

# Over-optimism and lender liability in the consumer credit market

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Credit purchases of consumer goods are commonly made upon terms governed by an agreement between the lender and the seller. The puzzle that the paper addresses is the issue that in this type of purchase the lender should be jointly liable with the seller for breach of sale contract by the seller (principle of joint responsibility). We study the rationale for this principle in situations where market failure arises because consumers underestimate the risk of product failure—for example due to seller misrepresentation—and it is difficult to enforce seller responsibility. We show that joint responsibility increases welfare and reduces the incentives of sellers to misrepresent the quality of their products.

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## 1. Introduction

When a consumer makes a purchase on credit she enters two contractual relationships: the sale contract with the seller and the credit contract with the lender. An issue much debated by policy makers is whether in the context of such credit purchases the lender should be jointly liable with the seller for breach of the sale contract by the seller.

In most industrialized countries, including members of the EU and in the US, credit purchases are regulated by a principle of joint responsibility (JR) whenever credit is advanced by a lender pursuant to an agreement with the seller (referred to as ‘linked credit’). This is the case for example when the seller and the lender are part of a joint venture or when the seller acts as a credit intermediary.<sup>1</sup> Under JR, the seller and the lender are jointly liable to the consumer for defective products or misrepresentation by the seller. Instead, when credit is provided by a lender

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<sup>1</sup>In some countries (e.g. the UK) credit-card agreements are also regulated by the joint-responsibility principle.

with no commercial links to the seller (referred to as ‘independent credit’), the more usual regime of seller responsibility (SR) applies. Under SR, the seller is the only party liable for breaching the sale contract.

The JR principle was first introduced in the UK by the Consumer Credit Act 1974. The British example was then followed by other countries and its principles appear in the Federal Trade Commission Holder Rule (1976) of the United States, and in the European Directive EEC/102/87. The JR principle is also contained in the proposal for the drafting of the new European Directive.<sup>2</sup>

The reasoning behind the adoption of the JR principle in the UK can be found in the Crowther Report which argued that JR can help to overcome the difficulties of enforcing seller responsibility, which arise because litigation is costly and because the seller can go bankrupt before the consumer is able to obtain redress.<sup>3</sup> In particular the report states (paras. 6.6.24):

If... the seller seeks to boost sales by making false representations, or supplies goods which are defective, is it right that the lender should be able to disclaim all responsibility and insist on repayment of the loan being punctually maintained? ... There are many reasons why in practice a legal right which the buyer may have against the seller is not sufficient protection. ... in some cases the seller's financial position is so poor that it is doubtful whether he will be able to meet the judgement even if the buyer is successful.

Empirical research confirms the concerns voiced in the report. According to the Office of Fair Trading (OFT, 2004), the largest cause of consumer complaints in the UK is ‘defective products and substandard services’, which accounts for nearly 50% of the total complaints. In about 20% of these cases, consumers encountered problems in obtaining adequate redress, or there was an attempt by the seller to restrict his liability. In about 25% of cases, consumers claimed that there was seller misrepresentation or lack of adequate information.

When the lender is jointly responsible for product failure and for misrepresentation by the seller, consumer protection is increased for two main reasons. First, consumers who buy through linked credit can use the deep pockets of the lender to obtain redress when the seller has gone bankrupt. It has indeed been estimated that in the UK 95% by volume of the claims under JR arise from the seller going out of business (OFT, 1995). Second, the consumers can withhold disputed repayments of the loan pending a final court decision, which saves them some of the loss associated with an inefficient judicial system. This is particularly relevant in countries like Italy where the duration of ordinary civil proceedings is 70% longer than the EU average and where legal interest rates often fail to compensate consumers for such a long wait (see Marchesi, 2003).

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<sup>2</sup>Modified proposal for a Directive of the European Parliament and of the Council on credit agreements for consumers amending Council Directive 93/13/EC (October 7, 2005 COM(2005) 483 final). Amended draft of the Austrian Presidency (April 4, 2006). <http://www.responsible-credit.net/index.php?id=1884>.

<sup>3</sup>Report of the Committee on Consumer Credit, under the presidency of Lord Crowther, March 1971.

In this paper we investigate the desirability of the JR principle given the difficulties of enforcing SR. We discuss the impact that the JR principle has on the incentives of sellers and lenders to make linked-credit agreements, on the efficiency of these agreements, and, crucially, on social welfare.

We build a model with a monopolistic product market and a perfectly competitive credit market. Consumers decide whether to buy one unit of product; they are risk neutral and alike in their preferences. Depending on their initial endowment of wealth, two classes of consumers are identified: the poor, who must borrow to finance their purchases, and the rich, who can buy for cash if they wish. Whether a consumer is rich or poor is unobservable and borrowing is costly. Product failure occurs with exogenous positive probability and it is verifiable *ex post* but the seller escapes liability with positive probability. Credit supply can take two forms: independent credit and linked credit. Under independent credit, the seller and the lender operate independently and each maximizes his own profit; under linked credit, they operate as a joint venture and maximize joint profits. We derive endogenously the conditions under which a linked-credit agreement is formed.

We focus on the possibility that consumers misperceive, and in particular underestimate, the risk of product failure. This assumption can be justified on two separate grounds. First, as we show in the paper, the seller has incentives to manipulate consumers' perceptions of product risk by misrepresenting the quality of his product. This possibility has also been suggested by legal scholars (see e.g. Hanson and Kysar, 1999a) and by industry regulators (OFT, 1997); empirical research also confirms this prediction. Hanson and Kysar (1999b, 2000), for example, provide evidence of misrepresentation in the food and pharmaceutical sectors, and for products marketed as environmentally friendly. They show that although consumers may be aware of manipulative practices and approaches, they appear to be generally unaware of the extent to which those tactics succeed.<sup>4</sup> Second, an extensive literature in psychology shows that people systematically underestimate the probability that adverse events will occur to them. This 'over-optimism' is viewed as inherent to human nature and its pervasiveness is shown in a relation to a wide range of events, including health risks, injuries in car accidents, mugging and divorce. See for example Weinstein (1980), Perloff and Fetzer (1986), Baker and Emery (1993), and Harris and Middleton (1994).<sup>5</sup> This exogenous view of consumer misperceptions has been applied

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<sup>4</sup>A related paper is Boyer *et al.* (1984) who assume that sellers can engage in misleading advertising to raise consumers' subjective probability of high product quality. Their paper investigates the conditions on market characteristics under which misleading advertising arises.

