor has made effort  $e_0$  or  $e_2$  and a probability  $\rho^w$  that he makes the corresponding observation in the case of a worker. If the manufacturer observes that the contractor has made effort  $e_0$ , he stops buying with probability  $\theta^c$ . In the case of a worker, the corresponding probability that he is fired is  $\theta^w$ . Lastly, I let  $\xi^i$ , where  $i$  equals either  $c$  or  $w$ , be equal to  $\theta^i \rho^i$ . Thus  $\xi^i$  is the probability that

the relationship with an agent that makes effort  $e_0$  is severed.

Two simple cases deserve to be considered. The first, which is consistent with Baker, Gibbons and Murphy (2001), is to suppose that  $\rho^c = \rho^w$  while  $\theta^c = \theta^w = 1$ . Thus the quality of the observations is the same in the integrated and the non-integrated case and the relationship is severed whenever it is observed the agent made effort  $e_0$ . I also consider the alternative explored in Rotemberg (1991) where  $\theta^c$  is equal to one while  $\xi^w$  is equal to zero. This captures, in extreme form, the idea that severing relationships with outside suppliers is easier in principle than is severing relationships with employees. As discussed in the introduction, this difference is partly due to the law.

The cost of firing contractors may also be lower as a direct consequence of the firm's ability to give orders to its employee. This ability implies that, even after an employer ascertains that the employee has carried out effort  $e_0$  and not effort  $e_2$ , the employer may prefer not to sever the relationship if the employee is good at carrying out effort  $e_1$ .<sup>13</sup> In other words, the existence of another range of activities may imply that it is not credible for the firm to fire an employee who carries out effort  $e_0$  instead of  $e_2$ . This in no way requires the irrelevance of the analysis of Shapiro and Stiglitz (1984), it simply requires that the events that trigger the firing of employees be different (and presumably more egregious) than those that trigger the severing of relationships with outside suppliers. The firm may, for example be happy to fire employees who do not carry out effort  $e_1$  but may be reluctant to let go those employees who prove adept at following these instructions.

I start by studying a contractor with altruism parameter  $\lambda$ . To avoid the implication that someone who becomes altruistic sees an instantaneous effect on the level of his utility through his vicarious enjoyment of another's consumption, suppose that an altruist gains utility only when his own actions raise the utility of the object of his altruism. Thus, a contractor whose altruism equals  $\lambda$  gains  $\lambda(z_2 - z_0)$  when the manufacturer receives a good worth  $z_2$ . This means that, in each period where he makes effort  $e_2$ , his total payoff is

---

<sup>13</sup>A complete model of this would presumably require some heterogeneity in the quality of matches between employees and employers so that  $e_1$  does not have the same effect with all these matches.

$$p^c - \delta_2 + \lambda\phi_2(z_2 - z_0).$$

If he continuously provides high effort, he is never fired and can expect to earn this payoff in every period. A contractor that deviates and makes effort  $e_0$  for a single period obtains a material payoff of  $p^c$  in the period of the deviation and has a probability  $\xi^c$  of receiving his reservation wage  $r$  per period in subsequent periods. With probability  $(1 - \xi^c)$ , his subsequent per-period payoff returns to  $p^c - \delta_2 + \lambda\phi_2(z_2 - z_0)$  (because I am studying a one period deviation). Thus this deviation is not profitable as long as

$$(1 - \beta)p^c + \beta \left[ \xi^c r + (1 - \xi^c)(p^c - \delta_2 + \lambda\phi_2(z_2 - z_0)) \right] \leq p^c - \delta_2 + \lambda\phi_2(z_2 - z_0)$$

or

$$p^c \geq r + \left[ 1 + \frac{1 - \beta}{\beta\xi^c} \right] (\delta_2 - \lambda\phi_2(z_2 - z_0)). \quad (15)$$

As long as  $\beta$  is strictly smaller than one, the minimum price that prevents this deviation exceeds the cost of providing effort  $e_2$  if the employee is selfish and  $\lambda = 0$ . Higher values of  $\lambda$  lower this minimum price and the same is true for higher values of  $\xi^c$ , since these imply that a deviation is more likely to be punished. Condition (15) is also sufficient for deterring deviations that last a finite number of periods since it deters such deviations in the last of these periods. Lastly, the existence of discounting implies that the contractor has nothing to gain from deviating infinitely into the future.

Consider deviations by the manufacturer from the proposed equilibrium. If the manufacturer offers any price between  $r$  and the minimum price that satisfies (15), the contractor expects this low price to prevail from then on and he therefore makes an effort equal to  $e_0$ . This means that the manufacturer who deviates has nothing to gain from paying more than  $r$ . Paying  $p^c$  in the expectation of inducing effort  $e_2$  is preferable to this deviation if

$$z_0 + \phi_2(z_2 - z_0) - p^c \geq z_0 - r$$

or

$$p^c \leq r + \phi_2(z_2 - z_0). \quad (16)$$

When a contractor is paid the minimum price that satisfies (15), this condition can be written as

$$(1 - \beta + \beta\xi)\delta_2 - \beta\xi^c\phi_2(z_2 - z_0) \leq (1 - \beta + \beta\xi^c)\lambda\phi_2(z_2 - z_0). \quad (17)$$

When the contractor is selfish so  $\lambda = 0$ , this conditions requires that the social benefits from making the effort  $e_2$ ,  $\phi_2(z_2 - z_0) - \delta_2$  be somewhat larger than zero. A higher  $\lambda$  lowers the minimum price that deters deviations by the contractor and thereby makes it easier to satisfy (16). So, when the left hand side of (17) is positive, this inequality puts a minimum bound on  $\lambda$ .

