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Reciprocity, Social Ties, and Competition in Markets for Experience Goods

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Reciprocity, social ties, and competition in markets for experience goods*

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Abstract

Reciprocal customers may disproportionately improve the performance of markets for experience goods. Reciprocal customers reward (punish) firms for providing good (bad) quality by upholding (terminating) the customer relation. This may induce firms to provide good quality which, in turn, may induce a positive externality for non-reciprocal customers who would, in the absence of reciprocal types, face market breakdown. This efficiency-enhancing effect of reciprocity is boosted when there are social ties between consumers *and* competition between firms. The existence of social ties or competition alone does not improve market performance.

Keywords: Social networks, reputation, reciprocity, experience goods, customer loyalty.

JEL classification: D43, L14, Z13.

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1 Introduction

Market failure may loom large in markets for experience goods. The quality of an experience good is known to consumers only after the good is bought and consumed (Nelson 1970). Consequently, if providing good quality is costly and if interactions are anonymous, firms have incentives to provide poor quality and consumers are reluctant to buy. Sometimes such market failure can be mitigated by measures taken by individual firms or governments. Examples include money-back guarantees and various forms of signalling (Leibenstein 1987, see Riley 2001 for a survey). If such measures are not feasible, long-term customer relations may provide a remedy against market failure in non-anonymous markets, as has already been argued by Akerlof (1970) and Arrow (1973). In this paper we investigate in a simple framework how *reciprocity* can provide a remedy against market failure—in particular, if consumers have social ties with each other which permit information exchange.

Reciprocity can induce long-term customer relations in non-anonymous markets because reciprocal customers "reward" firms who have provided good quality in the past by upholding the customer relation, and "punish" firms who have provided poor quality by terminating the customer relation. When confronted with a reciprocal customer, a profit-maximising firm trades off the one-time gain from providing bad quality against the loss from losing the customer. If the firm can keep the customer for a sufficiently long time by providing high quality, it is profitable to provide good quality. This direct effect of reciprocity on market performance is intuitive and empirically supported (Renner and Tyran 2004). In our approach this direct effect of reciprocity plays some role but it is supported by an indirect or social multiplier effect[1] of reciprocity. To the best of our knowledge, these have not

[1]Social multiplier effects result from positive externalities generating strategic complementarity between agents. That is, with social multiplier effects, the propensity of one person to perform a particular act is positively affected by his neighbours' propensity to do so. The existence of social multiplier effects implies that individual-level character-

been studied in the literature so far.

We demonstrate two effects of how reciprocal customers improve efficiency in markets for experience goods. The first effect results from a positive externality that reciprocal customers generate in the market by providing incentives for fully self-interested, non-reciprocal customers (who would choose to leave the market if left on their own) to enter the market also. Reciprocal customers "crowd-in" non-reciprocal customers. The second effect results from competition between firms and social ties among customers. We show that if reciprocal customers have social relations among each other, competing firms have an additional incentive to provide good quality because doing so may attract reciprocal customers from competing firms. This, in turn, provides additional incentives for non-reciprocal customers to enter the market. In other words, social ties tend to crowd-in reciprocal customers from competing firms which, in turn, tends to crowd-in non-reciprocal customers. We show that the existence of reciprocal customers is key to this result since social ties per se—in the absence of reciprocal customers—do not improve market performance. Nor does competition per se.

To demonstrate these effects in the most parsimonious way, we use a finitely repeated trust game (see James 2002 for a survey) as the basic building block of our model. Our model is "behavioural" in that it integrates insights from experimental economics into a standard game-theoretic analysis. We model agents who are heterogeneous with respect to their motivations (Camerer 2003). In particular, we model three *types* of customers: sophisticated types who are perfectly self-interested and forward-looking, reciprocal types who make their shopping decisions contingent on past firm behaviour, and loyal types who buy from one firm regardless of their experience. The focus of our model is on the (indirect) effects of reciprocal customers because mounting evidence from experimental studies suggests that reciprocity

istics can have a disproportionately strong effect on aggregate outcomes (see Becker and Murphy 2000). Glaeser, Sacerdote and Scheinkman (2003) show that social multiplier effects exist for example in the context of demographics and crime or among Dartmouth college roommates.

is a basic and common motivational drive (see Fehr and Gächter 2000 for a survey).