<sup>5</sup>The consent on consumers being inherently optimistic is however not unanimous and empirical justifications supporting the opposite argument have also been provided (see e.g. Viscusi, 1996, and Schwartz, 1992). We note that consumers often buy extended warranties (generally for their electronic appliances) that are typically overpriced. In these cases consumers would also appear to exhibit pessimism rather than optimism. In fact, endogenizing consumer optimism explains the apparent

by economists and legal scholars to the study of market performance in a number of fields.<sup>6</sup> Most important in the present context, it has been used to support the need for product-liability legislation.<sup>7</sup> However, these studies have neither discussed lender liability in the presence of consumer misperceptions nor have they endogenized the degree of over-optimism by considering the incentives of the seller to misrepresent product risk.

We start by considering the benchmark case where consumers do not misperceive product risk. We emphasize two points. First, when consumers have correct beliefs linked-credit agreements help to achieve market efficiency. Through linked-credit the seller price discriminates between the rich and the poor, which makes it profitable to induce poor consumers to enter the market when their utility is positive. The idea that linked credit is a price discrimination device was first proposed by Brennan *et al.* (1988) and it has recently found empirical support in Bertola *et al.* (2005).<sup>8</sup> The second point that we emphasize is that when consumers do not misperceive the risk of product failure there is no rationale for the JR principle. This is because JR yields the same level of welfare as SR.

Compared to the above benchmark, we show that over-optimism about the probability of product failure hurts consumers and benefits the seller. By underestimating the risk of product failure, consumers overestimate the expected value of the product and this enables the seller to raise the price and appropriate a ‘misperception rent’. More importantly, linked-credit agreements can now be welfare reducing: through price discrimination the seller may now induce entry from the poor when their utility is negative.

When we allow for over-optimism we also show that SR and JR are no longer equivalent: under JR welfare is greater. This stems from the other facet of over-optimism: consumers underestimate the value of the additional protection brought by JR because they underestimate the risk of product failure. The additional protection brought by JR has then the effect of reducing the misperception rent that the seller can extract out of consumer misperceptions. This in turn has a positive effect on welfare for two reasons. First, linked-credit agreements

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contradiction as it make sellers more likely to engage in hard-sales practices and make misleading claims in order to convince consumers to overestimate the value of an extended warranty.

<sup>6</sup>For example, Eisenberg (1995) points out how optimism by parties in a contract can explain why courts do not always fully enforce contractual terms. De Meza and Suthey (1996) discuss how optimism may explain the high failure rates of small businesses.

<sup>7</sup>See for example the seminal papers by Spence (1977) and Polinsky and Rogerson (1983).

<sup>8</sup>Alternative reasons for credit to be packaged with sales to consumers have also been suggested, including promoting purchases and reducing transaction costs (e.g., Wertenbroch, 2003). The main insights of our paper would remain under this alternative framework.

may again become welfare enhancing. Second, JR increases welfare because it reduces the incentives of the seller to misrepresent the quality of his products.

Our results are derived under the assumption that consumers have homogeneous beliefs: they all underestimate the risk of product failure. In the last part of the paper we consider the case of heterogeneous consumers and show that even if the presence of consumers with correct beliefs is likely to help to protect optimistic consumers, it may not suffice.

Overall, our results support the JR principle: JR is weakly welfare enhancing over SR. Legislation is then needed because JR reduces the profitability of linked-credit agreements and therefore it is a form of consumer protection that sellers and lenders have no interest in offering voluntarily. Consistent with this result, we find that the JR principle has been opposed by financial companies in various countries (see OFT, 1995).

The desirability of lender liability for product failure is an issue that has received little attention in the economics literature. One important exception is Iossa and Palumbo (2004) who consider a private-information setting in which lender liability is used as a device for signalling the reliability of the seller. In that context, and contrary to the case analysed here, the lender undertakes liability for product failure voluntarily. In both contexts, JR is welfare enhancing because of informational problems. A similar insight is informally discussed in Shavell (1987). Lender liability has instead been extensively analysed in the field of environmental regulation where the lender can be liable for the environmental damage caused by the firm that it finances. Pitchford (1995) and Boyer and Laffont (1997) show that full lender liability can induce the firm to underinvest in accident prevention and the lender to restrict lending. A group of comments by Balkenborg (2001) and Lewis and Sappington (2001), and a reply by Pitchford (2001) discuss respectively the role of the damage technology and of the distribution of bargaining power in the 1995 paper by Pitchford.

The rest of the paper is organized as follows. In Section 2 we present the basic model. We discuss the benchmark case of consumers with correct beliefs in Section 3, and analyse the effect of over-optimism under SR and under JR in Section 4. We study the incentives for linked credit in Section 5. In Section 6 we endogenize the level of over-optimism by studying the incentives of sellers to engage in misrepresentation, while in Section 7 we consider the case of heterogeneous consumers. Section 8 concludes by discussing some extensions of the model such as the case where product failure results in damages. All proofs missing from the text are relegated to an appendix.

## 2. The basic model

We consider a perfectly competitive credit market and a monopolistic product market. In the product market, the product is produced at a constant marginal cost, for simplicity normalized to zero, and it is offered for sale at a price  $p$ .

A proportion  $d \in (0, 1]$  of the goods is revealed defective after sale; product failure can be verified by third parties such as courts.<sup>9</sup>

Consumers derive utility from only one unit of the good and are alike in their preferences: they attach value  $B > 0$  to the good if it is not defective and zero otherwise. There are two classes of consumers, the rich and the poor, all of whom are risk neutral; we normalize to 1 the total number of consumers and denote by  $r$  the fraction of rich consumers. Rich consumers have sufficient money to purchase the good for cash if they wish, whilst poor consumers must always resort to the credit market. Class membership is unobservable. For simplicity, we assume that access to credit is unlimited and that consumers never default on their loans.

The credit market faces a perfectly elastic supply of funds at an exogenously determined interest rate, which we take as zero. However, the supply of loans entails positive transaction costs  $t$ . The interest rate charged to consumers is denoted by  $i$ .