Manufacturer profits when (17) is satisfied are

$$\pi^c = z_0 - r + \phi_2(z_2 - z_0) \left[ 1 + \lambda \left( 1 + \frac{1 - \beta}{\beta\xi^c} \right) \right] - \delta_2 \left( 1 + \frac{1 - \beta}{\beta\xi^c} \right). \quad (18)$$

Because profits rise with  $\lambda$ , altruism tends to arise in equilibrium. To see this, suppose that before the repeated interaction starts, there is a phase of the game where potential suppliers can raise their altruism parameter from  $\lambda = 0$  to  $\lambda = \bar{\lambda} > 0$  at cost  $g$ . Suppose again that there is a large pool of potential contractors and let them choose sequentially whether to spend  $g$  or not. After each has made his choice, the manufacturer picks a contractor with whom he interacts until the relationship ends. The manufacturer obviously picks an altruistic contractor, if one is available. The analysis is simplified by supposing that, if none is available, he picks the last contractor who had a chance to become altruistic while, if several are altruistic, he picks the first contractor who spent  $g$  to raise his  $\lambda$  to  $\bar{\lambda}$ .<sup>14</sup>

If the first contractor becomes altruistic, the present value of his material benefits is  $\frac{p^c - \delta_2 - r}{1 - \beta} - g$ . If the manufacturer is rational, he sets  $p^c$  to the minimum value such that (15) holds. Thus, the present value of the contractor's material benefits is positive if

$$\left[ 1 + \frac{1 - \beta}{\beta\xi} \right] \left( \delta_2 - \bar{\lambda}\phi_2(z_2 - z_0) \right) - \delta_2 \geq (1 - \beta)g. \quad (19)$$

---

<sup>14</sup>These specific assumptions ensure that some contractors know that they will not be picked if they do not become altruistic. With a sufficiently large number of potential contractors, it must be the case that most contractors have a small probability of being picked even if all contractors remain selfish. The analysis is then insensitive to the particular way the manufacturer picks contractors when they are all selfish.

The left hand side captures the per period rents earned by the contractor. These are positive when  $\bar{\lambda} = 0$  and falling in  $\bar{\lambda}$ . Thus, for  $\bar{\lambda}$  and  $g$  small enough, (19) is satisfied. Whenever this expression is satisfied, altruism emerges in equilibrium. The first contractor who has a chance to become altruistic does so because this means his rents are positive rather than zero. If, instead, (19) is violated, no contractor becomes altruistic because doing so leads to losses.

Now consider the analogous analysis for the case of a worker. To focus on the effect of the firm's ability to give orders to its employees, the rest of the model is the same. In particular, suppose somewhat counterfactually that there is an initial period where workers choose their altruism and the firm then chooses which worker to hire. Before looking at the decision of whether to become altruistic, however, consider the incentive of a worker to deviate from making the effort  $e_2$  for one period. As before, the manufacturer's strategy is to pay  $p^w$  except that, when the employee makes an effort  $e_0$ , the manufacturer severs the relationship with probability  $\xi^w$ .

An employee who deviates for one period and makes an effort  $e_0$  gets an expected material payoff of  $p^w - \phi_1\delta_1$  in that period and has a probability  $\xi^w$  of receiving  $r$  from that point onwards. With probability  $(1 - \xi^w)$  the employee gets the same amount after the deviation as he would in each period in which he does not deviate. This amount equals

$$p^w - \delta_2 - (1 - \phi_2)\phi_1\delta_1 + \lambda\phi_2(z_2 - z_0 - \phi_1(z_1 - z_0)). \quad (20)$$

Thus, deviations are deterred if

$$p^w \geq r + \phi_1\delta_1 + \left[1 + \frac{1 - \beta}{\beta\xi^w}\right] \left(\delta_2 - \phi_1\phi_2\delta_1 - \lambda\phi_2(z_2 - z_0 - \phi_1(z_1 - z_0))\right), \quad (21)$$

Once again, the minimum price that deters deviations falls when either  $\lambda$  or  $\xi^w$  rise.

An important consequence of (21) is that, while increases in  $\lambda$  reduce the lowest value of  $p^w$  that satisfies (21), they do so by less than they reduce the lowest value of  $p^c$  that satisfies (15). The reason is that altruism has a smaller effect on the willingness of the employee to find ways of raising output to  $z_2$  than it does on the willingness of a contractor to do so. This occurs, in turn, because raising output to  $z_2$  is less valuable for integrated manufacturers.

The profits of a manufacturer whose employee exerts effort  $e_2$  while being paid  $p^w$  are

$$\pi^w = z_0 + \phi_1(1 - \phi_2)(z_1 - z_0) + \phi_2(z_2 - z_0) - p^w.$$

With the minimum  $p^w$  that satisfies (21), these profits become

$$\begin{aligned} \pi^w = & z_0 - r + \phi_1(z_1 - z_0 - \delta_1) - (\delta_2 - \phi_1\phi_2\delta_1) \left(1 + \frac{1 - \beta}{\beta\xi^w}\right) \\ & + \phi_2(z_2 - z_0 - \phi_1(z_1 - z_0)) \left[1 + \lambda \left(1 + \frac{1 - \beta}{\beta\xi^w}\right)\right] \end{aligned} \quad (22)$$

Alternatively, the manufacturer could pay  $r + \phi_1\delta$  and let the employee exert effort equal to either  $e_0$  or  $e_1$  depending on whether the manufacturer finds a way to raise output to  $z_1$ . This yields profits of  $z_0 - r + \phi_1(z_1 - z_0 - \delta_1)$  so that paying  $p^w$  for effort  $e_2$  is preferable if

$$\phi_2(z_2 - z_0 - \phi_1(z_1 - z_0)) \geq \left(1 + \frac{1 - \beta}{\beta\xi^w}\right) \left(\delta_2 - \phi_1\phi_2\delta_1 + \lambda(z_2 - z_0 - \phi_1(z_1 - z_0))\right). \quad (23)$$

Consider first the case where  $\xi^w$  is small. This captures the idea that, while workers can be fired for poor performance, the performance has to be significantly poorer than for an outside supplier providing the same service. As discussed above, this can be due to laws protecting workers from dismissal.<sup>15</sup> It can also be due to the advantages of keeping a worker that is good at carrying out the activities I have grouped under  $e_1$ .

In either case, the effect of a sufficiently low value of  $\xi^w$  is to ensure that (23) is violated regardless of  $\lambda$  so that the manufacturer prefers to pay  $r + \phi_1\delta_1$  to obtain a good with an expected value of  $z_0 + \phi_1(z_1 - z_0)$ . This means that, in equilibrium, workers must be selfish. Combined with the earlier analysis for contractors, this model thus rationalizes the appearance of higher levels of altruism among parties participating in inter-firm transactions.

For the rest of this section, suppose that  $\xi^c = \xi^w$ . While arguably less realistic, this symmetric benchmark is of some interest, particularly because altruism can increase the benefits of vertical separation even in this case. Comparison of (18) and (22) establishes immediately that

---

<sup>15</sup>This raises the question of why workers are more protected from firing by laws. One reason could be that a worker who loses his job may incur a larger loss in standard of living than a contractor who loses an equivalent contract because contractors have better access to alternative opportunities. This, in turn, may be a side effect of the employer's control over the employee.