We proceed as follows. Section 2 relates our paper to the literature. Section 3 explains the basic ingredients of our modelling approach. Section 3.1 discusses monopoly as a benchmark case. We show that with an incentive structure in which market performance is low if all customers are sophisticated, market performance disproportionately improves with the share of reciprocal customers in the population, while market performance falls under some conditions with the share of loyal customers. In Section 3.2 we assume that firms compete, but that customers have no social ties among each other. We show that competition in the absence of social ties does not suffice to improve market performance. The intuition for this result is that in the absence of social ties customers do not systematically switch to firms having provided good quality in the past, and firms therefore have no additional incentive to provide good quality. In Section 3.3, we analyse competition between firms when customers are embedded in social networks of varying density. We show that reciprocal customers have stronger social multiplier effects if firms compete and customers are embedded in more dense networks. Section 4 provides some concluding remarks.

2 Reciprocity, reputation and social ties in markets for experience goods

Reciprocally motivated customers tend to "reward" firms for good performance by upholding the customer relation, and to "punish" the firm by terminating the customer relation. That is, a reciprocal customer is a repeat customer as long as he is provided with the desired quality. If the prospects for future interaction look good, a firm may find it profitable to provide good quality, which induces the reciprocal customer to stay with "his" firm. As a consequence, reciprocity directly improves the efficiency in markets for experience goods and induces long-term customer relations.

Long-term relations between buyers and sellers are very common in goods markets. For example, Blinder et al. (1998: 302) find that "about 85 percent of all the goods and services in the U.S. nonfarm business sector are sold to 'regular customers' with whom sellers have an ongoing relationship". However, this remarkable prevalence of long-term customer relations can be due to various factors (e.g., search or switching costs). The reason why we refer to reciprocity rather than to these alternative explanations is that reciprocity is a widespread motivational drive and that reciprocity-induced long-term relations may be relevant independently of, and therefore add to, the other explanations.

Empirical support for the direct effects of reciprocity comes from studies using a wide array of methods. Renner and Tyran (2004) study an experimental market for experience goods in which customers can choose to be repeat customers of a particular seller or to buy from an anonymous market. They show that both buyers and sellers prefer to repeatedly trade in a bilateral relation rather than use the anonymous market, and that the resulting repeat relations are more efficient than the anonymous market. They also find that buyers tend to punish sellers for providing bad quality by terminating the relation. Brown, Falk and Fehr (2004) find similar results in a labour market experiment in which quality uncertainty problems prevail. Bewley (1999) provides complementary support for the notion that reciprocity importantly shapes labour markets in a comprehensive questionnaire study. Field evidence on goods markets comes from Weisbuch, Kirman and Herreiner (2000). They observe that most buyers in the Marseille fish market repeatedly buy from the same merchant, and show that this behaviour can be explained by assuming that buyers increase the probability of shopping at a particular store if previous experience was favourable. Finally, management research suggests that customers tend to return to the same firm if they perceive to be treated fairly, but tend to shun a firm if they were treated unfairly (Forrester and Mante 2001, Ganesa 1994).

How do these direct effects of reciprocity relate to reputation? In non-

anonymous markets, customers can identify firms and choose whom to buy from. By repeatedly buying from the same firm, customers become repeat customers of a particular firm. By definition, a repeat customer knows how "his" firm performed in the past. Therefore, repeat interaction in non-anonymous markets allows a firm to establish a "reputation" as a high-quality provider among existing customers. We refer to this type of reputation formation as direct reputation formation.

In standard models of direct reputation formation (e.g., Kreps et al. 1982), firms can establish a reputation because consumers face some uncertainty about the type of the firm. If, for example, consumers think that there are some "nice" firms that always offer good quality (despite the economic incentives not to), then a perfectly rational firm may imitate the behaviour of a nice firm to "alter" the consumer's beliefs. The more often a consumer observes good quality, the higher his posterior belief to be actually confronted with a nice firm. In finitely repeated games of this type, rational firms will eventually exploit their stock of repeat customers. Our approach may look similar to these standard reputation models but this semblance is deceptive. In our approach, all firms are perfectly rational profit maximisers. There are no "nice" firms and, accordingly, profit-maximising firms cannot manipulate consumers' beliefs. However, there are different types of consumers—some are reciprocal, some are not—and we will show that the presence of the reciprocal types can create incentives for firms to deliver good quality.[2]

For reasons of tractability, our analysis remains relatively simple with respect to the modeling of social ties. For example, we do not study how social networks are formed in response to market failure in markets for experience goods (Kranton and Minehart 2001) or how the details of the social network structure affect economic interaction (for such an analysis, see Buskens 1998). Rather, we assume all customers to be equally well-embedded in the social

[2] An early contribution showing that different "types" of buyers may change market outcomes is due to von Ungern-Sternberg and von Weizsäcker (1985). In contrast to these authors, we use a game-theoretic framework and analyse the effects of social ties.