Credit supply can take two forms. A lender may operate independently of the seller and due to perfect competition charge an interest rate satisfying  $ip = t$ . Alternatively, he may sign an agreement with the seller in order to coordinate price and interest rate decisions. In this case the seller and the lender act as a joint venture and share the same information. We shall refer to the first scenario as ‘independent credit’ and to the second one as ‘linked credit’. In practice linked credit and independent credit are different. Under linked credit, the seller acts as an intermediary for the lender: he arranges credit for his customers and receives the cash price directly from the lender. Thus, the consumer bears no expenditure at the time of the purchase, that is, when the quality of the product is still unknown. Instead, under independent credit, the lender hands over the cash to the consumer. The payment to the seller is then made by the consumer at the time she makes the purchase.

We assume that the seller is unable to sell on credit without the financial support of a lender. This seems realistic: in practice sellers may be unable to offer credit directly for they lack the technology to screen consumers appropriately and/or to diversify default risk.<sup>10</sup> We also assume prohibitive the transaction cost associated with the consumer proving to the seller that she has received a loan from an independent lender and is indeed using that loan to finance her purchase. Thus, the seller is unable to observe whether a consumer obtained credit from an independent lender or is using her own wealth to finance her

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<sup>9</sup>The term ‘defective’ will be used throughout to represent also situations where the good is not delivered, it is delivered with delay or it is not in conformity with the standards specified in the sale contract.

<sup>10</sup>In any case, our results would be qualitatively unchanged if we assumed that the seller could offer credit directly; the linked-credit agreement of our model would then simply represent a situation where the seller is offering credit himself.

purchase. This implies that the seller cannot price discriminate between the rich and the poor through the price only.<sup>11</sup>

The liability regime depends on the form of credit. Under independent credit, the consumer is subject to a regime of seller responsibility (SR) where only the seller is responsible for breach of the sale contract. Of course, SR also applies to cash purchases. We take a positive approach to the liability legislation and assume that the legal liability of the seller is equal to the cash price  $p$ , which the seller must return to the consumer upon discovery that the product is defective.<sup>12</sup> Furthermore, we assume that enforcing SR is difficult and this results in the seller bearing only a proportion  $\gamma < 1$  of his legal liability (or equivalently meeting his obligations with probability  $\gamma < 1$ ). There are various reasons why in practice sellers may evade their responsibilities. First, judicial enforcement may be inefficient and result in lengthy trials or long waiting times for trials to go before the court. In this case  $\gamma$  captures the possibility that the legal interest rate fails to compensate the consumer for the wait. Second, the seller may go out of business before the consumer obtains redress; here  $\gamma$  represents the likelihood that the seller is still in business.

The liability regime that applies when the consumer finances her purchase through credit provided by a linked lender, is either one of seller responsibility (SR) or one of joint responsibility (JR). Under JR, the lender becomes jointly liable with the seller for product failure. This implies that an aggrieved consumer acquires the right to stop repaying her loan to the lender pending a court decision and if the product is discovered defective she does not need to repay the lender. This simple fact implies that JR increases consumer protection since it ensures that the consumer pays for the product only if it is not defective. Going back to our previous examples, the consumer is not affected by the risk that the seller goes bankrupt before he fulfils his obligations. Also, she does not suffer from the sluggishness of the judicial system, for she keeps the money in her pocket during the dispute.<sup>13</sup>

In the light of the above discussion, and assuming a unitary discount factor, when the consumer purchases the good for cash, her (net) expected utility is

$$u^S(p) = (1 - d)B - (1 - d\gamma)p \quad (1)$$

while, if she obtains credit but SR still applies, her net surplus is

$$v^S(p, i) = (1 - d)B - (1 - d\gamma)p - ip \quad (2)$$

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<sup>11</sup>Our results would continue to hold if we assumed that the seller were able to distinguish whether the consumer is using cash or independent credit, but were forced by law to charge a uniform price.

<sup>12</sup>In a previous version we assumed that the liability of the seller was given by  $B$ . This had no effect on the quality of our results.

<sup>13</sup>Given our specification of the seller legal liability, JR also offers the advantage that it covers interest repayments. While we recognize that this introduces an asymmetry into the model, the quality of our results would not change if we assumed that the liability of the seller were equal to  $p(1 + i)$  rather than  $p$ .

Instead, if she obtains credit under JR, the consumer obtains

$$v^J(p, i) = (1 - d)(B - (1 + i)p) \quad (3)$$

We assume that consumers are over-optimistic: either because it is in their nature or because they are susceptible to seller's manipulation, they underestimate the risk of product failure. The degree of consumers over-optimism is assumed exogenous and given by  $d - \widehat{d} > 0$ . We relax this assumption in Section 6. Note that one consequence of consumers being over-optimistic is that they underestimate the value of legal protection, that is, the expected compensation they receive from the seller under SR:  $(d - \widehat{d})\gamma > 0$ . This is the other facet of over-optimism, and, as we shall see, it plays an important role in what follows.<sup>14</sup>

Optimism implies that consumers have an incorrect perception of their surplus from consumption. The 'perceived (net) utilities' corresponding to (1), (2), and (3), are given by

$$\widehat{u}^S(p) = (1 - \widehat{d})B - (1 - \widehat{d}\gamma)p \quad (4)$$

$$\widehat{v}^S(p, i) = (1 - \widehat{d})B - (1 - \widehat{d}\gamma)p - ip \quad (5)$$

$$\widehat{v}^J(p, i) = (1 - \widehat{d})(B - (1 + i)p) \quad (6)$$

The unit profit of the seller on cash or independent-credit transactions under SR is

$$\omega^S(p) = (1 - d\gamma)p \quad (7)$$

Under linked credit the seller and lender set the price and the interest rate so as to maximize joint profits and then distribute these joint profits between themselves through a monetary transfer. Perfect competition in the credit market gives the monopolistic seller all the bargaining power and hence the possibility to appropriate the entire surplus. The unit profit that the seller makes on a linked-credit purchase under JR is therefore

$$\pi^J(p, i) = p - d(1 + i)p + ip - t \quad (8)$$

Instead, if SR also applies to linked-credit purchases, the unit profit of the seller becomes

$$\pi^S(p, i) = p(1 - d\gamma) + ip - t \quad (9)$$

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<sup>14</sup>One could as well assume that consumers also overestimate the compensation they receive from the seller under SR (or the likelihood of obtaining it):  $\gamma - \widehat{\gamma} \leq 0$ , where  $\widehat{\gamma}$  denote the consumers' beliefs about  $\gamma$ . Our results would remain qualitatively unchanged provided  $d\gamma - \widehat{d}\widehat{\gamma} > 0$ , that is, provided that the misperception of the probability of product failure is more severe than that of the likelihood of obtaining compensation (see Iossa and Palumbo, 2007).