**Proposition 4.** *If  $\xi^w = \xi^c$  and  $\lambda = 0$  while (17) and (23) both hold, then*

$$z_1 - z_0 > \delta_1 \left( 1 - \frac{\phi_2(1 - \beta)}{(1 - \phi_2)\beta\xi} \right) \quad (24)$$

*is sufficient for integration to be optimal.*

**Proof.** Since (17) and (23) both hold, both the contractor and the employee would exert effort  $e_2$ . The proposition then follows from comparing (18) to (22) *Q.E.D.*

More generally,

**Proposition 5.** *If  $\xi^w = \xi^c$  and  $\lambda = 0$ , (3) implies that the manufacturer hires a worker.*

**Proof.** If both (17) and (23) hold, this follows from Proposition 4. If (23) fails to hold, profits with a worker are higher than the expression in (22). As a result, (24) also implies that profits with integration exceed those with an independent contractor when (23) fails and (17) holds. If they both fail, neither type of agent makes the effort  $e_2$  so the one-shot outcome is repeated from period to period and (3) is sufficient for the manufacturer to hire a worker. Lastly, if (17) fails and (23) holds, the contractor would yield profits of  $z_0 - r$  per period to the manufacturer and, given (3), (23) implies that profits with a worker making the effort  $e_2$  are higher. *Q.E.D.*

This proposition shows that, when the agents are selfish and the  $\xi$ 's are equal, repetition of the interaction does not make the manufacturer prefer an outside contractor. Indeed, the opposite is closer to true. Since (24) is strictly weaker than (3), it is possible for the firm to prefer to integrate even though contractors would be preferred to workers in a one-shot interaction. A benefit of integration when interactions are repeated is that workers receive fewer rents when carrying out effort  $e_2$  because one motivation for carrying out this effort is to avoid having to make effort  $e_1$ .<sup>16</sup>

---

<sup>16</sup>This result is consistent with the insight of Baker, Gibbons and Murphy (2001) that a firm's choice between integration and non-integration remains non-trivial even with repeated interactions. However, while the difference between integration and non-integration is similar in the two analyses, it is not identical. Baker, Gibbons and Murphy (2001) focus on the exclusive ability of the contractor to take actions that raise his rewards outside the relationship while I focus on the firm's exclusive ability to control its employees. In both models, the worker is assumed to be more constrained than the contractor but my analysis applies also in cases where the price paid to the contractor is independent of the actions the contractor takes outside the relationship.

Endogenous altruism, on the other hand, can lead the manufacturer to use an outside contractor even when (3) holds. In particular,

**Proposition 6.** *If (3) holds while  $\xi^c = \xi^w = \xi$  and*

$$\phi_2(1 - \beta + \beta\xi)\bar{\lambda} > \beta\xi\phi_1\frac{z_1 - z_0 - \delta_1}{z_2 - z_0} - \left[ \beta\xi\phi_2 - (1 - \beta + \beta\xi)\frac{\delta_2}{z_2 - z_0} \right] \quad (25)$$

and

$$\beta\xi(1 - \phi_2) + [\phi_2(1 - \beta) - \beta\xi(1 - \phi_2)]\frac{\delta_1}{z_1 - z_0} < \phi_2(1 - \beta + \beta\xi)\bar{\lambda} < (1 - \beta)\frac{\delta_2 - \beta\xi g}{z_2 - z_0} \quad (26)$$

the firm is better off with a contractor.

**Proof.** Condition (25) is equivalent to requiring that the expression in (18) with  $\lambda = \bar{\lambda}$  exceeds the profits with a selfish worker  $z_0 - r + \phi_1(z_1 - z_0 - \delta_1)$ . Given that (3) holds, this ensures that profits with an altruistic contractor also exceed profits with a selfish contractor who is paid  $r$ .

Using (22) and (18), the difference between the profits with integration and profits without are

$$\phi_1(1 - \phi_2)(z_1 - z_0) - \phi_1\delta_1 + \phi_1\phi_2[\delta_1 - \lambda(z_1 - z_0)] \left[ 1 + \frac{1 - \beta}{\beta\xi} \right]$$

The first inequality of (26) ensures this is negative for  $\lambda = \bar{\lambda}$ . This means that profits are higher with an altruistic contractor than with a worker with the same level of altruism. Lastly, the second inequality in (26) is simply a restatement of (19); it ensures that contractors are willing to acquire this level of altruism. Thus, when these conditions hold, the contractor is willing to become altruistic and profits with an altruistic contractor exceed profits with any other type of agent. *Q.E.D.*

As long as the benefits from  $e_2$  are sufficiently larger than the benefits from  $e_1$ , condition (25) holds. This condition simply ensures that  $e_2$  is sufficiently valuable that a repeated relation that gives rise to  $e_2$  is better than simply giving orders to a worker. Condition (26) is more subtle. It requires that  $\bar{\lambda}$  be neither too large nor too small. If  $\bar{\lambda}$  is too large, contractors are unwilling to become altruistic because the resulting rents are insufficient. If

$\bar{\lambda}$  is too small, the tradeoff faced by the firm is too similar to that faced when  $\bar{\lambda} = 0$  and, in this case, (3) is sufficient to ensure that the firm prefers effort  $e_2$  with a worker over effort  $e_2$  with a contractor. However, because increases in  $\lambda$  reduce contractor rents more rapidly than worker rents, intermediate values of  $\bar{\lambda}$  do exist where the firm prefers a contractor.

### 3 Repeated Purchases with Fluctuations in Final Demand

In this section I neglect the employment relation to study conditions that lead not only to contractor altruism but also to manufacturer altruism towards the contractor. One way of rationalizing this analysis is by supposing that  $\xi^w$  is significantly smaller than  $\xi^c$  while  $z_1 - z_0 - \delta_1$  is small. Manufacturer altruism can emerge in this case if demand fluctuates so that a selfish manufacturer does not always make purchases from an altruistic contractor. The role of manufacturer altruism is then to increase the frequency of these purchases.

I capture the randomness in demand by supposing that the manufacturer receives  $sz$  for his unit if he sells it, where  $s$  is independently distributed over time and drawn from a c.d.f.  $F(s)$ . Without loss of generality, I suppose that the support of this distribution is given by  $[\alpha, 1]$  where  $\alpha \geq 0$ . I also suppose that the manufacturer knows the current value of  $s$  when he decides whether or not to order a unit from a contractor.

The setup I consider has the following structure. First, the contractors choose their altruism parameter, as before. Then the manufacturer chooses one particular contractor. At that moment, the manufacturer decides whether he wishes to become altruistic towards the contractor. After this, in each period, the manufacturer can make offers to purchase goods from either the altruistic contractor or from other contractors. After such an offer is made, the contractor who accepts it determines his level of effort.