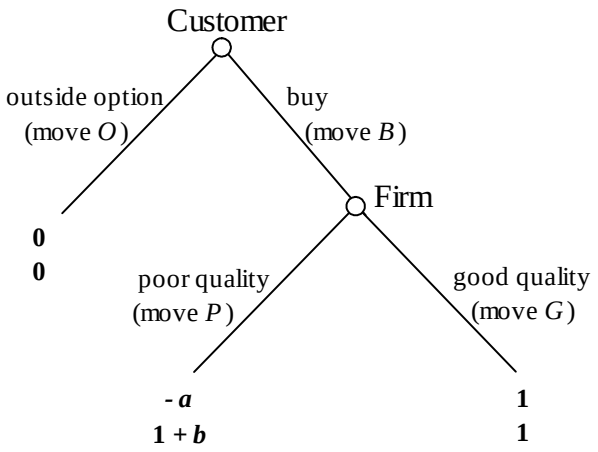

Figure 1: The market game $(a, b > 0)$

network. A further simplification is that firms are assumed to choose the quality of their product, but not the price. Extending the analysis to firms' pricing decisions may be quite fruitful because reciprocity may generate price rigidity (see Rotemberg 2002, Renner and Tyran 2004).

3 Model

The simple trust game shown in Figure 1 captures the key characteristic of markets for experience goods. The customer can either buy a unit of the good with unknown quality (move B) or stay out of the market (move O). The firm can either provide poor quality (move P) or good quality (move G). The firm has a temptation to cheat by providing poor quality since $1+b > 1$. The customer would, of course, prefer good quality over poor quality $(1 > -a)$. In fact, poor quality is assumed to be so poor that the customer prefers not buying at all over receiving a poor-quality product $(-a < 0)$.

Suppose that both players are rational and egoistic, and suppose further that the game is played only once. A rational customer anticipates that a rational profit-maximizing firm will provide poor quality. Therefore, such a customer will not buy $(0 > -a)$, and the only Nash equilibrium outcome is

complete market breakdown. Note that the prediction of market breakdown is as in Akerlof (1970), but is due to moral hazard in our model, and not to adverse selection. The prediction of market breakdown also prevails in this game if the game is repeated for any finite number of periods. If the game is extended such that there are many customers or many competing firms the same inefficient outcome results. Various mechanisms to mitigate this inefficiency have been discussed in the literature (e.g., branding, commitment strategies, advertisements, see Leibenstein 1987). In the following, we assume that these measures are not feasible which allows us to study the social multiplier effect of reciprocity in isolation.

We distinguish three types of consumers — *sophisticated* types (S), *reciprocal* types (R) and *loyal* types (L). The sophisticated consumers correspond to the standard assumptions of economics. They are fully rational and are able to perfectly predict the behaviour of all other agents. They simply maximise expected payoff. As a consequence, they shop if and only if a firm provides good quality with a sufficiently high probability. Reciprocal types are assumed to condition their decisions on experience. In particular, they are reciprocal in that they give it a try, and continue to buy from a firm if it has a clean past, i.e., if it always delivered good quality. Hence, reciprocal consumers become repeat customers if a firm provides good quality. However, they terminate the customer relation once a firm provides poor quality. Finally, loyal consumers are assumed to buy from one and the same firm regardless of experience or expectations. There are two possible reasons for why a consumer might be loyal in that sense. Firstly, he could—falsely—always expect good quality. Secondly, and more importantly, he might have an outside option that is even worse, i.e., he might need the product even if it has poor quality (perhaps because he needs it for medical reasons or is addicted to it).

Without loss of generality, we normalise the mass of consumers to 1. The share of sophisticated types is denoted by s, the share of reciprocal types by r, and the share of loyal types by l. Of course, $s + r + l = 1$.