Finally, while the surplus from selling to a consumer who buys for cash is always positive

$$w_R \equiv (1 - d)B > 0$$

we assume that the surplus from selling to a consumer who buys on credit may be either positive or negative, depending on the transaction cost of credit.

*Assumption 1*

$$w_P \equiv (1 - d)B - t > 0 \tag{A1a}$$

$$w_P \equiv (1 - d)B - t < 0 \tag{A1b}$$

Thus, under (A1a) welfare is maximized when both the rich and the poor purchase the product, with the rich buying for cash and the poor on credit. Under (A1b), only cash transactions are efficient: the poor should not buy. Denoting by  $W^*$  the first best level of welfare, we have

$$W^* = \begin{cases} w_{Rr} + w_P(1 - r) & \text{if (A1a) holds} \\ w_{Rr} & \text{if (A1b) holds} \end{cases} \tag{10}$$

### 3. Correct beliefs and linked credit

This section briefly illustrates the benchmark where consumers have correct beliefs. We highlight three things that are important when considering the desirability of the JR principle. First, linked credit is a device that makes it possible for the seller to price discriminate between rich and poor consumers. Second, in the absence of over-optimism, allowing for price discrimination, and thus for linked credit, is welfare enhancing. Third, in the absence of over-optimism, SR and JR are equivalent.

To see this, consider the case where SR applies to linked credit. Under independent credit, from (1) and (2), the reservation price of the rich is higher than that of the poor because the poor can only buy on credit and credit costs  $ip = t$ . Since the seller cannot distinguish between rich and poor consumers, he has two relevant options. Either he sets the price equal to the reservation price of the rich and thus sells only to them, or he lowers the price up to the reservation price of the poor and serves the whole market. The profit of the seller in each of these two cases are respectively  $w_{Rr}$  and  $w_P$  and it follows that under independent credit the seller's profit is given by

$$\Omega^S = \begin{cases} w_P & \text{under (A1a) if } w_P \geq w_{Rr} \\ w_{Rr} & \text{under (A1a) if } w_P \leq w_{Rr}, \text{ or under (A1b)} \end{cases} \tag{11}$$

The pricing choice of the seller results in market failure when (A1a) holds but  $w_P \leq w_{Rr}$ . In this case entry from the poor is efficient from a welfare point of view but unprofitable for the seller.

Linked credit can correct this inefficiency by allowing coordination of price and interest rate decisions, which in turn allows the seller to price discriminate between

rich and poor consumers. By setting  $i = i^S = 0$  and  $p = p^S$ , where  $p^S$  solves  $u^S(p^S) = 0$ , the seller can induce rich and poor consumers to separate: the rich buy for cash whilst the poor buy on credit.<sup>15</sup> The seller extracts the whole social surplus and offers credit only when the surplus from doing so is positive. The seller's profit is given by

$$\Pi^S = W^* = \begin{cases} w_{Rr} + wp(1 - r) & \text{under (A1a)} \\ w_{Rr} & \text{under (A1b)} \end{cases} \quad (12)$$

In this setting, imposing JR on linked-credit agreements has no impact on welfare or on the choice of the seller as to whether to make a linked-credit agreement: the seller would fully transfer the additional liability cost of the lender into a higher interest rate and replicate the equilibrium that arises under SR. In particular, he would charge  $p = p^S$  and  $i = i^J$ , where  $i^J$  solves  $v^J(p^S, i^J) = 0$ , and make profit  $\Pi^J = \Pi^S$ .<sup>16</sup>

*Proposition 1* When consumers have correct beliefs, linked-credit agreements have a positive impact on welfare and the joint responsibility principle is ineffective.

## 4. Over-optimism

Over-optimistic consumers are led by incorrect beliefs and this affects their willingness to pay. A measure of the extent to which over-optimism can hurt consumers is given by the difference between perceived and real utility, as denoted by  $\Delta v^i \equiv \widehat{v}^i(\cdot) - v^i(\cdot)$  for  $i = S, J$ , and  $\Delta u^S \equiv \widehat{u}^S(\cdot) - u^S(\cdot)$ .

Under SR, from (1) and (4), (2) and (5), we have

$$\Delta v^S = \Delta u^S \quad (13)$$

$$\Delta v^S = (d - \widehat{d})B - (d - \widehat{d})\gamma p \quad (14)$$

According to expression (13) under SR the effect of over-optimism is the same for cash and credit consumers. This holds because credit consumers must repay their debt to the lender regardless of whether the product is defective. Expression (14) captures the effect of misperception on consumers' willingness to pay. Since over-optimistic consumers underestimate the risk of product failure, the first term in (14) is positive. The second term is negative and represents the difference between the real and perceived value of consumer protection, given the liability of the seller  $p$ . The difference between these two terms is non-negative, i.e.  $\Delta v^S \geq 0$ , for any price and interest rate that induce consumers to buy, that is for any  $p$  and  $i$  such that  $\widehat{v}^S(p, i) \geq 0$ .

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<sup>15</sup>Note that at  $p = p^S$  and  $i = i^S = 0$ , rich consumers do not gain from switching to credit since  $u^S(p^S) = v^S(p^S, i^S)$ .

<sup>16</sup>However, the welfare equivalence between JR and SR may not hold in the presence of moral hazard. See Section 6 for a discussion of the impact of JR on the seller's incentives for product care.

The extent to which consumers may be hurt by their misperception, given by  $\Delta v^S$ , decreases with the size of the seller liability. By increasing the liability from  $p$  to  $L \equiv \frac{1}{\gamma}B > p$ , full protection, i.e.  $\Delta v^S = \Delta u^S = 0$ , could be achieved.<sup>17,18</sup> Increasing protection when consumers are over-optimistic is always beneficial for consumers because over-optimistic consumers underestimate the value of the additional protection and therefore are not willing to fully pay for it. Consequently, the seller cannot fully transfer the cost of an increase in liability into a higher price (or interest rate).