Except for the stage where the manufacturer chooses his altruism, this timing of decisions is the same as in section 2. In the analysis of section 2, this additional stage would have had no effect. The reason is that the agents were influenced only by the prices ( $p^c$  and  $p^w$ ) they could expect to earn in the future. While manufacturer altruism could have an effect on

these prices, that would not have increased manufacturer profits since I focused on equilibria where the prices were such that profits were maximized.

The randomness of  $s$  implies that it is no longer reasonable to require that the manufacturer purchase one unit from the contractor in each period. If  $s$  is sufficiently low such purchases are inefficient. I thus suppose that the manufacturer determines when he makes purchases from contractors. I also focus only on equilibria where the price of such purchases is independent of  $s$ . This independence of the price on the state of final demand could be rationalized by supposing that contractors do not know the current value of  $s$  while they also fail to remember the past prices they were offered by the manufacturer. They are able to remember, however, whether they were ever offered a price so low that they chose not to make the effort  $e_2$ . This means that equilibria may exist where contractors make effort  $e_2$  when they are offered a price no smaller than a cutoff price  $\tilde{p}$  and where they cease making this effort if they are ever offered a lower price.

Under these assumptions, a selfish manufacturer would offer  $\tilde{p}$  to a contractor that he expected to make the effort  $e_2$  if and only if

$$sz_0 + \phi_2(z_2 - z_0)s - \tilde{p} \geq \max(0, sz_0 - r).$$

The left hand side of this expression are the profits from paying  $\tilde{p}$  for  $e_2$  while the right hand side are the highest profits that the manufacturer can earn if he does not pay  $\tilde{p}$ . These latter profits equal  $sz_0 - r$  when it is worthwhile to hire a contractor who makes effort  $e_0$  and zero otherwise.

Suppose that, instead of being selfish, the manufacturer feels altruism towards the contractor. I capture this altruism by the parameter  $\lambda^m$ . The effect of this parameter is to lead the manufacturer to maximize the sum of his own material payoffs and  $\lambda^m$  times the increase in the material payoffs of the contractor that is due to the actions of the manufacturer. The increase in the contractor's material payoffs from being offered  $\tilde{p}$  assuming this leads to the effort  $e_2$  equals  $\tilde{p} - \delta_2 - r$ . Thus, an offer of  $\tilde{p}$  to a contractor whom he expects to make effort  $e_2$  is preferable for a manufacturer with altruism parameter  $\lambda^m$  than either making no

offer or making an offer of  $r$  to a contractor who will make effort  $e_0$  as long as

$$sz_0 + \phi_2(z_2 - z_0)s + \lambda^m(\tilde{p} - \delta_2 - r) - \tilde{p} \geq \max(0, sz_0 - r). \quad (27)$$

This inequality can be interpreted in two ways. First, it gives the minimum  $s$ , which I label  $\tilde{s}$ , such that the manufacturer is willing to offer  $\tilde{p}$  if he expects the contractor to make effort  $e_2$ . Additionally, (27) can be seen as defining a “maximum offer curve” which gives the maximum  $\tilde{p}$  that a firm is willing to pay for a given  $s$ . Increases in  $s$  raise the maximum-offer price as do increases in  $\lambda^m$  in those cases where  $\tilde{p}$  exceeds  $\delta_2 + r$ . This is shown graphically in Figure 1 which depicts “maximum offer curves” for  $r = 0$ ,  $\phi_2 = .6$ ,  $(z_2 - z_0) = 15.5$  and  $\delta_2 = 6$ , though their qualitative properties do not depend on these parameters. The line that starts from the origin corresponds to the case where  $\lambda^m$  equals zero while the other line corresponds to  $\lambda^m = .2$ . The two lines cross at the point where  $\phi_2(z_2 - z_0)s = \delta_2$  so that effort  $e_2$  is socially optimal. For higher values of  $s$ , altruism on the part of the manufacturer raises the price the manufacturer is willing to pay, or imply that a selfish manufacturer would have ordered only if  $s$  were larger than the minimum  $s$  that leads the altruist to place an order.

For  $s < \tilde{s}$ , the manufacturer’s offer depends on whether  $sz_0$  is greater than or smaller than  $r$ . If it is greater, the manufacturer offers  $r$  to a contractor whom he expects to make effort  $e_0$  and otherwise he simply refrains from buying the good. To simplify the analysis, I suppose that  $r < \alpha z_0$ , so the manufacturer always buys a unit. Manufacturer profits are then

$$\pi^m = \int_{\alpha}^1 [sz_0 - r]dF(s) + \int_{\tilde{s}}^1 [\phi_2(z_2 - z_0)s - \tilde{p}]dF(s). \quad (28)$$

I now turn to analyzing the contractor and let  $\lambda^c$  denote his altruism parameter. The key issue facing the contractor is whether he should exert effort  $e_2$  when he is offered  $\tilde{p}$ . As before, I consider equilibria where, if the contractor fails to make this effort, there is a probability  $\xi$  that the manufacturer learns this and ceases making offers of  $\tilde{p}$  to the contractor. The contractor expects that if, instead, the manufacturer does not learn that the contractor has exerted a low level of effort, he will offer  $\tilde{p}$  again whenever  $s$  is above the cutoff value  $\tilde{s}$ .

Let  $\Omega$  be given by

$$\Omega = \int_{\alpha}^{\tilde{s}} r dF(s) + \int_{\tilde{s}}^1 [\tilde{p} - \delta_2 + \lambda^c \phi_2(z_2 - z_0)s] dF(s) = r + [1 - F(\tilde{s})] [\tilde{p} - r + \lambda^c \phi_2(z_2 - z_0)E(s|s \geq \tilde{s})].$$

This is the expected one-period benefit to the contractor of being ready to provide effort  $e_2$  when receiving a price  $\tilde{p}$ . With probability  $F(\tilde{s})$  this benefit equals only  $r$  because the manufacturer fails to place an order with the contractor. The contractor then chooses not to deviate from the equilibrium where he makes effort  $e_2$  when he is offered  $\tilde{p}$  as long as

$$\tilde{p} + \frac{\beta}{1 - \beta} (\xi r + (1 - \xi)\Omega) \leq \tilde{p} - \delta_2 + \lambda^c \phi_2(z_2 - z_0)E(s|s \geq \tilde{s}) + \frac{\beta}{1 - \beta} \Omega.$$

Rearranging and using the definition of  $\Omega$ , this requires that

$$\tilde{p} - r \geq [\delta_2 - \lambda^c \phi_2(z_2 - z_0)E(s|s \geq \tilde{s})] \left[ 1 + \frac{1 - \beta}{\beta \xi [1 - F(\tilde{s})]} \right]. \quad (29)$$

Inequality (29) defines a “minimum requirement curve” which gives the minimum  $\tilde{p}$  such that the contractor is willing to make effort  $e_2$ . Leaving aside contractor altruism, an increase in  $\tilde{s}$  reduces the frequency with which the manufacturer places orders and thus requires that the contractor receive a higher price if he is to be restrained from deviating. His total future rents must remain the same but, because he collects rents less frequently, they must be higher in the periods that he collects them. As before, an increase in contractor altruism lowers the price the contractor must be paid to induce him to provide high quality.