Our analysis focuses on how reciprocals shape markets for experience goods. Market performance is measured as the volume of good quality goods traded. For the sake of simplicity, we do not analyse pricing decisions explicitly (see Renner and Tyran 2003). We restrict our analysis here to two-period markets and assume a common discount factor $0 > \delta > 1$. This simplifies our presentation as far as possible while still retaining the full strategic structure of the problem.

3.1 Monopoly

In this section we assume that there is only one firm, and that customers have no social ties among each other and, thus, cannot share their experience otherwise. However, the market is non-anonymous in the sense that consumers know (and remember) the quality provided by the single firm. We assume that all customers make their shopping decisions simultaneously and independently. Moreover, we assume that the game described in Section 3 is played twice. The two-period case is conveniently simple but contains all qualitative features of the general finitely repeated game with T periods (to which our analysis can be easily extended).

We solve the two-period game by simple backward induction.

2nd period, 2nd stage The monopolist chooses to deliver poor quality (move P) regardless of how many consumers decided to buy his product and regardless of the composition of the consumers who made this decision.

2nd period, 1st stage By definition, loyal types (L) decide to buy (move B) from the monopolist.

Sophisticated types (S) anticipate the monopolist's defection in the 2nd stage and choose their outside option (move O).

The behavior of reciprocal types (R) is contingent on the firm's past performance. If the monopolist has delivered poor quality in the first

period, reciprocal types punish the firm by terminating the relation, i.e., by choosing their outside option. If the firm has delivered good quality, reciprocal customers uphold the relation and buy again.

1st period, 2nd stage Clearly, the monopolist's decision will depend on the number and types of consumers who have decided to buy in the 1st period, 1st stage. By assumption reciprocal and loyal types always decide to buy in the first period. Thus, the monopolist faces $r+l$ reciprocal and loyal consumers and maybe also a fraction of sophisticated customers which we denote by k ($\leq s$). Anticipating the future, the monopolist can calculate the payoffs associated with good and poor quality as follows. Delivering good quality gives him $k+r+l$ in this period and $(1+b)(r+l)$ in the next period. In case of poor quality he will earn $(1+b)(k+r+l)$ this period and $l(1+b)$ next period. Thus, he will decide to deliver good quality if and only if

$$k+r+l+\delta(1+b)(r+l) \geq (1+b)(k+r+l)+\delta l(1+b)$$

which can be re-written as

$$k \leq r\left(\delta\frac{1+b}{b}-1\right)-l. \tag{1}$$

1st period, 1st stage By assumption reciprocal and loyal consumers give it a try without any further considerations. Not so, of course, sophisticated customers who anticipate the future and thus condition (1). As a consequence, equilibrium behaviour prescribes that exactly

$$k^{*MON} = \max\left\{0, \min\left\{r\left(\delta\frac{1+b}{b}-1\right)-l, s\right\}\right\} \tag{2}$$

sophisticated consumers decide to buy. Therefore, k^{*MON} is the maximum number of sophisticated customers that can enter the market such that the monopolist finds it still profitable to provide good quality. In words, the max- and min-operators simply state that k^{*MON} must be at least 0, and can be at most s.

Equation (2) reveals what we have discussed earlier: Without reciprocal or loyal customers ($r = l = 0$) the market breaks down completely, i.e., $k^{*MON} = 0$.

The main result of our analysis is that reciprocal types have a disproportionate effect on market outcomes. We find that, provided firms are not too impatient (δ is not too small), and that the temptation to cheat is not too large (b is not too large), reciprocal customers generate an externality in the market, and crowd-in some k^{*MON} sophisticated customers. More precisely, the share of sophisticated customers who buy in period 1 is weakly increasing in r ($\partial k^{*MON}/\partial r \geq 0$). Reciprocal customers directly increase efficiency by buying in the first period and, in addition, indirectly increase efficiency by crowding-in some sophisticated customers. Since k^{*MON} is a measure of market efficiency, reciprocal customers increase efficiency in customer markets.

If there are too many loyal customers [$l > r(\delta\frac{1+b}{b} - 1)$], the monopolist has always an incentive to deliver poor quality which induces sophisticated customers to stay out of the market. In case of $0 < k^{*MON} < s$, changes in l do not affect market performance in the first period. The reason is that for each additional loyal buyer a sophisticated buyer is crowded out ($\partial k^{*MON}/\partial l = -1$). The intuition for this result is that since loyal customers return even upon having been cheated there is no sanction for the firm cheating on them. Note also that the presence of loyal customers may annihilate the efficiency-enhancing effect of reciprocal customers. As can be seen from (2), if l is sufficiently large, $k^{*MON} = 0$, and an increase of the share of reciprocal types has no effect in this case.