Two considerations follow. First, our assumption that the legal liability of the seller is given by  $p$  rather than  $L$  reflects the difficulty for policy makers in computing  $L$  because of lack of information on the relevant parameters. Over-optimism would not be an issue if the optimal level of liability could be placed upon the seller. The second and more important consideration is that, since JR increases consumer protection, the extent to which consumers can be hurt by their over-optimism is lower under JR than under SR. By comparing (14) and  $\Delta v^J$  where  $\Delta v^J = (d - \widehat{d})(B - p(1 + i))$  (from (3) and (6)) the following lemma is obtained.

*Lemma 1*  $\Delta v^S > \Delta v^J$  for any  $p$  and  $i$  such that  $\widehat{u}_p^i(p, i) \geq 0$ ,  $i = S, J$ .

## 5. Incentives for linked-credit agreements

### 5.1 Independent credit

Consider the case where consumers are over-optimistic and let  $\widehat{p}^S$  denote the reservation price of the rich and  $\widehat{q}^S$  denote the reservation price of the poor in the presence of over-optimism where  $\widehat{p}^S$  and  $\widehat{q}^S$  solve respectively:  $\widehat{u}^S(\widehat{p}^S) = 0$  and  $\widehat{v}^S(\widehat{q}^S, i\widehat{q}^S = t) = 0$ , and where  $\widehat{q}^S < \widehat{p}^S$ . If the seller sets  $p = \widehat{p}^S$ , he sells only to the rich and his profit is (from (1) and (7))

$$\Omega^S(\widehat{p}^S) = (w_R - u^S(\widehat{p}^S))r \tag{15}$$

where  $-u^S(\widehat{p}^S) > 0$ . Compared to the case of correct beliefs (eq. (11)) charging the reservation price of the rich yields the seller greater profits. This ‘misperception rent’ is given by  $-u^S(\widehat{p}^S)r > 0$  and it arises because over-optimism allows the seller to charge a higher price,  $\widehat{p}^S > p^S$ .

If instead the seller sets  $\widehat{q}^S$ , he sells to both the rich and the poor and obtains (from (2) and (7))

$$\Omega(\widehat{q}^S) = (w_R - u^S(\widehat{q}^S)) \tag{16}$$

The misperception rent is now given by  $-u^S(\widehat{q}^S) > 0$ .

<sup>17</sup>Note that only if  $\gamma = \widehat{\gamma} = 1$  will  $L$  equate utilities across states (as in Spence, 1977; Polinsky and Rogerson, 1983). If  $\widehat{\gamma} > \gamma$  the perceived utility in the bad state is greater than the real utility. Therefore,  $L$  must be greater than the loss ( $B$ ) suffered by consumers in the event of product failure.

<sup>18</sup>Note that if  $d\gamma$  were lower than  $\widehat{d}\widehat{\gamma}$ , consumers would overestimate protection and imposing a positive liability on the seller would not be optimal.

For simplicity, in the rest of the paper we shall restrict our attention to the case where  $\Omega(\widehat{p}^S) > \Omega(\widehat{q}^S)$ , so that under independent credit the seller sets  $p = \widehat{p}^S$  and sells only to the rich. Comparing (15) with (16), this occurs if  $r$  is sufficiently high.<sup>19</sup>

In the light of this, the level of welfare under independent credit is given by

$$\begin{aligned} W^S &= \Omega(\widehat{p}^S) + u^S(\widehat{p}^S)r \\ &= w_R r \end{aligned} \tag{17}$$

From (17) and (10), when (A1a) holds under independent credit there is a welfare loss: entry from the poor is efficient from a welfare point of view but it does not occur because it is unprofitable for the seller. Instead, when (A1b) holds under independent credit welfare is maximized: entry from the poor is inefficient and it does not occur.

## 5.2 Linked credit

*5.2.1 Seller responsibility* Let us consider the case where SR applies to linked credit. As in the case of correct beliefs, linked credit allows the seller to price discriminate between the rich and the poor. However, as we show below, contrary to the case of correct beliefs, linked credit may now cause inefficiencies.

When (A1a) holds, entry from the poor generates a positive surplus ( $w_P > 0$ ). With linked credit, the seller can then extract this surplus and perfectly price discriminate between rich and poor by setting  $i = \widehat{i}^S = 0$  and  $p = \widehat{p}^S$  so that

$$\widehat{u}^S(\widehat{p}^S) = \widehat{v}^S(\widehat{p}^S, \widehat{i}^S) = 0$$

The seller will then also gain a misperception rent  $u^S(\widehat{p}^S)$  from both classes of consumers and make profit equals

$$\Pi^S(\widehat{p}^S, \widehat{i}^S) = w_R r + w_P(1 - r) - u^S(\widehat{p}^S) \tag{18}$$

Under (A1b), entry from the poor is detrimental to welfare ( $w_P < 0$ ). However, because of the misperception rent, inducing the poor to buy will still be profitable if  $w_P - u^S(\widehat{p}^S) > 0$ . Assuming w.l.g. that linked credit occurs only if the seller makes profits strictly greater than under independent credit, we obtain the following proposition.

*Proposition 2* When seller responsibility applies to linked credit, linked credit is welfare enhancing under (A1a) whilst it creates a welfare loss under (A1b) if

$$w_P - u^S(\widehat{p}^S) > 0 \tag{19}$$

and it has no effect otherwise.

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<sup>19</sup>In particular if

$$\frac{r}{1-r} \geq \frac{w_R - u^S(\widehat{q}^S)}{-u^S(\widehat{p}^S) + u^S(\widehat{q}^S)}$$

where  $-u^S(\widehat{p}^S) + u^S(\widehat{q}^S) > 0$  since  $\widehat{p}^S > \widehat{q}^S$ . We discuss the case where the above does not hold at the end of Section 5.

As in the case of correct beliefs (Proposition 1), under SR, linked credit is welfare enhancing when (A1a) holds, but it is now socially harmful in case (A1b) when (19) holds. With over-optimism the seller manages to induce poor consumers to buy the product even if their utility is a negative.