Figure 2 depicts “minimum requirement curves” for the same parameters as those in Figure 1 and  $\beta = .99$ ,  $\xi = .2$ ,  $F$  uniform,  $\alpha = .2$  and two different values of  $\lambda^c$ . When  $\lambda^c = 0$ , the slope of this line is proportional to  $f(\tilde{s})/(1 - F(\tilde{s}))^2$ . If the hazard  $f/(1 - F)$  is monotone, as I assume throughout, this slope is increasing in  $\tilde{s}$ . An increase in  $\lambda^c$  not only lowers  $\tilde{p}$  when  $\tilde{s}$  takes the minimum value of  $\alpha$ ; it also lowers the slope of  $\tilde{p}$  with respect to  $\tilde{s}$  for each value of  $\tilde{s}$ . The reason is that the conditional mean  $E(s|s \geq \tilde{s})$  is increasing in  $\tilde{s}$ . Thus, increases in  $\tilde{s}$  raise the vicarious benefits of an altruist when he makes effort  $e_2$ , because they imply that the manufacturer is gaining more through this altruistic act.

An equilibrium with high quality for given levels of the two altruism parameters, if one exists, is a pair of values for  $\tilde{p}$  and  $\tilde{s}$  such that  $\tilde{p}$  is the minimum price that satisfies both

(27) and (29) for  $s = \tilde{s}$ . The reason for selecting the minimum price, i.e, the price that maximizes manufacturer profits, is that the manufacturer would never choose to make  $\lambda^m$  greater than one and, once (29) and (27) are satisfied, increases in  $\tilde{p}$  are simply transfers from the manufacturer to the contractor. The equilibrium price is on the “minimum requirement curve” but it can be below the “maximum offer curve” for  $s = \tilde{s}$ .

As in the case of constant demand, there are cases where no  $\tilde{p}$  can ensure that a selfish contractor produces high quality goods that are purchased by a selfish manufacturer. Two sufficient conditions for this outcome are

$$\delta_2 \left[ 1 + \frac{1 - \beta}{\beta \xi} \right] > \phi_2(z_2 - z_0)\alpha \quad (30)$$

and

$$\delta_2 f(\alpha) \frac{1 - \beta}{\beta \xi} > \phi_2(z_2 - z_0). \quad (31)$$

The first ensures that the “maximum offer curve” is below the “minimum requirement curve” at  $s = \tilde{s} = \alpha$ . This condition is actually necessary to rule out an equilibrium where high quality is provided for all values of  $s$ . The second of these inequalities ensures that the slope of the “minimum requirement curve” is steeper at  $\alpha$  than the slope of the “maximum offer curve” so that, given the monotone hazard of  $f$ , the former curve lies everywhere above the latter.

Whether the outcome without altruism involves the provision of high quality or not, contractor altruism arises in equilibrium if the cost of this altruism is low enough. This is shown in the following proposition.

**Proposition 7.** *If both manufacturer and contractor find any level of altruism costless, the equilibrium is the first best with  $\tilde{s} = \max(\alpha, \frac{\delta_2}{\phi_2(z_2 - z_0)})$  and  $\tilde{p} - r = \delta_2$ . This equilibrium requires a strictly positive value for  $\lambda^c$  but the equilibrium is consistent with  $\lambda^m = 0$ .*

**Proof.** That this pair of  $\tilde{s}$  and  $\tilde{p}$  induces the first best outcome is immediate since the social value of effort  $e_2$  is  $\phi_2(z_2 - z_0)$  and the social cost is  $\delta_2$ . That this pair is consistent with (27) when setting  $\lambda^m = 0$  is immediate as well. It is also obviously consistent with (29) for some

strictly positive value of  $\lambda^c$ . Contractors have no reason to deviate from this  $\lambda^c$  because their total rents at this equilibrium are zero since they are being paid the cost of their effort. By the same token,  $\lambda^c$  cannot be smaller than this value because contractors would earn rents otherwise. Lastly, manufacturers have no reason to acquire positive altruism. Raising  $\lambda^m$  from zero neither changes  $\tilde{p}$  nor  $\tilde{s}$ . The latter is not affected because for  $s$  below  $\frac{\delta_2}{\phi_2(z_2 - z_0)}$ , increases in  $\lambda^m$  actually lower the maximum offer price. *Q.E.D.*

The role of contractor altruism is the same as in the previous section; it lowers contractor rents and facilitates the production of high quality goods. With sufficient contractor altruism, the inefficiencies due to the lack of observability of effort disappear so manufacturer altruism plays no role. Manufacturer altruism can play a role, however, when contractor altruism is costly. To show this, I focus on the case where varying  $\lambda^m$  costs no resources while contractor altruism is exogenously set to  $\bar{\lambda}$ . Implicitly, the cost  $g$  of this altruism is assumed to be lower than the rents collected by the contractor while higher levels of altruism are assumed to be prohibitively expensive.

With this exogenous  $\lambda^c$ , I provide two sets of sufficient conditions for  $\lambda^m > 0$  in equilibrium. The first applies to the case where, without manufacturer altruism, contractor effort is always  $e_0$

**Proposition 8.** *Suppose that*

$$\hat{p} \equiv [\delta_2 - \bar{\lambda}\phi_2(z_2 - z_0)E(s)] \left[ 1 + \frac{1 - \beta}{\beta\xi} \right] > \phi_2(z_2 - z_0)\alpha \quad (32)$$

and that, for all  $\bar{s}$  between  $\alpha$  and 1,

$$u(\bar{s}) \equiv \frac{f(\bar{s})}{1 - F(\bar{s})} \left\{ \frac{(1 - \beta)[\delta_2 - \bar{\lambda}\phi_2(z_2 - z_0)E(s|s \geq \bar{s})]}{\beta\xi(1 - F(\bar{s}))} - \bar{\lambda}\phi_2(z_2 - z_0)[E(s|s \geq \bar{s}) - \bar{s}] \left( 1 + \frac{1 - \beta}{\beta\xi} \right) \right\} > \phi_2(z_2 - z_0). \quad (33)$$