Finally, it does not come as a surprise that k^{*MON} is (weakly) increasing in δ and decreasing in b. The higher the firm values the future, the smaller are the incentives to defect today. And the higher the gains from delivering poor quality, the bigger are the incentives to do so.

To summarise: While reciprocal types crowd-in sophisticated customers, loyal types tend to crowd them out. However, reciprocal customers in most cases disproportionately improve the efficiency of the market for exper-

ience goods. The reason is that the firm knows that antagonising reciprocal customers is costly, and is therefore hesitant to cheat. The sophisticated customers know this and can free-ride on the reciprocal types' willingness to punish the firm by terminating the relation.

In this section we have disregarded social ties among customers to be able to focus on the direct effect of reciprocity. But, of course, social ties cannot have an effect in the setting we studied. The reason is that social ties serve to transmit information about quality in the market. However, such transmission is worthless since all customers share the same experience in monopoly.

3.2 Competition without social ties among customers

In this section we analyse how competition between firms affects efficiency in markets with quality uncertainty as explained at the beginning of Section 3. One might suspect that competition will eliminate or at least mitigate the problem. However, our main result in this section is going to be that—for most plausible cases—competition *on its own* does not improve market performance. We shall only analyse the simplest form of competition, namely the duopoly case with two identical firms. Generalisations are straightforward.

If there are two firms we must, of course, redefine the decision rules of reciprocal customers. Loyal customers are modelled as before, they stick to one firm regardless of what happens in the market. Reciprocal customers stick also to the firm they have bought from first provided that it has delivered good quality. What differs from the monopoly case is how reciprocal customers act once their firm has disappointed them. Reciprocal customers still punish their firm by terminating the customer relation. Since we assume in this section that customers are anonymous to each other, they cannot learn from each other, but will only know their particular shopping history. In particular, they will not know which quality the other firm (from which they didn't buy) has delivered. Thus, within our framework two rules

for reciprocal customers could apply. They could never buy again after having been sold poor quality or they could switch to another firm (or, in fact, do this with some probability and drop out of the market with the remaining probability.)

It turns out that in the two-period model the first-period equilibrium solution is independent from the reciprocal customers' decision rule and it is easy to see why. Take the reciprocal customers who bought from firm 1 and got poor quality. The only difference between the two rules is in how these customers affect the total numbers of customers who go shopping *at firm 2 in the second period*. In this period, however, both firms deliver poor quality anyway. Moreover, firm 2 cannot influence the decision of customers who bought in the first period from firm 1 as its quality is, due to anonymity, unobservable. Hence, if reciprocal customers try out a different firm after being disappointed, this will simply induce a windfall profit for the other firm but it will not be of any strategic significance.

Having made this observation, it is also straightforward to solve the rest of the game. Without social ties among customers, the duopoly game is more or less a composite of two monopoly games. In essence, there is no real competition between the two firms as they can't communicate how good they are to customers who have not chosen to buy from them. Thus, the incentives of a firm to provide good quality in period 1 depends in the same way on the number of customers as in equation (1). And the behaviour of sophisticated customers is again a simple function of the number of reciprocal and loyal customers of the two firms, similar to equation (2).

Let r_i, l_i, and k_i denote the shares of reciprocal, loyal and sophisticated customers who buy in period 1 from firm i (and let r, l, and s be the total fractions of the three different types). Then firm i delivers good quality if and only if

$$k_i \leq r_i \left(\delta \frac{1+b}{b} - 1 \right) - l_i. \tag{3}$$

The shares of sophisticated customers who will go shopping at firm i in

the first period, k_i^*, are determined by

$$k_i^{*DUO} = \max\left\{0, \min\left\{r_i\left(\delta\frac{1+b}{b}-1\right)-l_i, 1-l-r-k_j\right\}\right\}.$$

Notice that the equilibrium might be asymmetric in the sense of $k_i^{*DUO} \neq k_j^{*DUO}$ even if reciprocal and loyal customers are equally distributed among the two firms, i.e., if $r_i = r/2$ and $l_i = l/2$. This case can arise when the parameters, δ and b, and the shares, r and l, are such that $r\left(\delta\frac{1+b}{b}-1\right)-l > s$. This, however, is the case when all sophisticated customers buy in the first period. On the other hand, if $r_i = r/2$ and $l_i = l/2$, all solutions that imply $k^{*DUO} < s$ entail $k_i^* = r\left(\delta\frac{1+b}{b}-1\right)/2 - l/2$.[3] Thus, in the case of symmetrically distributed reciprocal and loyal customers, we will always have

$$k_1^{*DUO} + k_2^{*DUO} = k^{*DUO} = k^{*MON}$$

and hence the same efficiency as in the monopoly case.

If reciprocal and loyal customers are not equally distributed, the welfare effects of competition are ambiguous. Welfare may increase but may also become smaller. To illustrate the latter case, simply assume that the parameters and shares of reciprocal and loyal customers are such that $k^{*MON} > 0$ and that we have for one firm $r_i > 0$ and $l_i > r_i\left(\delta\frac{1+b}{b}-1\right)$ such that (3) does not hold for this firm. Then no sophisticated customer will buy from this firm. Moreover, the total number of rational customers buying from both firms will be smaller than $(r_1+r_2)\left(\delta\frac{1+b}{b}-1\right) - l_1 - l_2$ and, hence, smaller than k^{*MON}. The intuition for this case is simple. If one firm has a disproportionate number of loyal customers it may have incentives to deliver poor quality even if no sophisticated customers show up. In that case the

[3] Suppose this were not true, i.e., suppose one firm would have less customers. (Clearly, it can't have more customers as $r\left(\delta\frac{1+b}{b}-1\right)/2 - l/2$ since this would provide an incentive to deliver poor quality what would be anticipated by the sophisticated customers.) Then some of the sophisticated customers who do not buy from either of the firms could profitably deviate by buying from the firm with less customers (without giving this firm an incentive to deliver poor quality).

reciprocal customers of firm j (who, in general, increase efficiency by making it attractive for rational customers to join them) are "wasted" on this firm.

On the other hand, suppose that the parameters are such that $1 > k^{*MON} > 0$, $r_i = r$ for one firm and $l_j > 0$ for the other firm. In that case the loyal customers of firm j (who, in general, reduce efficiency) do not do any harm. No rational customer buys from this firm anyway. Were some of these loyal types redistributed to firm i they would, of course, reduce the number of sophisticated customers buying from i (as they would reduce the number of sophisticated customers buying from a monopolist).

So we find that only rather "extreme" distributions of reciprocal and loyal customers can induce welfare changes when we compare competition without social ties among customers with the monopoly case. We point this out simply because accuracy demands it and not because we are considering these effects as important. In the realm of our modelling approach, the symmetric case seems the one which is justified best. In the absence of any history (at the beginnging of each period) no customer, regardless of their type, should have a particular reason to prefer either of the firms. Thus, for other than sophisticated customers the assumption that they flip a coin seems appropriate. In the case of a continuum of customers this gives exactly rise to the equal-distribution case. This analysis can easily be generalised to the case with $n > 2$ firms and $T > 2$ periods.

3.3 Competition with social ties among customers

In this subsection, we assume that customers have social ties among each other. These social ties allow customers to learn from each other, for example by word-of-mouth communication, about the quality chosen by *both* firms. From the discussion above, it should be clear that this implies that reciprocal customers should be modelled differently. We will assume that they buy from the same firm again if it has delivered good quality and that they will switch firms if the one they bought from delivered poor quality and they know about another that delivered good quality. In all other cases they will not buy again

and leave the market.

We assume that customers are embedded in social networks of density $d \in [0,1]$. This density determines whether a customers learns about the quality of the other firm. Hence, d can be interpreted as the percentage of reciprocal customers who were disappointed from their firm and now switch to the firm that has a clean past. We will show that the existence of social ties affects market outcomes rather dramatically as the two firms now compete for reciprocal customers. In particular, a firm will have an additional incentive to provide good quality if it knows that the other firm provides poor quality. The reason is that the firm can gain *additional* customers in this case, while this had been impossible for, both, monopolists and duopolists in markets without social ties. The dependence of one firm's optimal behaviour on its belief about the other firm's actions causes multiplicity of equilibria with the unique symmetric equilibrium being in mixed strategies.