Denoting by  $W^S$  the level of welfare under SR and taking into account the conditions under which linked credit occurs, we have

$$W^S = \begin{cases} \Pi^S(\widehat{p}^S, \widehat{i}^S) + u^S(\widehat{p}^S) = w_R r + w_P(1-r) & \text{under (A1a), or (A1b)} \\ & \text{if } w_P - u^S(\widehat{p}^S) > 0 \\ \Omega^S(\widehat{p}^S) + u^S(\widehat{p}^S)r = w_R r & \text{(A1b) if } w_P - u^S(\widehat{p}^S) < 0. \end{cases} \quad (20)$$

Comparing (20) with (10), and in light of Proposition 4, we obtain the following corollary.

*Corollary 1* With seller responsibility, a welfare loss arises when Assumption A1b and condition (19) hold.

**5.2.2 Joint responsibility** Under JR consumer protection is greater than under SR, which, as suggested in Lemma 1, implies that the consumer is better off under JR than under SR. We now show that JR ensures full consumer protection and aligns the seller's incentives to enter a linked-credit agreement with social-welfare maximization: under JR, linked credit (and therefore entry from the poor) is profitable as well as socially optimal if (A1a) holds, whilst it is neither profitable nor socially optimal if (A1b) holds.

Under JR, when (A1a) holds the seller will price discriminate between the rich and the poor by setting  $p$  and  $i$  such that (i) the poor buy on credit and their perceived utility is zero and (ii) the rich buy for cash. This leads to  $p = \widehat{p}^S$  and  $i = \widehat{i}^J$ , where  $\widehat{i}^J$  solves

$$\widehat{u}^S(\widehat{p}^S) = \widehat{v}^J(\widehat{p}^S, \widehat{i}^J) = 0$$

Two things then follow. First, the seller cannot extract any misperception rent out of those consumers who buy the product under linked credit. This occurs because under JR the consumer who buys on credit pays for the product only if the product is not defective, and thus misperception over the probability that the product is defective does not matter. In particular, at  $\widehat{v}^J(\widehat{p}^S, \widehat{i}^J) = 0$  we have  $p(1+i) = B$ , which implies  $v^J(B/(1+i), i) = 0$ . Second, the rich are not protected by JR; since the seller loses from JR, he sets the interest rate so as to dissuade the rich from switching to credit.

In the light of this, under (A1a), the seller's profit is given by

$$\Pi^J(\widehat{p}^S, \widehat{i}^J) = [w_R - u^S(\widehat{p}^S)]r + w_P(1-r) \quad (21)$$

whilst under (A1b) his profit is (15).

Denoting by  $W^J$  the level of welfare under JR and taking into account the conditions under which linked credit occurs, we have

$$W^J = \begin{cases} \Pi^J(\widehat{p}^S, \widehat{i}^J) + u^S(\widehat{p}^S)r = w_{RR} + w_P(1-r) & \text{under (A1a)} \\ \Omega^S(\widehat{p}^S) + u^S(\widehat{p}^S)r = w_{RR} & \text{under (A1b)} \end{cases} \quad (22)$$

Comparing (20) with (22) we obtain as follows:

*Proposition 3* Joint responsibility increases welfare when both (A1b) and condition (19) hold. In the remaining cases it has no impact on welfare.

Under JR, price discrimination and therefore linked credit occurs only when it is welfare enhancing. For this reason a joint responsibility legislation helps to ensure that linked-credit agreements are welfare enhancing. Since JR hurts the seller, leaving the choice of the liability regime (SR or JR) to sellers or lenders would lead to inefficient self-regulation. This provides a rationale for the existing legislation on JR.<sup>20</sup>

*Corollary 2* With over-optimism, the seller and the lender would never offer joint responsibility voluntarily.

*Proof* See the Appendix. □

## 6. Endogenous over-optimism: seller misrepresentation

Until now we have treated the degree of consumer over-optimism as exogenous. In this section, we briefly relax this assumption and analyse the incentives of sellers to generate over-optimism through misrepresentation. Seller misrepresentation is a well known concern of legislators who have long since put in place legislation aimed at dealing with it. The Misrepresentation Act 1967 in the UK and the fact that under JR the linked lender is also liable for misrepresentation by the seller provide an example.

We assume that the seller chooses the level of misrepresentation before knowing how a potential buyer would pay for the product. This seems realistic. We model seller misrepresentation as the undertaking of unverifiable actions (or the making of statements) that affect consumers' estimate of the probability of product failure  $\widehat{d}$  so as to increase or generate over-optimism. In particular, for any true probability  $d$ , the more the seller engages in misrepresentation the lower is  $\widehat{d}$ . For simplicity, and without loss of generality, we let  $\gamma=0$ . Formally, let  $g(\widehat{d})$  denote the total cost (e.g. intensity of the hard-sale practice) for the seller of inducing a level

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<sup>20</sup>Before concluding this section, recall that in Section 5.1 we assumed that  $r$  is sufficiently high that, under (A1a), with independent credit the seller prefers to set the price equal to the reservation price of the rich and sell only to them rather than lower the price and serve the whole market. It should be apparent now that if we relaxed this assumption linked credit would have no effect on welfare in case (A1a). However, Proposition 3, and Corollaries 1, 2, and 3 would continue to hold.

of misperception  $d - \widehat{d}$ , with  $\widehat{d} = [0, d]$ , we assume that  $g(d) = 0$ ,  $g'(\widehat{d}) < 0$ ,  $g''(\widehat{d}) > 0$ , and  $\lim_{\widehat{d} \rightarrow 0} g(\widehat{d}) = \infty$ .<sup>21</sup>

In this setting, it is easy to show that, given the level of  $\widehat{d}$ , the seller's choice of  $p$  and  $i$  still follows the analysis in Section 5. Now consider the optimal choice of  $\widehat{d}$  for the seller; the following result is then obtained.

*Proposition 4* The joint-responsibility principle lowers the incentives of the seller to misrepresent product quality, which generates a non-negative impact on welfare.

*Proof* See the Appendix.  $\square$

The level of over-optimism under JR is lower than under SR, because JR reduces the incentives of the seller to misrepresent product quality and the misperception rent that the seller can extract out of consumer over-optimism. Since engaging in misrepresentation constitutes a wasteful activity from a social point of view, a lower level of misrepresentation raises welfare.

Note that this beneficial effect of JR does not affect the poor consumers only, but it extends also to the rich who, as we have seen, always buy for cash. Since misrepresentation is lower under JR than under SR, the misperception rent of the seller is smaller, and all consumers are better off.