*These conditions are identical to (30) and (31) respectively when  $\bar{\lambda} = 0$ . Increases in  $\bar{\lambda}$  lower the left hand side in both conditions and thereby increase the stringency of these conditions.*

If, in addition,

$$\int_{\alpha}^1 [\phi_2(z_2 - z_0)s - \hat{p}]dF(s) > 0 \quad (34)$$

which requires that there exists a  $\hat{s} < 1$  such that

$$\phi_2(z_2 - z_0)\hat{s} = \hat{p},$$

the firm benefits prefers setting  $\lambda^m$  equal to  $\lambda^\alpha > 0$  where

$$\lambda^\alpha = \beta\xi \frac{\phi_2(z_2 - z_0)\alpha - \delta_2}{\delta_2(\beta\xi + 1 - \beta)},$$

to setting  $\lambda^m = 0$ . The reason is that  $\lambda^m = \lambda^\alpha$  allows for an equilibrium where  $\tilde{s} = \alpha$  and  $\tilde{p} = r + \hat{p}$ .

**Proof.** Conditions (32) and (33) ensure that the minimum requirement curve is everywhere above the maximum offer curve in the absence of manufacturer altruism. This means that, even with a contractor whose altruism parameter equals  $\bar{\lambda}$ , the equilibrium outcome involves effort  $e_0$ . When, instead,  $\lambda^m$  is given by  $\lambda^\alpha$ , it follows immediately from (27) that the manufacturer is willing to make offers for  $s \geq \alpha$  at price  $\hat{p} + r$ . Given the expectation of receiving offers at this price with probability one, (29) implies that the contractor is willing to make effort  $e_2$ . There is thus an equilibrium where the firm earns the left hand side of (34) more than it does without altruism. The firm is thus willing to acquire this level of altruism, particularly since the definition of  $\lambda^\alpha$  implies that  $\lambda^\alpha < 1$ . Q.E.D.

Altruism commits the manufacturer to lose money by paying  $\tilde{p}$  when  $s < \hat{s}$ . For  $s$  near  $\hat{s}$ , the losses this occasions the manufacturer are small relative to the gains of the contractor, so only a modest level of altruism is necessary to lead the manufacturer to offer  $\tilde{p}$  in this case. What the manufacturer gains from this commitment is that his profits increase when  $s > \hat{s}$ . The reason this commitment is useful is that the manufacturer's benefit from  $e_2$  when  $s = \hat{s}$ ,  $\phi_2(z_2 - z_0)\hat{s}$ , exceed its social cost  $\delta_2$ . The two parties thus have something to gain from increasing the frequency of purchases and splitting the resulting surplus between them.<sup>17</sup>

---

<sup>17</sup>Altruism thus plays a similar role here as in Rotemberg and Saloner (1993) where altruism also allows the firm to earn increased profits on average by committing itself to earn lower profits in certain states of nature where some other agent (in that case an employee with a particular prearranged incentive contract) gains greatly from the firm's altruism.

The above proposition gives conditions under which the manufacturer prefers some altruism to selfishness when the latter gives rise to effort  $e_0$  in all states of demand. I now show that this intuitive result holds also in situations where there already exist some states of demand where the contractor makes effort  $e_2$ . Such a situation can arise when (32) holds but (33) fails to hold for at least some  $\bar{s}$  between zero and one. An equilibrium like that depicted in point  $A$  of Figure 3 can then exist. In this case

**Proposition 9.** *Suppose the equilibrium with  $\lambda^m = 0$  is interior so that  $0 < \tilde{s} < 1$ . Ignoring the costs of manufacturer altruism, the manufacturer gains by setting  $\lambda^m > 0$  if (32) holds and  $\bar{\lambda}$  is sufficiently small that*

$$\delta_2 > \bar{\lambda}\phi_2(z_2 - z_0) \left\{ E(s|s \geq \bar{s}) + [E(s|s \geq \bar{s}) - \bar{s}] \left[ 1 + \frac{\beta\xi(1 - F(\bar{s}))}{1 - \beta} \right] \right\} \quad (35)$$

for all  $\bar{s} \leq \tilde{s}$

**Proof.** The effect of changing  $\tilde{p}$  and  $\tilde{s}$  on manufacturer profits can be obtained by differentiating (28). This yields

$$d\pi^m = -f(\tilde{s}) \left[ \phi_2(z_2 - z_0)\tilde{s} - \tilde{p} + r \right] d\tilde{s} - (1 - F(\tilde{s})) d\tilde{p}.$$

When  $\lambda^m = 0$ , (27) implies that the term in square brackets is zero. Thus profits are strictly higher with  $\lambda^m > 0$  if small increases in  $\lambda^m$  from  $\lambda^m = 0$  lower  $\tilde{p}$ .

To understand why an increase in  $\lambda^m$  lowers  $\tilde{p}$ , note that the equilibrium must have similar properties to those of point  $A$  in Figure 3. In particular, any interior equilibrium must occur at a point where the maximum offer curve intersects the minimum requirement curve from below. The reason is that, even if there is also an intersection from above, the firm prefers points with lower values of  $\tilde{p}$ . The slope of the minimum requirement curve is given by  $u(s)$ , which is defined in (33). Thus this slope is positive at least until  $\tilde{s}$  if (35) holds for all  $\bar{s} \leq \tilde{s}$ . Combined with (32), this implies that the intersection of the maximum offer curve with the minimum requirement curve occurs at a price above  $\delta_2$ . As a result, such an intersection takes place to the right of the point where the maximum offer curves for different values of  $\lambda$  intersect. Thus an increase in  $\lambda^m$  from zero moves the equilibrium from

a point like  $A$  in Figure 3 to a point like  $B$ . In other words, it ensures that the maximum offer curve with  $\lambda^m$  slightly higher than zero intersects the minimum requirement curve at a lower value of  $\tilde{p}$  than does the maximum offer curve with  $\lambda^m = 0$ . *Q.E.D.*

The proposition shows that, if the equilibrium value of  $\bar{\lambda}$  is relatively low, manufacturer profits rise by increasing  $\lambda^m$  above zero. The reason is that this increases the range of realizations of  $s$  such that the manufacturer offers  $\tilde{p}$ . For given  $\tilde{p}$ , the manufacturer loses nothing from raising this range slightly. However, if  $\bar{\lambda}$  is small enough, the contractor is earning equilibrium rents so that the increase in this range allows the manufacturer to lower  $\tilde{p}$  and this raises manufacturer profits.