For ease of notation we will focus on the case of equally distributed types and parameters such that $1 > k^{*MON} > 0$.

We solve the game by backward induction.

2nd period, 2nd stage Both firms choose to deliver poor quality regardless of how many consumers decided to buy their products and regardless of the composition of the consumers they face.

2nd period, 1st stage By definition, loyal types (L) decide to buy from the same firm as before.

Sophisticated types (S) anticipate the firms' defection in the second stage and choose their outside options.

The behaviour of reciprocal types (R) is contingent on firms' past performance In particular, the behaviour of reciprocal types depends on the history of the firms they have been shopping from in period 1 as well as on the history of the other firm, insofar as this history is known to reciprocal customers. If both duopolists have delivered poor quality in the first period, they will choose their outside option; if both

delivered good quality, they will buy from the firm from which they bought it the first period. If firms' qualities were different, they buy from the one with better quality.

1st period, 2nd stage Firms' behaviour will depend on the number of customers in their shops *and* on what they expect the other firm to do. Let us first suppose firm i expects firm j to deliver good quality. Then also delivering good quality (and anticipating the future correctly) would give a payoff of $k_i + \frac{r+l}{2} + \delta(1+b)\frac{r+l}{2}$ while the provision of poor quality would yield $(k_i + \frac{r+l}{2})(1+b) + \delta(1+b)\frac{l}{2}$. Thus, delivering good quality (G_i) would be better than delivering poor quality (P_i) if and only if

$$k_i \leq \frac{r}{2}\left(\delta\frac{1+b}{b} - 1\right) - \frac{l}{2} \ (= \underline{k}) \tag{4}$$

as in (3). Next, consider the case where firm i expects that firm j will deliver poor quality. While delivering poor quality would yield the same payoff as above, there is now an extra incentive to deliver good quality. In this case, firm i can attract the reciprocal customers who were disappointed from firm j in the first period. Thus providing, good quality would give a payoff of $k_i + \frac{r+l}{2} + \delta(1+b)\frac{r(1+d)+l}{2}$ making good quality the better option if and only if

$$k_i \leq \frac{r}{2}\left(\delta\frac{(1+b)(1+d)}{b} - 1\right) - \frac{l}{2} \ (= \overline{k}). \tag{5}$$

Notice that the threshold value of sophisticated customers is higher when firm i expects firm j to provide poor quality, i.e., $\overline{k} > \underline{k}$ if $d > 0$. This relation essentially captures the fact that the existence of social ties provides additional incentives for firms to provide good quality. For given k_i and k_j, (4) and (5) essentially describe the firms' best-reply correspondences from which it is straightforward to find the equilibria. Table 1 shows which pure-strategy subgame equilibria arise. For example, suppose that $k_i, k_j < \underline{k} < \overline{k}$. This may, for example, happen if s is small relative to r. In this case, providing good quality is a dominant

	$k_j < \underline{k}$	$\underline{k} \leq k_j \leq \overline{k}$	$\overline{k} < k_j$
$k_i < \underline{k}$	(G_i, G_j)	(G_i, P_j)	(G_i, P_j)
$\underline{k} \leq k_i \leq \overline{k}$	(P_i, G_j)	(G_i, P_j) & (P_i, G_j)	(G_i, P_j)
$\overline{k} < k_i$	(P_i, G_j)	(P_i, G_j)	(P_i, P_j)

Table 1: Pure-strategy equilibria in the quality-setting subgame played among two firms in the presence of social ties.

strategy for both firms, and the pure strategy equilibrium is (G_i, G_j) (see upper left cell of Table 1).

The analysis of this stage is completed by computing the mixed-strategy subgame equilibrium that can arise when $\underline{k} \leq k_i, k_j \leq \overline{k}$. Let p_i the probability with which firm i chooses good quality. Then firm j must be indifferent between the payoff it can assure by choosing poor quality and the gamble that is induced by choosing good quality, i.e.,

$$\begin{aligned}(k_j + \frac{r+l}{2})(1+b) + \delta(1+b)\frac{l}{2} &= p_i\left[k_j + \frac{r+l}{2} + \delta(1+b)\frac{r+l}{2}\right] \\ &\quad +(1-p_i)\left[k_j + \frac{r+l}{2} + \delta(1+b)\frac{r(1+d)+l}{2}\right]\end{aligned}$$

has to hold. Solving this equation with respect to p_i gives the equilibrium probability

$$p_i^* = \frac{1+d}{d} - \frac{b(2k_j + r + l)}{\delta r\,(1+b)\,d}$$

which is between 0 and 1 for $\underline{k} \leq k_j \leq \overline{k}$.

1st period, 1st stage Inspecting Table 1 it is straightforward to see that in equilibrium at least $\underline{k}$ and not more than $\overline{k}$ rational consumers will go to either of the firms. Moreover, it is easy to see that there is no equilibrium where the two firms play according to the asymmetric subgame

equilibria identified above. (If they were to do so, no sophisticated customer would come to the poor–quality firm. And if no sophisticated customer were to come to a firm it would have an incentive to produce good quality.) Hence, customers will correctly anticipate that the firms will mix over their actions in stage 2. As a consequence, sophisticated customers must compare the possible benefits of good quality and possible losses from buying poor quality. In equilibrium there will be exactly so many sophisticated customers buying from firm j such that they earn in expectation exactly the outside option payoff of 0. Formally, $p_i^* - a(1 - p_i^*) = 0$ has to hold. This gives immediately

$$k_j^{*TIES} = \frac{1}{2}\delta r \frac{d\,(1+b)}{b\,(1+a)} + \underline{k}$$

or, in total,

$$k_1^{*TIES} + k_2^{*TIES} = k^{*TIES} = r\left[\left(\delta\frac{1+b}{b}\right)\left(\frac{1+a+d}{1+a}\right) - 1\right] - l. \quad (6)$$

To assess the effect of competition we write the last equation as

$$k^{*TIES} = k^{*MON} + \delta r \frac{d\,(1+b)}{b\,(1+a)} \quad (7)$$

which shows that there are *additional* customers crowded-in by the combined effect of social ties and competition ($\Delta \equiv \delta r \frac{d(1+b)}{b(1+a)} \geq 0$). Clearly, the size of this additional effect depends on network density d. In particular, competition does not improve market performance in the absence of social ties (i.e., $k^{*TIES} = k^{*MON}$ for $d = 0$), and the number of sophisticated customers crowded in is increasing in network density ($\partial\Delta/\partial d > 0$). It is most important to note that the share of additional sophisticated customers also increases with the number of reciprocal customers r ($\partial\Delta/\partial r > 0$ for $d > 0$). This means that reciprocal customers generate a more pronounced externality in the market if firms compete and customers have social ties among each other. This is because they crowd-in more sophisticated customers. Finally, it should also be noted that social ties and reciprocity interact. In particular, social ties reinforce the direct effect of reciprocal customers ($\partial^2\Delta/\partial d\partial r > 0$).

In Section 3.1, we have seen that the share of sophisticated customers in non-degenerate cases ($0 < k^{*MON} < s$) increases with δ, and falls with b. The same, of course, is true for k^{*TIES}. The firms' temptation to cheat customers reduces the additional share ($\partial\Delta/\partial b < 0$). And the share of additional sophisticated customers crowded-in is higher if the cost of obtaining poor quality for customers is lower ($\partial\Delta/\partial a < 0$).

4 Concluding remarks

The analysis above shows that reciprocity may mitigate market failure in markets for experience goods. The effect is more pronounced when there is competition between firms *and* social ties among consumers. Then firms compete for reciprocal consumers because they might become repeat customers. Sophisticated consumers benefit from the presence of reciprocals: they can free-ride on their presence.

Our paper illustrates that competition alone is not always the sole answer. On the contrary, as long as consumers do not exchange information we have seen that moving from a monopoly to a duopoly market efficiency remains at exactly the same level. But competition in the presence of social ties does the trick. The duopoly market functions much better when there is an underlying social network in which consumers are embedded. For competition to work really well, some social cohesion is required.

One final remark seems in order. The literature on "social capital" discusses potential economic and social effects of trust, social norms and social ties (e.g., Putnam 2000). We believe our analysis contributes to this debate. We show that potential market failure cannot only be alleviated by mechanisms devised by firms (such as branding) but also by social capital. We model an example of how social capital based on reciprocity and social ties can substitute for missing or expensive legal structures, facilitating transactions and reducing transaction costs (Arrow 1972). As a consequence, our model helps to explain why in communities with dense social networks fewer

regulations and mechanisms devised by firms are observed.

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