The results of this section show how JR is good for providing incentives to reduce seller misrepresentation. This is important since previous results in the context of environmental regulation have suggested that lender liability may reduce the incentives of the seller to invest in product care. In particular, Pitchford (1995) and Balkenborg (2001) have shown how the effect of lender liability on incentives for product care depends on the distribution of the bargaining power between the firm and the lender. The distribution of bargaining power between the seller and the lender instead plays no role in our context.<sup>22</sup>

## 7. Heterogeneous consumers

In this section we allow for the possibility that some consumers have correct beliefs. We show that since these consumers are willing to pay less for the product than the over-optimistic ones, if the seller does not manage to price discriminate between the

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<sup>21</sup>An alternative modelling choice could be to assume that misrepresentation is verifiable, although imprecisely and at some costs. In this case,  $g(\widehat{d})$  would represent the expected fine incurred by the seller. We believe that our simple formulation suffices to capture the idea that seller misrepresentation can be beneficial to the seller for it generates over-optimism, but it is costly.

<sup>22</sup>In particular, when the seller has all the bargaining power lender liability reduces the incentives for product care. This is because the higher the liability cost of the lender when the accident occurs (and the firm lacks sufficient funding to compensate victims), the greater the compensating payment which the firm will have to give to the lender in the event of no accident. This implies that the firm has less to gain from reducing  $d$ . Instead, the choice of  $\widehat{d}$  under JR does not depend on the distribution of the bargaining power between the lender and the seller. This is because the endogenous variable is  $\widehat{d}$  and not  $d$ ; thus, it does not matter whether the transfer is paid in the good or bad state.

two types of consumers, he might prefer to give up the misperception rent in order to serve all types. Thus, the presence of consumers with correct beliefs can help to address the market problems that may arise because of consumer over-optimism.

Let  $\alpha$  denote the fraction of rich and poor consumers with correct beliefs and for simplicity let  $\gamma = 0$ . Without loss of generality consider the case where  $p^S > \widehat{q}^S$  (which requires  $(d - \widehat{d})B < t$ ), so that the willingness to pay for each class of consumers is ranked as follows

$$\widehat{p}^S > p^S > \widehat{q}^S > q^S$$

Under independent credit, the associated profits are

$$\Omega^S(\widehat{p}^S) = [w_R - u^S(\widehat{p}^S)](1 - \alpha)r$$

$$\Omega^S(p^S) = w_R r$$

$$\Omega^S(\widehat{q}^S) = [w_R - u^S(\widehat{q}^S)][1 - \alpha(1 - r)]$$

$$\Omega^S(q^S) = w_P$$

Thus, for  $\alpha$  low and  $r$  high, the seller still prefers to set  $\widehat{p}^S$ , extract the misperception rent from the rich consumers and keep the poor out of the market. But if  $\alpha$  grows sufficiently high the seller prefers to set  $p^S$  and give up the misperception rent in order to sell to consumers with correct beliefs.

Consider now linked credit. If the seller sets  $\widehat{p}^S, \widehat{i}_S = 0$ , he obtains

$$\Pi^S(\widehat{p}^S, \widehat{i}_S = 0) = [w_R - u^S(\widehat{p}^S)](1 - \alpha)r + [w_P - u^S(\widehat{p}^S)](1 - \alpha)(1 - r)$$

whilst if he sets  $p^S, \widehat{i}_S = 0$  he makes

$$\Pi^S(p^S, \widehat{i}_S = 0) = w_R r + w_P(1 - r)$$

and again we find that for  $\alpha$  sufficiently high the seller gives up the misperception rent in order not to lose consumers with correct beliefs. The implication is that the presence of consumers with correct beliefs increases the likelihood that linked credit only occurs when it is welfare enhancing, as in our benchmark case of Section 3. Should this occur a joint-responsibility legislation would have no effect, as in Section 3.

Suppose however that the seller can offer a warranty  $G$  at the price of  $g$  to his customers. The seller will set  $g, G$  in order to separate consumers according to their beliefs and avoid losing the misperception rent. He can do this because of the other facet of over-optimism: over-optimistic consumers underestimate the value of additional protection and value the warranty at  $\widehat{d}G < dG$ .

To see this, consider rich consumers and suppose the seller sets  $\widehat{p}^S$  and offers a warranty contract  $\{G^*, g^*\}$  such that they self select: (i) those with correct beliefs buy the product and warranty, (ii) those with over-optimistic beliefs only buy the product. Incentive compatibility for (i) requires

$$u^S(\widehat{p}^S; g, G) = (1 - d)B - (1 - \widehat{d})B - g + dG \geq 0$$

$$g^* \leq dG - (d - \widehat{d})B$$

as consumers with correct beliefs are willing to buy the product only if the seller offers them a warranty that covers the misperception rent,  $(d - \widehat{d})B$ . Incentive compatibility for (ii) requires

$$g^* \geq \widehat{d}G$$

as over-optimistic consumers are not willing to pay more than  $\widehat{d}G$  to have the warranty. Combining the two conditions above, we obtain

$$(d - \widehat{d})(G - B) \geq 0$$

Thus, if  $G \geq B$  the seller can offer a warranty rent that does not attract over-optimistic consumers for the underestimation of the value of the warranty by the over-optimistic consumers is larger than the misperception rent  $(d - \widehat{d})B$ . Taking into account that the seller wishes to minimize  $G$  and maximize  $g$ , in equilibrium

$$\begin{aligned} G^* &= B; \\ g^* &\leq dG^* - (d - \widehat{d})B = \widehat{d}B \end{aligned}$$

It is easy to show that, because of the possibility for the seller to offer the warranty contract above, the presence of consumers with correct beliefs no longer works as a protection device for the over-optimistic ones. Indeed, when SR applies, linked credit with  $\{\widehat{p}^S, \widehat{i}_S = 0\}$  still occurs under (A1a) and (A1b) if (19) holds. In the first case, the seller offers the warranty contract  $\{G^*, g^*\}$  to all consumers and serves all of them; in the second case, he offers the warranty contract only to those consumers who buy for cash, and serves all consumers but the poor with correct beliefs.<sup>23</sup> Because over-optimistic consumers do not buy the warranty, the seller continues to obtain the misperception rent from them. We summarize the results of this section below.

*Proposition 5* The presence of consumers with correct beliefs can help to protect over-optimistic consumers but it may not suffice to eliminate the market failure due to consumer over-optimism.

## 8. Discussion

We have studied the impact of a legal principle that makes the seller and the lender jointly liable to the debtor for breach of the sale contract by the seller under linked credit. We have shown that joint responsibility helps to correct the market failure that may arise because of over-optimism and seller misrepresentation, and it helps to ensure that linked-credit agreements are welfare enhancing. We have

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<sup>23</sup>Note that it is sub-optimal for the seller to offer the warranty to all consumers. When  $\widehat{i}_S = 0$  under SR rich and poor behave in the same way so if the rich consumers with correct beliefs buy the warranty so do the poor ones. With  $w_p < 0$  the seller would then make negative profit on poor consumers with correct beliefs.

also shown that joint responsibility reduces the incentives of sellers to engage in misrepresentation. The rationale for this legal principle stems from the fact that while JR reduces market failure due to over-optimism, it would not be offered voluntarily.

To illustrate the robustness of our results, we conclude by highlighting two possible extensions and discussing some of the assumptions of the model.

**8.1.1 *Damage*** We have assumed throughout that product failure causes no other loss to consumers than the foregone benefit of consumption. In practice, however, product failure may result in injuries or other types of damage. When product failure causes damage, JR reduces but does not eliminate the inefficiency that can arise under SR. Consumers can resort to the lender when the seller goes bankrupt, which increases consumer protection, but they still need to resort to the judicial system to obtain compensation for damages. Thus JR protects consumers from the possibility of seller bankruptcy but not from the inefficiency of the judicial system. In countries with an established tradition for protecting consumers' interests or where consumers associations are strong enough to ensure that consumers are fully compensated for the damages they suffer, JR ensures full consumer protection (see Iossa and Palumbo, 2007 for a formal derivation of this result).

**8.1.2 *Heterogenous tastes*** In a previous version of this paper (Iossa and Palumbo, 2007) we showed that when consumers differ in their valuation of the product, full price discrimination through credit subsidization is no longer feasible. For large differences in evaluations the seller may choose to supply only rich consumers also under (A1a). When (A1a) holds it may then be socially optimal to let the seller take advantage of consumer misperception in order to mitigate the monopoly inefficiency. JR will continue to be desirable when tastes are not too heterogeneous or if the number of rich consumers is sufficiently low.

**8.1.3 *Other justifications for linked credit*** We have considered a situation where incentives to make linked-credit agreements stem from the possibility to engage in price discrimination. However, there may be reasons other than price discrimination to justify linked credit. For example, coordination can be a way to reduce the cost of lending, by using the facilities of the seller to supply credit (Wertenbroch, 2003). Some of our results extend to this setting. In particular, joint responsibility will still help to reduce the misperception rent of the seller and the incentives of the seller to misrepresent the quality of its product.

**8.1.4 *Market structure*** We have assumed that the product market is monopolistic and the capital market is perfectly competitive. If we expand the setting to allow for at least some competition in the product market, the misperception rent that a seller can appropriate would fall, which would reduce the incentives to misrepresent product quality. The welfare gain from JR would still arise but be lower than in

the case of a monopolistic product market. Our results do not however extend to the case of perfect competition in both markets. The reason is twofold. First, with competitive markets there is no scope for price discrimination (and hence for linked credit).<sup>24</sup> Second, over-optimistic consumers would perceive themselves as worse off under joint responsibility because perfect competition forces sellers (lenders) to fully transfer the cost of additional liability into higher prices (interest rates).<sup>25</sup> Therefore, linked credit would not arise in equilibrium. However, it is also the case that under perfect competition sellers have no incentives to engage in costly misrepresentation, and therefore over-optimism may not be an issue there.

**8.1.5 Risk aversion** The need for JR legislation also rests on the inability of insurance markets to develop and protect consumers from product failure. The reason is that over-optimistic consumers underestimate the likelihood of product failure and thus the value of insurance for product failure. Consumers who are sufficiently risk averse may be willing to pay a risk premium that is sufficient to cover the risk for the insurer but risk neutral consumers would not.

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<sup>24</sup>Note that the discussion in Section 5 does not rely on the seller pricing behavior. Thus, also under perfect competition in the product market, i) over-optimism hurts consumers (unless the seller liability is equal to  $L$ ) and ii) JR benefits consumers by reducing the difference between their perceived and real utilities.

<sup>25</sup>Indeed, Spence (1977) shows that under perfect competition the voluntary level of liability offered by sellers is zero.

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## Appendix

*Proof of Corollary 3* Under (A1a), the seller earns  $\Pi^J(\hat{p}^S, \hat{i}^J)$  under JR, and  $\Pi^S(\hat{p}^S, \hat{i}^S)$  under SR, where, from (18) and (21):  $\Pi^S(\hat{p}^S, \hat{i}^S) > \Pi^J(\hat{p}^S, \hat{i}^J)$ . Under (A1b), the seller earns  $\Omega^S(\hat{p}^S)$  under JR and  $\max[\Pi^S(\hat{p}^S, \hat{i}^S), \Omega^S(\hat{p}^S)]$ , under SR.  $\square$

*Proof of Proposition 4* From the analysis in Section 5, when (A1a) holds, the seller makes a linked-credit agreement under both SR and JR. Let  $\hat{d}^S$  and  $\hat{d}^J$  be the level of  $\hat{d}$  that maximize respectively  $\Pi^S(\hat{p}^S, \hat{i}^S)$  and  $\Pi^J(\hat{p}^S, \hat{i}^J)$ , as given by expressions (18) and (21). We have

$$\frac{-\partial u^S(\hat{p}^S(\hat{d}^S))}{\partial \hat{d}} = g'(\hat{d}^S); \quad \frac{-\partial u^S(\hat{p}^S(\hat{d}^J))}{\partial \hat{d}} r = g'(\hat{d}^J)$$

implying  $d > \hat{d}^J > \hat{d}^S$ . Thus, welfare increases under JR. When (A1b) holds, the seller may make a linked-credit agreement under SR whilst he will never make it under JR. The effect of JR on welfare then follows by noting that the level of  $\hat{d}$  that maximizes  $\Omega^S(\hat{p}^S, \hat{i}^S)$ , as given by expressions (15), is  $\hat{d} = \hat{d}^J > \hat{d}^S$ .  $\square$