## 4 Conclusion

This paper has shown that endogenous altruism can play a key role in determining whether transactions take place inside or between firms. It can, in particular, lead to situations where external suppliers engage in substantial effort to improve the quality of the product they deliver. The suppliers that do so can be “trusted” by their customers. Moreover, the model also predicts that buyers will sometimes respond to supplier altruism with altruism of their own, so that trust becomes bidirectional. This fits, broadly, with an extensive literature suggesting that vertical business relations in which firms trust each other are particularly valuable (see Dyer and Chu 2003 for a recent example and many references). Most of this empirical literature on trust does not measure the warmth of the feelings between individuals in buying and selling organizations, however.<sup>18</sup> It would thus be interesting to know the extent to which these feelings are paramount among firms that have close relations with one another.

One clear implication of the model is that these feelings need not always arise, nor does

---

<sup>18</sup>Smitka (1991) does not discuss these feelings explicitly either. His study stands out, however, because he emphasizes that trust between Japanese auto manufacturers and their suppliers required that the manufacturers get to know the executives of the selling organizations personally (p. 169). He also suggests that social activities that included the engineers in both organizations contributed to an atmosphere of collaboration (p. 158-159).

any particular business have to have the same feelings for all those it deals with. It is easy to imagine, for example, buyers purchasing inputs from different suppliers who vary in both the extent to which they can increase quality through non-contractible actions and the extent to which they find such actions costly. The model would then imply that a given buyer can have quite different levels of altruism for different suppliers. Similarly, a particular supplier may have different relations with different customers because their need for quality differs. In addition, it is possible to interpret some of the equilibria I discussed in section 3 as involving purchases from a selfish contractor when  $s$  is below  $\tilde{s}$  and purchases from an altruistic one when  $s$  is above this cutoff. All of these re-interpretations of the model fit with Uzzi's (1997) observation that buyers and sellers typically have both "arm's length" relations and "special" ones, where only the latter correspond to altruistic ones. This variety in the relationships of a single firm also serves to differentiate the model from genetic explanations for altruism (as in Frank (1987)) as well as ones based on having had a common experience that has permanently changed one's tastes (as in Akerlof (1983)).

It is worth noting, however, that the analysis of multiple relationships is quite incomplete in this model. A richer set of implications could also be drawn if the underlying parameters of the model varied over time and if the time requirements for developing trusting relations were made explicit. The model might then be able to rationalize the existence of firms with different types of vertical relations at any given moment in time as well as the desire of firms to change these relationships. It might also help explain why less integrated firms can sometimes beat their integrated counterparts while, at other times, vertically integrated firms appear impregnable.

## References

- Akerlof, George, "Loyalty Filters," *American Economic Review* 73, March 1983, 54-63.
- Baker, George, Robert Gibbons and Kevin J. Murphy, "Relational Contracts and the Theory of the Firm," *Quarterly Journal of Economics*, 117, February 2002, 39-84.
- Burt, Ronald S, and Marc Knez, "Trust and Third-Party Gossip," in Roderick M. Kramer and Tom R. Tyler *Trust in Organizations*, Thousand Oaks: Sage, 1996.
- Camerer, Colin, "Gifts as Economic Signals and Social Symbols," *American Journal of Sociology*, 94, (supplement 1988), 675-700.
- Carnevale, Peter J. D., Dean G. Pruitt and Patricia I. Carrington, "Effects of Future Dependence, liking, and Repeated Requests for Help on Helping Behavior," *Social Psychology Quarterly*, 45, March 1982, 9-14.
- Collins, Nancy L. and Lynn Carol Miller, "Self-disclosure and liking: A meta-analytic review," *Psychological Bulletin*, 116, November 1994, 457-475.
- Dyer, Jeffrey H. and Wujin Chu, "The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea," *Organization Science*, 14, January-February 2003, 57-68.
- Eccles, Robert G. and Harrison C. White, "Price and Authority in Inter-Profit Center Transactions," *American Journal of Sociology*, 94, 1988 Supplement, S17-S51.
- Frank, Robert H. "If Homo Economicus Could Choose His Own Utility Function, Would He Want One with a Conscience?" *American Economic Review* 77, September 1987, 593-604.
- Freeland, Robert F., *The Struggle for Control of the Modern Corporation*, Cambridge: Cambridge University Press, 2001.
- Granovetter, Mark, "Economic Action and Social Structure: The Problem of Embeddedness," *American Journal of Sociology*, 91, 1985, 481-510.
- Grossman, Sanford J. and Oliver D. Hart, "The Costs and Benefits of Ownership: A theory of Vertical and Lateral Integration" *Journal of Political Economy*, August 1986, 94, 691-719.
- Homans, George, *The Human Group*, New York: Harcourt, 1950.
- Ingram, Paul and Peter W. Roberts, "Friendships among Competitors in the Sydney

- Hotel Industry, *American Journal of Sociology*, 106, September 2000, 387423.
- Klein, Benjamin and Keith B. Leffler, "The Role of Market Forces in Assuring Contractual Performance", *Journal of Political Economy*, August 1981, 89, 615-41.
- Kranton, Rachel E. and Deborah F. Minehart, "Networks versus Vertical Integration," *Rand Journal of Economics*, Autumn 2000, 5, 301-31.
- Levesque, Maurice, "Meta-Accuracy Among Acquainted Individuals: A Social Relations Analysis of Interpersonal Perception and Metaperception," *Journal of Personality and Social Psychology*, 72, January 1997, 66-74.
- Lorenz, Edward H. "Neither Friends nor Strangers: Informal Networks of Subcontracting in French Industry," in Gambetta, Diego ed. *Trust: Making and Breaking Cooperative Relations*, New York: Basil Blackwell, 1988.
- Radner, Roy, "Repeated Principal-agent Games with Discounting," *Econometrica*, 53, September 1985, 1173-98.
- Rotemberg, Julio J., "A Theory of Inefficient Intrafirm Transactions," *American Economic Review*, 81, March 1991, 191-209.
- , "Human Relations in the Workplace," *Journal of Political Economy*, 102, August 1994, 684-718.
- Rotemberg Julio J. and Garth Saloner, "Leadership Style and Incentives," *Management Science*, 39, 1993, 1299-1318.
- Rusbult, Caryl E., "Satisfaction and commitment in friendships," *Representative Research in Social Psychology*, 11, 1980, 96-105.
- Simon, Herbert, "A Formal Theory Model of the Employment Relationship," *Econometrica*, 19, July 1951, 293-305.
- Shapiro, Carl and Joseph E. Stiglitz, "Equilibrium Unemployment as a Worker Disciplining Device," *American Economic Review*, 74, June 1984, 433-44.
- Smitka, Michael J., *Competitive Ties: Subcontracting in the Japanese Automotive Industry*, New York: Columbia University Press, 1991.
- Uzzi, Brian, "Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness," *Administrative Science Quarterly*, 42, March 1997, 35-67
- Walker, Gordon and Laura Poppo, "Profit Centers, Single-Source Suppliers, and Trans-

actions Costs,” *Administrative Science Quarterly*, 36, March 1991, 66-87.

Wernerfelt, Birger, “On the Nature and Scope of the Firm: An Adjustment Cost Theory,”  
*Journal of Business*, 70, October 1997, 489-514.

Figure 1:

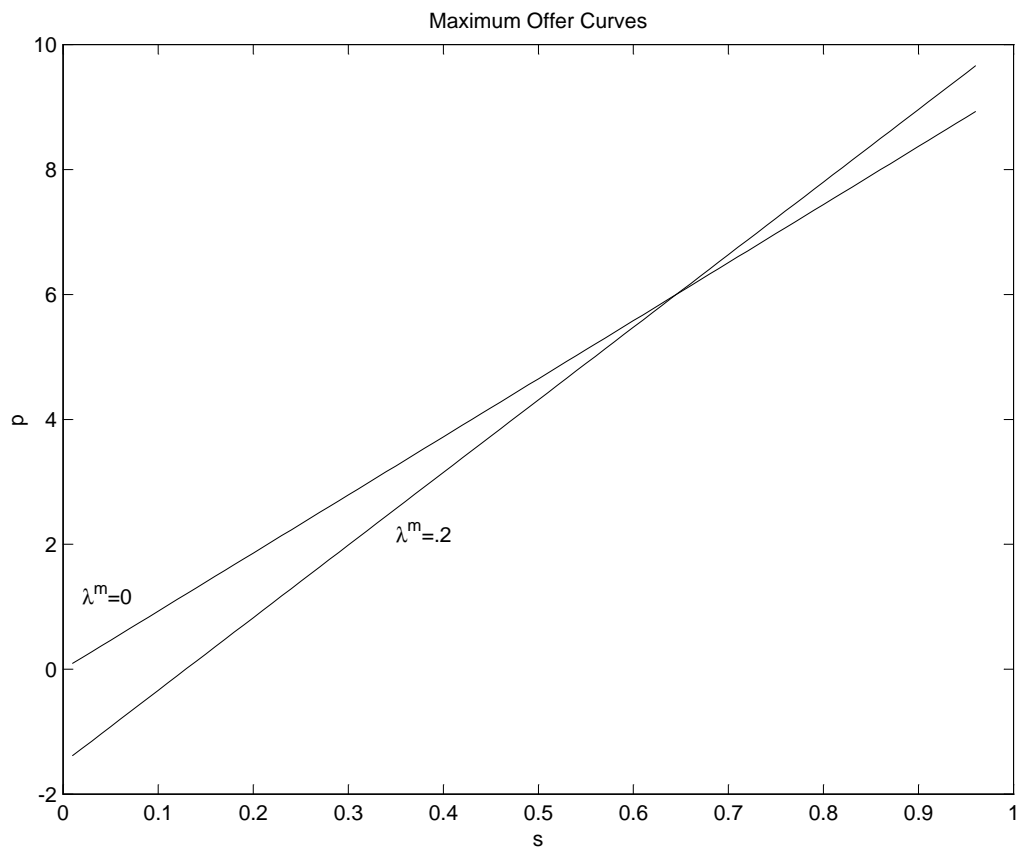


Figure 2:

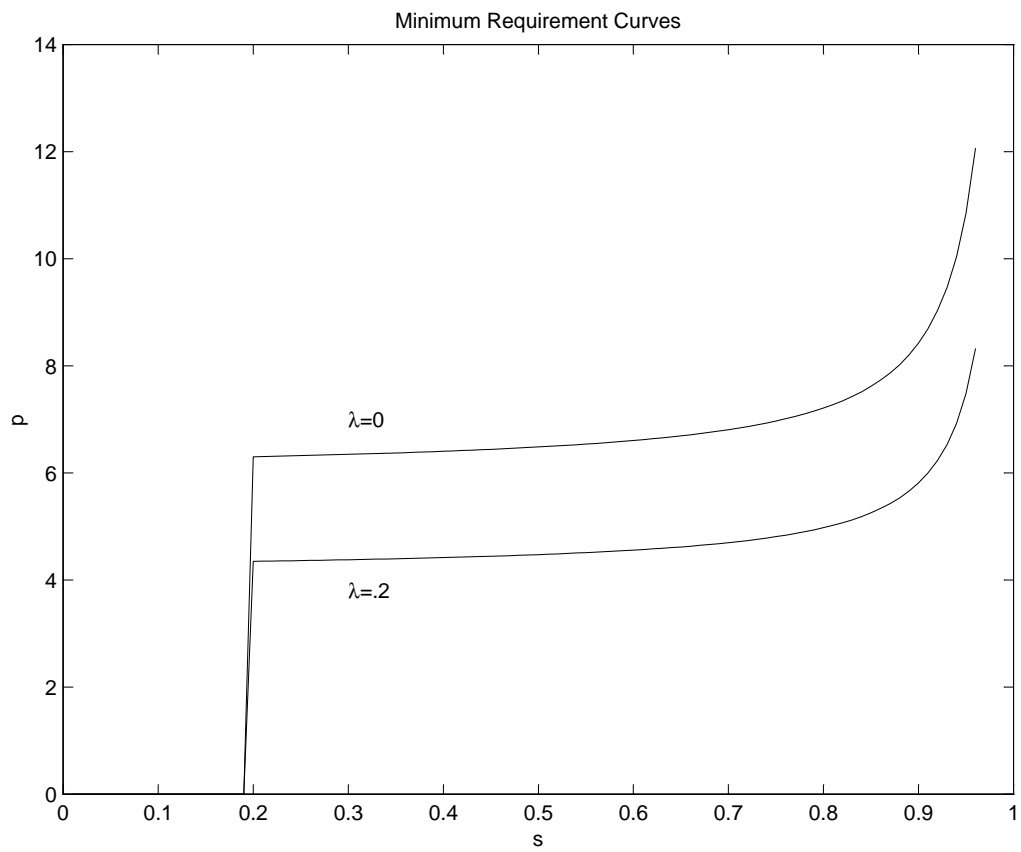


Figure 3:

