Private Labels, Buyer Power and Competition Policy

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A thesis submitted in November 2008 in fulfilment of the requirements for the degree of Doctor of Philosophy in Economics at the London School of Economics and Political Science

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2 Abstract

Private labels – products controlled by retailers instead of suppliers - are an increasingly important market segment for firms worldwide. They, and the closely related concept of buyer power, have become a topic of major interest and concern for competition authorities around the world.

Firstly we explain the growth of private labels as retailers taking over the role of quality certification from suppliers. Consumers, wary about product quality, seek reassurance in a brand they can trust, and this role of certifying quality is moving downstream from manufacturers to distributors. We explain this by modelling the negotiations that takes place within the production chain, and demonstrate that by establishing a private label a retailer improves his sourcing options and hence his bargaining position, and increases his profits.

Next we examine how the presence of private labels in a market affects non-price competition between firms, in particular incentives to invest, an area which the literature has neglected in favour of a simple focus on prices. We demonstrate that, while under certain conditions the conventional wisdom that private labels can reduce suppliers' investment incentives can be correct, the outcome is more complex than traditionally thought. Private labels can also potentially spur suppliers to increase investment, which ultimately benefits consumers.

Thirdly we examine the implications of private labels for an argument of great significance in competition policy: the countervailing buyer

power merger defence. We discuss several major cases where this idea – that buyer power downstream can prevent wholesale prices rising following an upstream merger – has been crucial in determining the outcome. We present a formal model of this argument – to our knowledge the first – and demonstrate some limitations to the validity of this defence, but also highlight circumstances where it may be unexpectedly applicable.

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3 Acknowledgements

I'd like to express my gratitude to my supervisor Professor Andrea Prat. His insights and comments were invaluable in improving the quality of my research and in ultimately enabling me to complete this thesis.

I'd also like to thank Professor Roman Inderst who provided significant guidance during the early stages of my research and helped me gain a complete understanding of my research topic.

I also gratefully acknowledge the scholarship I was awarded by the UK Economic and Social Research Council.

4 Main Introduction

The dramatic growth of private labels is one of the most important developments in retailing that has occurred in the past two decades. The traditional dominance of large suppliers and their brands has been successfully challenged by increasingly confident retailers who in addition to selling products are now taking more control of the whole industrial structure behind their introduction, development and marketing.

Private labels are complex and multi-faceted, and raise a whole range of questions. Various authors have focussed upon different aspects of their nature. These include how they affect the positioning of goods within the product space, their impact upon competition within and between stores and their effect upon retail prices and output. As a result it is not to be expected that there can be any one model that entirely explores all of the issues they raise, instead there are many different valid approaches and avenues of inquiry, each of which can examine different aspects of these goods.

Private labels have traditionally fallen into somewhat of a gap between various academic disciplines. On the one hand the economic literature on industrial organisation has developed advanced models to examine the nature of competition between firms. Using formal techniques such as game theory and econometrics economists have been able to rigorously explore key issues such as price setting, investment and bargaining between firms.

The power of these models lies in their generality, their results do not depend upon the exact products in question, or the names of the firms that sells them, but are instead derived from industry fundamentals such as the costs of production and the nature of demand. However, the strength of these models is often their very weakness, by attempting to always be so general such models risk becoming slightly detached from real world developments and failing to address specific issues that policy makers and practitioners face. This is to some extent the case with private labels, which fall within the realm of such work but have received relatively little attention in the literature so far.

On the other hand there are many more applied academic fields such as business, marketing and management which often use less technical forms of analysis, but more readily address specific real world developments such as private labels. Such literatures can be very informative; many facts are noted, trends described and theories suggested and discussed. However, the less formal nature of these disciplines can potentially limit their ability to rigorously test the hypotheses they put forward and critically evaluate competing explanations for observed outcomes.

This thesis attempts to combine these two separate narratives and contribute to a growing formal economic literature on private labels. By bringing together the factual insights and ideas of the applied literatures and the formal tools of the economic literature the key issues and questions that have been raised with respect to private labels can be

addressed.

In the first paper we adopt an entirely new perspective on private labels by going back to first principles and reconsidering what role these goods fundamentally perform. An argument is developed that the key feature of store brands is that they represent the retailer taking over the responsibility for quality certification of goods from suppliers. We model these goods as being effectively identical to national brands, with the only difference being that retailers are responsible for their branding instead of suppliers.

By taking this approach we focus attention upon an issue that has been widely discussed in the marketing literature, but is only now receiving attention by economists, and that is how private labels affect the vertical relationships between retailers and their suppliers. It has often been suggested that the introduction of these goods serves to improve a retailer's negotiating position with those firms it purchases its inputs from, but often the mechanism through which this comes about is not clearly defined. We show that by establishing a private label a retailer can source his inputs more widely, which improves his outside option and thereby increases the proportion of industry profits which he is able to secure.

In the second paper we examine how private labels affect competition between retailers that possess them and those that do not. Unlike most of the literature, however, we examine non-price competition between

firms, particularly investments into quality. Such alternative forms of competition have been relatively neglected by the existing literature, and can potentially indicate key dynamic implications of the introduction of private labels. We show that both pro- and anti-competitive outcomes are possible, that these goods can potentially lead to either higher or lower levels of product quality.

In the third paper we examine how private labels fit into wider issues that arise in competition policy. More specifically, we model them as providing a retailer with countervailing buyer power through which he can resist an increase in his wholesale price following an upstream merger. We then test the argument that the presence of such power means that an otherwise problematic upstream merger should be allowed to proceed, and demonstrate that such reasoning is potentially flawed as the merger can serve to create a barrier to entry into the market, which weakens the competitive constraints acting upon the downstream retailer. Therefore we demonstrate that the issue of private labels potentially has far reaching implications, with consequences for the debate into buyer power and topics in merger control.

5 Private Labels and Quality Certification

5.1 Introduction

Private labels, often also called own labels or store brands, have seen rapid development and growth over the past few decades. Across many countries and product categories private labels have achieved high levels of market penetration, and are now a crucial feature of many retail markets. In this article we explore the reasons behind the development of these goods, and seek to understand their impact upon competition and welfare.

The market most often associated with private labels is grocery retailing, and we emphasise the particular relevance of our model to this industry.[1] However, it is important to recognise the importance of own labels across the whole economy. For example Kumar and Steenkamp (2007) note that over 45% of clothes sales in the US are private labels, with this figure being over 65% in some product categories. They also discuss the importance of store brands in product categories as diverse as books and financial services, and note that worldwide private label sales are now worth one trillion dollars.

In our model we focus upon the role of branding as providing a form

[1]For example private labels account for over 40% of all UK grocery sales, and as noted by Boston Consulting group (2007), this growth is increasingly broad based. They have grown across market categories (packaged food, household goods etc), across segments (mass market, premium) and across channels (convenience, online).

of quality certification for consumers who are wary of product quality.[2] As we argue in our stylised facts in the next section, the role of branding is key in consumer good industries but has been relatively overlooked by the literature on private labels.

We endogenise the branding process, allowing both suppliers and retailers to engage in brand building. Crucially, we note how this affects the bargaining position of firms at both levels of the production chain, and determines the division of profits. We find that by establishing a private label a retailer improves his negotiating position as he is then able to source his inputs from both branded and unbranded suppliers, since he is able to sell the products of the latter certified by his own label.

Contrary to the existing thinking of many practitioners, who worry they can lead to firms having excessive buyer power, we demonstrate that the ability of retailers to establish private labels can only improve welfare. Without store brands industries may suffer from a lack of any quality certification at all because a hold-up problem prevents suppliers from investing in brand building. This leads to a market failure where both firms and consumers suffer, a problem we show private labels can overcome.

The majority of the literature on private labels simply seeks to examine their introduction and impact in a horizontal context, upon intra-

[2]There is of course, following Akerlof (1970), a significant literature on consumers buying goods of uncertain quality. The idea of quality certification was introduced by Viscusi (1978), while Klein and Leffler (1981) and Shapiro (1983) similarly study the incentives of firms to invest in a reputation for high quality.

store competition with national brands and inter-store competition between retailers.[3] However, in their survey of the literature Bergès-Sennou, Bontems and Réquillart (2004) note that it has also been recognised that introducing a private label improves a retailer's bargaining position with respect to his suppliers, though there has been relatively little formal research into this.[4]

One key exception is Scott Morton and Zettelmeyer (2004) who note that private labels allow retailers to take over the positioning of goods in the product space, and allow them to position them as close substitutes for branded goods. This improves their outside-option in negotiations with suppliers and allows them to obtain preferential terms of supply from manufacturers.[5]

Similarly, Gabrielsen and Sørgard (2007) present a model where a retailer can stock a private label in addition to a national brand, and demonstrate that this threat can lead to price concessions from suppliers in exchange for an exclusivity contract where retailers commit to not introducing the private label.

One shortcoming of the literature is its failure to explicitly tackle the issue of why the market share of private label goods has increased

[3]For example there is a significant empirical literature on this, see Sethuraman (1992), Raju, Sethuraman, and Dhar (1995), Ward, Shimshack, Perloff and Harris (2002), Putsis (1997) and Bonfrer and Chintagunta (2004).

[4]Similarly Steiner (2004) notes that "Retailers with large private label sales are better able to bargain with manufacturers for a lower price". He quotes the 2000 Private Label Manufacturers Industry Roundtable, who claim that a strong private label allows a retailer to get better deals from manufacturers.

[5]Sayman, Hoch and Raju (2002) and Narasimhan and Wilcox (1998) both also discuss the impact of private labels upon vertical relationships.

so dramatically in recent years; if it is in a retailer's interests to introduce an own label good now, why was it not 20 years ago? We turn to this question in an extension and demonstrate a link between increased concentration in retail markets and the growth of private labels.

The rest of the paper is organised as follows, in section 2 we review the existing literature on private labels and use it to present four stylised facts upon which we build our model. In section 3 we briefly lay out a basic horizontal model of consumers facing products of uncertain quality. In section 4 we develop the main vertical model where we endogenise branding decisions and examine the way in which private labels affects the bargaining between suppliers and retailers. In section 5 we extend our model to investigate the effects of increasing retail concentration on the establishment of own labels. In section 6 we conclude.

5.2 Stylised Facts about Private Labels

5.2.1 Production

It is important to realise that just because a retailer controls and brands a private label, it doesn't mean he is directly responsible for its production. Instead of producing the good himself he may instead outsource its production, often to a firm from a competitive fringe of small manufacturers, or even to a large manufacturer of branded products.[6]

[6]Quelch and Harding (1996) note three reasons for national brand producers to manufacture their own competitors. Firstly to use up spare capacity. Secondly, because if they didn't produce them someone else would anyway. Thirdly to diversify their activities, particularly over the business cycle as it has been suggested that sales

For example, Bergès-Sennou, Bontems and Réquillart (2004) provide evidence from the French dairy sector, noting the existence of all three methods of private labels production. All large dairy firms also produce private labels, several medium and small manufacturers specialise in private labels, and at least one retailer has its own production unit.

If fact, it makes sense for retailers to outsource production because they may well lack knowledge of the production processes required to manufacture the goods themselves. This point is emphasised by Hughes (1996), who notes that

> "Most UK food retailers do not have the facilities to manufacture their own private label products, so they rely instead upon outside suppliers."

Based upon these observations we make the following observation

1. The production of private labels is often outsourced to other firms.

This is therefore the approach we adopt here, with private labels being manufactured by suppliers not the retailer, which is an important difference from much of the existing literature which often makes an implicit assumption of self-production by retailers.[7]

of private labels are anti-cyclical.

[7]For example see Gabrielsen and Sørgard (2007) and Sayman, Hoch and Raju (2002).

5.2.2 Quality

Private label goods have traditionally been seen as low quality products, with plain packaging and little to no attempt by retailers to engage in brand-building. However, the market has been undergoing rapid change, particularly in countries such as the UK where it is well developed. Here private labels have succeeded in transforming themselves into effective rivals for many of the leading national brands, with their quality being seen as comparable to these goods.[8] Dobson(2005) notes that

> "In contrast to other countries where own-label ranges might be seen simply as cheap, low-quality products, own-label goods in Britain consist of multi-tiered ranges, from basics (so-called "value" lines) to premium goods (e.g., Tesco's "finest" range), with the latter acting as direct rivals to the major branded goods."

In a report on private labels Boston Consulting Group (2007) note a similar fact, that far from simply being discount products, own labels now occupy all market segments including mass-market and even premium. In their report they comment on the similarity between private labels and established brands.

> "Most consumers would be hard-pressed to tell you how manufacturer brands, as a group, differ from ROBs [Retailer Own

[8] These historical developments are discussed in Hughes (1997).

Brands]. From a shopper's perspective, they are simply competing brands on a shelf".

This is further emphasised by Thomassen (2007) who discusses a recent Nielsen study which found that more than 50% of UK shoppers believe that private label beer or coffee is of same or better quality than traditional brands.

This similarity of quality is further emphasised by the point made above that private labels are often produced by the very same firms that manufacture leading national brands. Quelch and Harding (1996) note how widespread this is, commenting that

> "More than 50% of U.S. manufacturers of branded consumer packaged goods make private-label goods as well."[9]

We therefore make the following statement

2. Private labels are now often the same quality as established national brands.

Based upon this observation, we construct a model where consumers do not view private labels as being of lower quality than national brands, which is a different approach from much of the literature.[10]

[9] For example, they note that Heinz is a major supplier of private-label baby food.

[10] For example see Mills (1995), Gabrielsen and Sørgard (2007) and Scott Morton and Zettlemeyer (2004).

5.2.3 Branding

Given the amount of money spent on advertising, it is clear that branding is a major feature of consumers goods industries. Quelch and Harding (1996) note that branding plays an important role of quality certification, claiming that

> "Brand names exist because consumers still require an assurance of quality when they do not have the time, opportunity, or ability to inspect alternatives at the point of sale."[11]

They also quote James Burke, former CEO of Johnson and Johnson, as saying

> "[A brand is] the capitalized value of the trust between a company and its customers".

Given the development of private labels, as noted in our second stylised fact, we echo the view expressed by Kumar and Steenkamp (2007) who claim that

> "Retails now position private labels as brands in their own right".[12]

[11] Quelch and Harding were actually making this point with respect to national brands, claiming this is an advantage they posses over private labels. However, as noted below, we argue such a certification role can be played by all brands, including ones controlled by retailers.

[12] They quote several examples of strong private label brands including IKEA and several owned by Decathlon.

Therefore, we argue that it is also entirely reasonable to interpreting private labels as performing a similar role of quality assurance as established national brands. We therefore state our third stylised fact

3. Branding is a key feature of modern private labels, and plays a crucial role of quality certification.

Therefore, we focus upon the role of branding as quality assurance, and private labels as the method by which retailers can take over this role from suppliers.

5.2.4 Growth

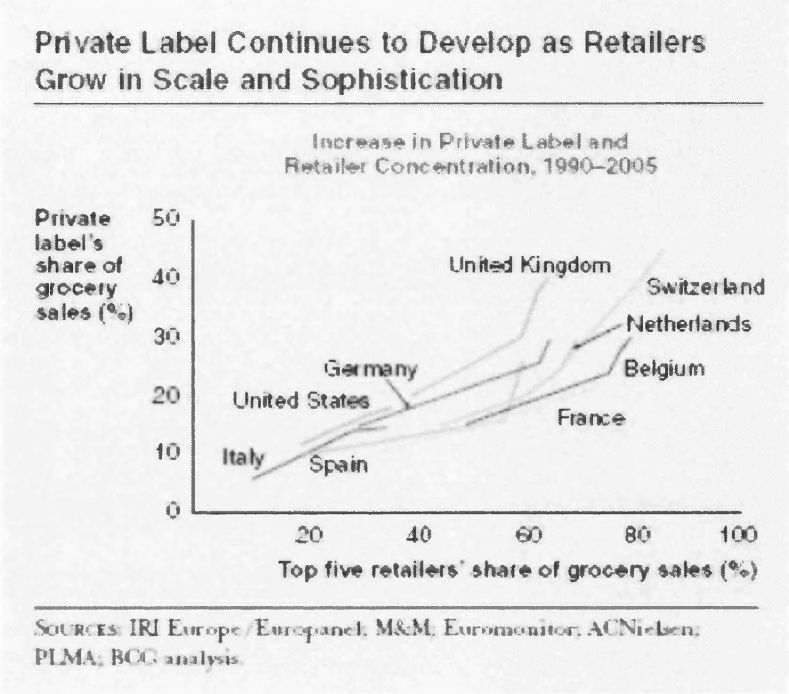
A key feature of the private labels market has been its dramatic growth over the past few decades and, as shown in the following figure from Boston Consulting Group (2007), worldwide this is strongly correlated with the increasing concentration of retail markets.

Note that this relationship holds both across time within a country, and in cross section between countries. The correlation between these two variable is further noted by Bergès-Sennou, Bontems and Réquillart (2004) who comment that

> "PL penetration, as measured by market share, also increases with retail concentration as measured by the CR5."

Based upon these observations of the data, we state our final stylised fact

Figure 1: Growth of Private Labels and Retailing Concentration



4. Private Labels have grown rapidly, and this has occurred alongside a significant increase in retailing concentration.

Though of course it is important to recognise that correlation doesn't imply any sort of causation, a model of private labels that drew a link between increased retailing concentration and the growth of own brands would be stronger for fitting these observed facts.

5.3 The Horizontal Model

5.3.1 The Basic Setup

Before moving to consider the vertical aspects of branding, we first establish a benchmark case with no vertical dimension for comparison. We have two retailers, R_1 and R_2 in the downstream market. R_1 sells a high

quality good of quality $\hat{u}$, while R_2 sells a low quality product quality $\check{u}$; with $\hat{u} > \check{u}$. We assume that both retailers can produce their goods at constant marginal cost 0, and that we have $\hat{u} > 0 > \check{u}$. We denote the average quality as $\bar{u} = \frac{\hat{u}+\check{u}}{2}$, and further assume that we have $\bar{u} < c = 0$.

There is one representative consumer, who can buy a variable amount of one of the goods in each of two periods; he may not purchase both goods, though he may purchase none if he so wishes. Retailers compete by setting their prices $p_i \geq 0$ simultaneously, these can be changed between periods.

We define the following term which we will use later

$$\tilde{\pi} = \left(\frac{\hat{u}}{2}\right)^2$$

The consumer's utility function is a function of the quality of the good he purchases, his chosen quantity, and the price set by the retailer. It is given by

$$U(u_i, q) = u_i q - \frac{q^2}{2} - p_i q$$

Taking first order conditions on quantity, we can solve for the consumer's demand function

$$q = u_i - p_i$$

We can see that a consumer will purchase a good only if its price is

below its (perceived) quality, so there is no profitable trade between the consumer and R_2. In the first period, the consumer decides if to purchase the good at all, then who to buy it off, and lastly how much to purchase. After buying a good in period one he becomes aware of its quality and then has the option of purchasing more of the same good in the second period.

We assume the consumer may not switch goods, we motivate this assumption by the existence of a large switching cost which would not make this worthwhile, for example this could be because a consumer would need to expend effort to become familiar with a second product. Alternatively this can be explained by recent insights from behavioural economics which note that consumers don't always act optimally; for example they may irrationally not wish to expend the effort of considering switching products, or may be unduly fearful of the downside risks of doing so, and may therefore display undue product loyalty.[13]

We generalise our model by assuming that if a consumer purchases a product there may be a minimum purchase requirement, which we denote as y.[14] For example products are generally only available in discrete quantities and tend to come in packages of a given size, so it is potentially not possible to purchase certain very small quantities. We define the following value

[13] See Howells (2005) for a discussion of consumer behaviour and behavioural economics, and how such insights have recently impacted upon consumer policy.

[14] Note that we can set $y = 0$ and allow infinitely small purchases and our model works equally well.

$$x = \frac{y^2}{2} - \bar{u}y$$

Here $-x$ is the expected payoff experience by a consumer who purchases a product of expected average quality for zero price. We assume that the minimum purchase quantity y is not too large, so that a consumer who purchases such an amount of an expected average quality product wouldn't expect to incur an excessively large loss.

$$x \leq \frac{\tilde{\pi}}{4}$$

5.3.2 Observable Quality

We turn first to the case when the consumer can observe the quality of the goods being sold by retailers. In this situation we can ignore the issue of competition between retailers because the consumer will never want to purchase off the low quality retailer because $\check{u} < 0$.

We prove the following result for the equilibrium here.

Lemma 1 *In equilibrium the low quality retailer earns zero profits, while the total profit of the high quality retailer and utility of the consumer are*

$$U^* = \tilde{\pi}$$

$$\Pi^*_{R_1} = 2\tilde{\pi}$$

Proof. See Appendix. ■

Total welfare, the sum of consumer utility and firms' profits, is therefore

$$W = 3\tilde{\pi}$$

5.3.3 Unobservable Quality

Previously we considered the special case when the consumer was perfectly informed as to the quality of the products sold by the two retailers. We now relax this assumption and examine the case when the consumer is initially unsure of the quality of the products sold by the two retailers, and instead is only aware of the average quality in the market, $\bar{u}$. Henceforth, where appropriate, we work in terms of expectations of both profit and utility based upon this probabilistic choice.

If the consumer does choose to buy a positive quantity of a good in the first period, he becomes aware of its true quality. He has the option to purchase the same good again in the second period; if the good is revealed to be of low quality after purchase in the first period the consumer will not exercise this option and will purchase a zero quantity in the second period. Alternatively, if the good purchased is revealed to be of high quality then the second period will proceed in a similar fashion to the case examine above with observable quality.

We can show the following result

Lemma 2 *In equilibrium the low quality retailer earns zero profits, while the total profit of the high quality retailer and utility of the consumer are*

$$U^* = \frac{1}{4}\tilde{\pi} - x$$

$$\Pi^*_{R_1} = \frac{1}{2}\tilde{\pi}$$

Proof. See Appendix. ■

The consumer will wish to purchase a good in the first period to enable him to discover its quality and then have the chance of earning positive profits in the second period. But the expected quality of the good is $\bar{u} < 0$ so he will wish to purchase as little as possible, just enough to learn its quality, the minimum amount y. As we demonstrated in the proof of Lemma (2), the optimum prices in the first period for both firms are zero, hence retailers make zero profits in this period even though one of them will make some sales.

Substituting the average quality $\bar{u}$ and the equilibrium prices 0 into the consumer's utility function yield that in the first period he stands to make an expected loss of x. There is a 50% chance that the good he purchases in the first period happens to be of high quality, if it is then the second period proceeds as in the observable quality case and full period profits and utility are earned. Therefore retailer profits are one quarter of what they were in the observable case, and the consumer's utility is one quarter minus the expected first period loss x. Note that our

earlier assumption on the magnitude of x ensures that the consumer's participation constraint is satisfied and he will wish to undertake the given strategy described.

We have a total welfare of

$$W = \frac{3}{4}\tilde{\pi} - x$$

Therefore in this equilibrium where quality is unobservable there is a significant market failure. There is a welfare loss of x in the first period when the consumer makes the minimum purchase to test out the quality of the good, and there is only a 50% chance that positive welfare will be achieved in the second period, if the consumer happened to pick the high quality good in the first period.

5.3.4 Certification Equilibria

From our results in the last section we see that there is clearly scope for some kind of signalling or certification of quality to improve welfare. We now consider this possibility, that the retailers are able to engage in the branding of their products as a signal of quality, and examine whether this is able to solve the market failure that results from the asymmetric information about product quality.

We model this by adding an initial stage to the game where retailers are able to engage in quality certification. This stage, undertaken before prices are set and the consumer undertakes his purchasing deci-

sions, features both retailers simultaneously engaging in money burning signalling. Here, therefore, we focus on "soft" certification, where money spent on advertising creates a strong brand image which indirectly signifies the high quality of the good to consumers, similar to Milgrom and Roberts (1986). However, our model could apply equally well to "hard" certification - where high quality firms can spend money on some credible signal of quality, such as obtaining a certificate from an independent quality-monitoring body.

For example the UK Soil Association, a body committed to promoting organic food and farming, has a specialist arm "Soil Association Certification Ltd." which specialises in certifying products as organic. After providing detailed information, and allowing inspectors to visit their premises, firms that meet the required standards are entitled to declare themselves as officially certified organic by the Soil Association and can brand their products with the official symbol of the body.

We model retailer R_i deciding what quantity of money γ_i to spend on branding his good as a signal of quality. We then see if there is a separating equilibrium where the high quality retailer, R_1, spends a given amount γ^* which serves as a credible signal of his high quality; with the consumer having the belief that the quality of the good is high only if spending on quality certification by that firm is at least γ^*, and the low quality retailer R_2 has no incentive to falsely certify his quality as high. We make a small assumption here, which is that if a firm is

indifferent about investing in establishing a brand, he will not do so.[15]

We have the following result

Lemma 3 *There is a certification equilibrium where only the high quality retailer engages in quality certification. The amount he spends on this is*

$$\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$$

Here the low quality retailer earns zero profits, while the total profit of the high quality retailer and utility of the consumer are

$$U^* = \tilde{\pi}$$

$$\Pi^*_{R_1} = 2\tilde{\pi} - \gamma^*$$

Proof. See Appendix. ■

If R_1 decides to engage in signalling, we are effectively in the observable quality equilibrium from above, while if he decides not to we are effectively in the unobservable quality equilibrium. Money burning is therefore profitable for him provided the cost of doing so is less than the extra profit he stands to make in moving to the observable quality situation: $\frac{3}{2}\tilde{\pi}$.

If the low quality retailer does not certify then he earns zero profits,

[15]This simply serves to remove awkward points of indifference where it is hard to pin down an agent's exact behaviour, ensures that all indifferent firms act in the same way, and allows us to focus on our main results. This assumption is entirely realistic, a firm is unlikely to spend money now with the hopes of only making it back with no profit at a later date because of risk aversion.

as in the unobservable quality equilibrium, while if he falsely signals his good as high quality he earns one period of high quality profits before consumers realise and decide not to repurchase his good in the second period. He will therefore not choose to engage in quality certification provided the cost of doing so is greater than the amount he stands to make from it: $\tilde{\pi}$.

Therefore the logic underlying this certification equilibrium is that the gains to signalling are greater for the higher quality retailer than the low quality one. R_2 only stands to make one period of full profits before consumers realise he falsely signalled his quality, while R_1 stands to make two periods of profit after doing so. Therefore, as long as the cost of certification lies between these two levels of profit, it is optimum for the high quality retailer to signal his quality but not the low quality one to falsely do so.

Given that γ^* is spent on signalling, here we have a total welfare of

$$W = 3\tilde{\pi} - \gamma^*$$

We showed that in equilibrium $\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$, substituting this into the above equation therefore yields a welfare level of

$$2\tilde{\pi} \geq W > \frac{3}{2}\tilde{\pi}$$

Therefore we see that by being able to engage in quality certification

welfare has been significantly increased above the level in the unobservable quality case, though it is not as high as in the observable case as money needs to be wasted here on signalling.

5.4 The Vertical Model

Now we enhance our basic model to enable us to examine the key issue of how the role of quality certification is split between suppliers and retailers. We introduce a vertical element into the game; R_1 is now supplied by one of two upstream suppliers, S_1 and S_2, who both produce a good of quality $\hat{u}$ at marginal cost $c = 0$. Similar to the basic model, this vertical chain will now, as a whole, want to engage in the branding of its product, but the question of how this will occur within the chain is of interest.

Several possibilities come to mind; perhaps each firm will try to avoid paying the certification cost, aiming to free-ride off the branding done by the other party in the vertical agreement. On the other hand, if the other firms are not engaging in certification it may be in one agent's unilateral interest to bear the financial burden of doing so because the personal benefits of branding outweigh the costs. Alternatively, if being responsible for the branding of the product carried some economic benefit, perhaps there will be some competition between parties to be the one responsible for certifying the quality.

We now have a 3 stage game:

Stage 1 - Retailers and suppliers make simultaneous certification decisions

Stage 2 - Vertical contracting between the suppliers and R_1.

Stage 3 - The good is sold to consumers. This is the same as the basic model, with prices being set and the consumer being able to purchase in two sub-periods.

We assume that in stage 1, R_1 and the suppliers cannot contract over the certification decisions, and thus that any money spent on branding in stage 1 is sunk.

The vertical contracting takes place as simultaneous Nash bargaining with each supplier S_j, over a two-part tariff which specifies a combination of a per unit price and a fixed fee, (w_j, τ_j). We argue that modelling contracts between suppliers and retailers as two-part tariffs is more suitable than using linear tariffs, which is often assumed in the literature.[16]

Two-part tariffs are the simplest contractual form which allow the vertical chain to separate the issues of setting the optimal wholesale price and distributing the profits between the supplier and retailer. They allow the supply chain to overcome the problem of double-marginalisation, and are hence more efficient and allow the vertical chain to maximise industry profits.

There is also some evidence to support the idea that firms use two-part tariffs in practice, Bonnet, Dubois and Simioni (2006) study the

[16] For example see von Ungern-Sternberg (1996) and Gabrielsen and Sørgard (2007).

bottled water market in France and find evidence for non-linear tariffs, particularly two-part tariffs. However, the picture is admittedly not entirely clear, Smith and Thanassoulis (2006) examined the UK market for milk and found support for linear tariffs, noting that firms use a simple per-unit price with no fixed fee element.

Both negotiations are conducted simultaneously meaning that no firm has a first mover advantage, and each supplier treats the outcome of the other negotiation as given and forms rational expectations about its outcome. Suppliers will offer R_1 a contract specifying a unit wholesale price of $c = 0$, as this maximises the joint profit of the vertical agreement, and standard outside-option bargaining then takes place over the fixed fee, τ_i. If in equilibrium R_1 contracts with supplier S_i , when negotiating over τ_i he has an outside option equal to the full value of contracting with supplier S_j, who offers him the full surplus in making his best attempt to win the contract. The suppliers, on the other hand, have no outside option as there is no alternative to selling their goods through R_1[17]; any remaining surplus above R_1's outside option is split between the retailer and the active supplier according to R_1's bargaining power, α.

In solving this we proceed in four steps. First we analyse what happens when the vertical chain fails to undertake any certification. Secondly we examine the situation when the suppliers take on the role of quality assurance. Thirdly we look at the case when the retailer is responsible for

[17] R_1 in this model corresponds to a "gatekeeper" retailer; this is, he has sole access to a set of consumers. Any suppliers wishing to reach those consumers must do so through him, meaning that he is in a very strong bargaining position.

quality certification. Then finally we bring all of these strands together and, using the insights gained from examining the other situations, solve the model when both retailers and suppliers choose whether to engage in certification.

5.4.1 No Certification by the Vertical Chain

Here the two suppliers are identical and thus there is Bertrand competition between the suppliers and R_1 has full outside option and so keeps all the profit from the vertical agreement for himself, and is indifferent between which supplier he chooses. Hence the suppliers make no profit, since they have no bargaining power because they are perfectly substitutable, and other payoffs are similar to the base case.

R_2 makes zero profit because even if the consumer does randomly select him in the first purchase period he buys from him at a price of zero and doesn't repurchase in the next period. Consumers have a 50% chance of earning one period of full utility in the second period if by chance they choose the high quality good in the first period, but stand to earn an expected payoff of $-x$ in the first period. Similarly, the high quality retailer makes, on average, half a period of profit - in the second period if the consumer happens to choose him in the first, no profits are made in the first period again because prices are zero.

$$\Pi^*_{R_2} = \Pi^*_{S_1} = \Pi^*_{S_2} = 0$$

$$\Pi^*_{R_1} = \frac{1}{2}\tilde{\pi} \tag{1}$$

$$U = \frac{1}{4}\tilde{\pi} - x$$

Therefore, just like in the horizontal model with no certification, we get a total welfare of

$$W = \frac{3}{4}\tilde{\pi} - x$$

5.4.2 Certification by Suppliers

Now we consider the situation when only the suppliers in the vertical chain can certify the quality of the product sold by R_1, though R_2 can (falsely) certify. As noted previously, spending on quality assurance cannot be contracted upon, and after a supplier invests money in this it is treated as a sunk cost during his negotiations with retailers. There is therefore a potential hold-up problem, where welfare improving investments may not be made because after the money is invested the supplier is vulnerable to opportunism by the retailer, who may claim most of the extra profit generated. Foreseeing this, the supplier may never make the investment in the first place as he knows that he will not be able to make sufficient profits after doing so to cover the cost; this may then hurt the retailer who loses out through being unable to commit to not

acting opportunistically.[18]

Solving this model in a manner similar to the basic model, to stop R_2 engaging in false certification we must have that the cost of certification is greater than the single period profits which he can earn from doing so

$$\gamma \geq \tilde{\pi}$$

We prove a simple result which makes the later exposition easier:

Lemma 4 *Never will both suppliers engage in quality certification*

Proof. See Appendix. ■

Henceforth, without loss of generality, we consider the supplier that may certify to be S_1. From the previous section, we know that if S_1 doesn't certify then he will make zero profits in equilibrium and that if he does then the consumer will purchase the good in equilibrium in both periods and total agreement profits will be $2\tilde{\pi}$, which will be split between the retailer and supplier.

The retailer has an outside option, he can sell S_2's good unbranded and hope the consumer will randomly select it to test in period 1, and that then he will thus earn full profits in period 2. This is similar to the situation described above with no vertical certification, therefore R_1's outside option, as established in equation (1), is worth $\frac{1}{2}\tilde{\pi}$. The rest of the surplus is split according to the retailer's bargaining strength α:

[18] See Inderst and Wey (2007b) for a discussion of the hold-up problem, and Chen (2003) for an example with suppliers investing in increased product variety.

$$\Pi_{S_1}^* = (1-\alpha)\left[2\tilde{\pi} - \frac{1}{2}\tilde{\pi}\right] - \gamma$$

$$\Pi_{S_1}^* = \frac{3}{2}(1-\alpha)\,\tilde{\pi} - \gamma$$

The retailer benefits from free-riding on the supplier's certification of product quality and now makes positive profits.

$$\Pi_{R_1}^* = \alpha 2\tilde{\pi} + (1-\alpha)\,\frac{1}{2}\tilde{\pi}$$

$$\Pi_{R_1}^* = \frac{3}{2}\alpha\tilde{\pi} + \frac{1}{2}\tilde{\pi}$$

Thus we have an equilibrium where a supplier engages in quality certification (but the low quality retailer doesn't) if

$$\frac{3}{2}(1-\alpha)\,\tilde{\pi} > \gamma \geq \tilde{\pi}$$

Such a value of γ exists if

$$\alpha < \frac{1}{3}$$

That is, if suppliers have sufficiently strong bargaining power then they can overcome the potential hold-up problem and have an incentive to engage in branding as they stand to make sufficient profit back later to justify the initial expenditure. If this is the case we then have an

equilibrium here with

$$\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}(1-\alpha)\tilde{\pi}\right)$$

Note that this range is (weakly) a subset of the range found in the base case, the ranges are identical when the supplier has full bargaining power and keeps all the incremental profit from certification, thus having the same incentives as the R_1 in the base case. Note that the retailer may actually be better off here having a lower bargaining power, as by allowing the supplier to keep a larger share of the incremental profits after branding it gives him an incentive to do it in the first place - and the retailer can then free-ride on the increased profits.

Looking at welfare, we have when $\alpha < \frac{1}{3}$

$$W = 3\tilde{\pi} - \gamma^*$$

And when $\alpha \geq \frac{1}{3}$ we have

$$W = \frac{3}{4}\tilde{\pi} - x$$

5.4.3 Certification by R_1

Now we consider the situation when R_1 can certify the quality of the product that he sells but his suppliers cannot, R_2 can still falsely certify. If R_1 does invest in stage 1, we interpret this as him establishing a private

label, he is now able to sell the goods of the suppliers under his own brand name.

After establishing his own label, consumers are reassured by this quality certification and the previous full information equilibrium results, with the good being purchased from R_1 in both periods. However, as well as increasing the total surplus to $2\tilde{\pi}$, the establishment of the private label also affects how it is distributed between suppliers and retailers, this is our first key result.

Proposition 5 *By engaging in quality certification through establishing a private label the retailer can improve his bargaining position with suppliers, as he can now source his good equally well off all suppliers whether branded or not. This means he takes all of the profit from the vertical agreement.*

Proof. See Appendix. ■

If the retailer spends γ on establishing his private label, his profit is now.

$$\Pi_{R_1} = \alpha 2\tilde{\pi} + (1-\alpha)2\tilde{\pi} - \gamma$$

$$\Pi_{R_1} = 2\tilde{\pi} - \gamma$$

Other firms will make zero profits.

$$\Pi^*_{R_2} = \Pi^*_{S_1} = \Pi^*_{S_2} = 0$$

Therefore, for branding to be profitable for R_1 he must earn greater profits from doing so than from not branding, and attempting to sell an unbranded product.

$$2\tilde{\pi} - \gamma > \frac{1}{2}\tilde{\pi}$$

$$\gamma < \frac{3}{2}\tilde{\pi}$$

As noted previously, to prevent R_2 falsely certifying his good as high quality we require

$$\gamma \geq \tilde{\pi}$$

There is thus an equilibrium here with quality certification by R_1 for

$$\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$$

Which is the same region we identified in the base case model.

5.4.4 Certification by Suppliers or Retailers

Now we proceed to solving the full model, where both suppliers, S_1 and S_2, and the retailers, R_1 and R_2, simultaneously choose whether to certify

the quality of the product, and we investigate when in equilibrium it is the supplier or the retailer responsible for branding the good. Following on from lemma (4), we only consider the possibility in equilibrium that S_1 will certify the product's quality.

Note that if R_1 certifies, the certification decision of the suppliers are irrelevant as the retailer is able to successfully market the products of both suppliers as high quality, regardless of whether they have engaged in certification or not.

In this equilibrium consumers have the belief

$$u_i = \hat{u} \iff \gamma_i \geq \gamma^*$$

They do not distinguish between branding by the supplier and the retailer, they care only that the product's quality has been certified. We can now combine the insights of the previous few sections to solve the full certification game, which can be represented in the following normal form.

Table 1: Certification Game

		S_1	
		Certify	Not Certify
R_1	Certify	$2\tilde{\pi} - \gamma^*$, $-\gamma^*$	$2\tilde{\pi} - \gamma^*$, 0
	Not Certify	$\frac{3}{2}\alpha\tilde{\pi} + \frac{1}{2}\tilde{\pi}$, $\frac{3}{2}(1-\alpha)\tilde{\pi} - \gamma^*$	$\frac{1}{2}\tilde{\pi}$, 0

As previously noted, let us consider a situation where branding will occur, so we can focus upon the key issue of who will undertake it. This requires the previously noted condition

$$\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$$

We can immediately note that when the supplier is not engaging in certification, the retailer will wish to do so himself. Similarly we can observe that when the retailer is branding, the supplier will not want to, as mentioned above his investment would be redundant as the retailer would be free to use the good of either supplier with his own brand. This immediately establishes a Nash equilibrium, where only the retailer engages in quality certification.

However, let us consider the potential for an equilibrium where only the supplier engages in certification. Consider the situation when the retailer is not certifying, the supplier will wish to certify if

$$\frac{3}{2}(1-\alpha)\tilde{\pi} - \gamma^* > 0$$

$$\gamma^* < \frac{3}{2}\tilde{\pi}(1-\alpha)$$

However, also consider the behaviour of the retailer when the supplier is certifying; he will wish to certify in addition to the supplier if

$$2\tilde{\pi} - \gamma^* > \frac{3}{2}\alpha\tilde{\pi} + \frac{1}{2}\tilde{\pi}$$

$$\gamma^* < \frac{3}{2}\tilde{\pi}\,(1-\alpha)$$

Note that these are the same conditions. So we have that whenever the supplier would wish to certify (with the retailer not certifying), the retailer would wish to additionally certify afterall - and as noted above this would mean that the supplier would then wish to stop certifying. So there is no equilibrium where only the supplier engages in branding of the good.

The logic is as follows; when the retailer brands he keeps all the profits from the agreement, his incremental profit from branding here is therefore the supplier's profit (from when only the supplier was branding). Therefore, whenever it is worth the supplier engaging in branding, because his profits are greater than the cost, it must necessarily also be so for the retailer because he can steal this exact same profit from the supplier, for the same cost.

We put these findings into our next key result

Proposition 6 *The only equilibrium with branding occurs with the retailer R_1 verifying the quality of the good; suppliers never engage in branding.*

Proof. See Appendix. ■

Thus the only equilibrium we have is one where R_1 engages in branding by spending some amount $\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$, in contracting with the

suppliers he is able to sell either good equally well under his brand so he keeps all the profit from the vertical relationship, being supplied at marginal cost 0 with no fixed fee. The consumer forms beliefs that this branding implies that that the good is high quality and purchases it in period 1, and after verifying that its quality is indeed high he then repurchases it in period 2.

$$\Pi^*_{R_2} = \Pi^*_{S_1} = \Pi^*_{S_2} = 0$$

$$\Pi^*_{R_1} = 2\tilde{\pi} - \gamma^*$$

$$U = \tilde{\pi}$$

This gives us total welfare of

$$W = 3\tilde{\pi} - \gamma^*$$

5.5 Analysis and Policy Implications

So our results indicate that retailers develop private labels as it allows them to source their goods from a wider variety of suppliers; from those without brands of their own as well as those that produce established national brands. This serves to improve their bargaining position with respect to suppliers, as they can more credibly threaten to switch to a

rival manufacturer should they not receive preferential terms of supply. Technically, establishing a private label enhances a retailers outside option in his negotiations, which ensures him a greater share of the profits of the vertical chain.

This effect links into the wider concept of buyer power, which has been a growing area of research in the literature on vertical contracting between suppliers and retailers.[19] Some commentators have expressed concern about the growth of this buyer power, and therefore about the rapid development of private labels, worrying that it could lead to anti-competitive outcomes in both upstream and downstream markets. For example, in the UK Competition Commission inquiry into the grocery market some market participants were worried that the ability of powerful buyers to obtain preferential terms of supply could potentially threaten the long term viability of manufacturers.

However, contrary to these views, we get the following result concerning the welfare implications of private labels in our main model

Proposition 7 *The ability of retailers to establish private labels (weakly) improves welfare.*

Proof. See Appendix. ■

The intuition behind this result is that without private labels the market can suffer from a hold-up problem; that suppliers will fail to

[19] Important contributions include Katz (1987), Inderst and Shaffer (2007a) and Inderst and Wey (2007a).

engage in certification if their bargaining power is sufficiently low as they wont be able to recoup sufficient profits to cover the costs of doing so. In these circumstances, the ability of retailers to establish a private label can overcome this problem and increases both the profits of firms and the consumer's utility.

5.6 Growth of Private Labels

Proposition (6) established that suppliers will never brand goods, because the moment it becomes profitable for them to do so, it becomes profitable for the retailer to brand himself, making the suppliers' actions redundant. This result seems at odds, however, with empirical observation which have shown suppliers traditionally dominating the role of branding within the vertical chain. We turn to an extension which can explain why private labels have grown over time, linking it into our fourth stylised fact which recognised that this growth has occurred alongside an unprecedented increase in concentration in retailing markets.

Assume there are $n \geq 2$ distinct symmetric downstream markets; each market i has the same structure as the market described in the previous models, that is there is a high quality retailer $R_{i,1}$ and a low quality retailer $R_{i,2}$. We also assume that these downstream markets are completely separate on the demand side - there is no substitution between them. However, it is the same set of two suppliers, S_1 and S_2, that sell to the high quality retailer, $R_{i,1}$, in all markets. This setup

corresponds to a situation where large national suppliers sell to several distinct local geographic markets, with the retailers being independent stores not part of any national chain.[20]

This setup intuitively appears to provide a situation where suppliers may play some role in branding afterall, because they stand to gain the benefits of this across several markets, whilst paying the cost only once. Let us again consider the payoffs in the branding subgame; note that since all high quality retailers $R_{i,1}$ face symmetrical decisions, we will have a symmetric solution each $R_{i,1}$ chooses the same strategy in each market. We present a "reduced" version of the normal form game below; note that since we look for symmetric equilibria we only need to examine the decision of a representative R_1, not each $R_{i,1}$ individually, which makes representing the game simpler.

Of course, when considering deviations by R_1, we must consider a unilateral deviation by a single $R_{i,1}$ in one market, not a common deviation by all R_1's. However, because the payoff to a particular retailer $R_{i,1}$ is independent of the actions of all other high quality retailers $R_{j,1}$ we can accurately solve for an equilibrium by analysing the decision of a representative retailer.

The only difference in the payoffs in his case is when the supplier certifies and the retailer doesn't, in which case the supplier makes n times the flow profit, which reflects his presence in multiple markets.

[20] Such a multiple-market setup was first used by Katz (1987), and has been adopted in other papers, such as Inderst and Wey (2007a).

Table 2: Certification Game with Multiple Markets

		S_1	
		Certify	Not Certify
R_1	Certify	$2\tilde{\pi} - \gamma^*$, $-\gamma^*$	$2\tilde{\pi} - \gamma^*$, 0
	Not Certify	$\frac{3}{2}\alpha\tilde{\pi} + \frac{1}{2}\tilde{\pi}$, $\frac{3}{2}n(1-\alpha)\tilde{\pi} - \gamma^*$	$\frac{1}{2}\tilde{\pi}$, 0

Solving the game ,we can see that there is still an equilibrium with only the retailer certifying quality; however let us also consider the possibility of an equilibrium where (just) the supplier is responsible for certifying the quality of the good.

For this we require it to be in the supplier's interests to establish a brand

$$\frac{3}{2}n(1-\alpha)\tilde{\pi} - \gamma^* > 0$$

$$\gamma^* < \frac{3}{2}n(1-\alpha)\tilde{\pi}$$

And also for it to not be worth the retailer establishing a private label

$$\frac{3}{2}\alpha\tilde{\pi} + \frac{1}{2}\tilde{\pi} \geq 2\tilde{\pi} - \gamma^*$$

$$\gamma^* \geq \frac{3}{2}(1-\alpha)\tilde{\pi}$$

Proposition 8 *With suppliers selling to multiple downstream markets, there is an equilibrium where the supplier is responsible for the branding of the good.*

Proof. See Appendix. ■

In this equilibrium we have

$$\Pi^*_{S_1} = \frac{3}{2} n (1 - \alpha) \tilde{\pi} - \gamma^* \geq 0$$

$$\Pi^*_{R_{i,1}} = \frac{3}{2} \alpha \tilde{\pi} + \frac{1}{2} \tilde{\pi}$$

$$\Pi^*_{S_2} = \Pi^*_{R_{i,2}} = 0$$

We can use this result to explain why private labels have grown so much in recent decades. Previously the grocery market resembled this multiple-market setup, before chain stores each retailer operated in a limited area, and was relatively small compared to the national suppliers they dealt with. Then, however, national chain retailers developed, a situation we can interpret in our model as a merger occurring between each of the n retailers $R_{i,1}$ to form the single retailer R_1 we had in our base-case vertical model.[21]

This structural change in the industry alters the relative incentives of the suppliers and retailers to invest in maintaining a brand name, and as we have seen in our original model there is no equilibrium with suppliers taking responsibility for quality certification. In other words,

[21] Technically, such a merger would result in a slightly different situation to that presented in the earlier model, as the presence of several markets would serve to multiply the flow profits by n. However, this doesn't affect any of the qualitative results.

the growth of national chain retailers has directly led to the growth of private labels.[22]

5.7 Conclusions

Private labels are a market segment of increasing size and importance to both firms and regulators. Their market share has surged over the past 20 years in countries around the world, and appears destined to continue to do so, and they now account for a large proportion of the goods sold by grocery retailers worldwide.

Economists are belatedly catching onto the importance of private labels, and have begun to study the repercussions of their growth. However, most of the existing work examines their impact in a horizontal framework, looking at intra-store competition between private labels and national brands or how they affect inter-store competition between different retailers. We claimed that arguably the most important impact of private labels is the way in which they affect the vertical relationship between retailers and suppliers, an area which has received insufficient attention, and which we made the focus of our paper.

We based our model on observable facts, including that private labels

[22]Further to our main result, we can also note that the more distinct markets that the supplier is selling to in this multi-market setup (that is, the larger suppliers are compared to retailers) then the greater is the range of γ for which an equilibrium with supplier certification exists. To some extent this arguably can be intuitively interpreted as it being more likely that suppliers will be the ones responsible for branding the product than retailer, the larger suppliers are. So, in addition to our main point which examined a distrete shift in industrial structure from independent retailers to chain stores, this intuitive argument appears to support a similar conclusion for a more gradual growth of retailing concentration.

are essentially the same products as national brands, only branded under the retailer's name rather than the supplier's, and that their growth has been accompanied by a rapid increase in the concentration of the retailing market.

We developed a model of retailing with a vertical aspect, allowing us to study the effect of private labels on the bargaining process between suppliers and retailers. Consumers are unsure about the quality of the products they purchase, and hence only wish to purchase branded goods - seeing this as a signal of quality. The branding process is thus endogenised, with both suppliers and retailers able to take responsibility for it, meaning there is an element of vertical competition within the production chain to undertake the role of providing quality certification.

For the branding process we focussed upon soft certification, where quality is signalled through spending on advertising in a money-burning fashion, but noted our results could equally well apply to hard certification, where firms spend money to gain accreditation from a trusted third party. We were able to show that private labels can only improve welfare, as they can overcome a potential hold-up problem when the supplier has insufficient incentives to certify the quality of the product himself.

The underlying logic of our model recognises that the retailer has an incentive to establish a private label, as possessing one increases his supply options; he becomes able to sell goods produced by suppliers that lack a brand of their own, as he can package the good under his own

brand to signal its high quality to consumers. This improves his outside option when negotiating with manufacturers, and hence allows him to secure discounts on his inputs.

One advantage of our approach is that by endogenising the establishment of private labels it allows us to examine why they have grown so dramatically over the past few decades. We linked this into our observation of increased retail concentration; this has increased the relative incentive of retailers to be responsible for branding the good as opposed to suppliers.

5.8 Appendix

5.8.1 Proof of Lemma 1

We solve for the subgame perfect Nash equilibrium by first calculating the consumer's demand function given the prices set by the retailers, p_{R_i}. We then substitute this into the retailers' profit functions in order to find the optimum price for them to set to maximise their profits. The two periods will proceed identically since nothing will change, nor will information be revealed, between the two.

The consumer will never purchases the low quality good because $\breve{u} < 0$, so it follows directly that R_2 will earn zero profits

$$\Pi^*_{R_2} = 0$$

For the high quality retailer, R_1, the consumer's demand function is

$$q_{R_1} = \hat{u} - p_{R_1}$$

Substituting this into the retailer's profit function, he would maximise his profits and set

$$p^*_{R_1} = \frac{\hat{u}}{2}$$

The consumer will therefore purchase

$$q^*_{R_1} = \frac{\hat{u}}{2} > 0$$

And will earn equilibrium utility in period 1 of

$$U^*_1 = \hat{u}\left(\frac{\hat{u}}{2}\right) - \frac{\left(\frac{\hat{u}}{2}\right)^2}{2} - \left(\frac{\hat{u}}{2}\right)\left(\frac{\hat{u}}{2}\right)$$

$$U^*_1 = \frac{1}{2}\left(\frac{\hat{u}}{2}\right)^2$$

And the retailer would earn profits in period 1 of

$$\Pi^*_{1,R_1} = \left(\frac{\hat{u}}{2}\right)^2$$

After purchasing the good and confirming that its quality was in fact $\hat{u}$, this stage-game equilibrium would be repeated in period 2. So overall utility and profit levels would be twice these levels, giving us

$$U^* = \tilde{\pi}$$

$$\Pi^*_{R_1} = 2\tilde{\pi}$$

5.8.2 Proof of Lemma 2

Again we solve for the subgame perfect equilibrium of the game, and therefore proceed from the last period. Here, if the consumer has purchased a positive quantity of either good in the first period he becomes fully informed as to the quality of both products. Given the existence of the switching cost the consumer only has the option of purchasing more of the good he bought in the first period. If by chance he purchased the low quality product in the first period he will purchase zero of it in the second period, while if he bought the high quality good then the game proceeds as in the full information case analysed earlier and the consumer's demand function is, as derived above, $q_{R_1} = \hat{u} - p_{R_1}$.

In this case, facing this demand function, R_1 would optimally set price $p^*_{R_1} = \frac{\hat{u}}{2}$. There is therefore a $\frac{1}{2}$ chance that both consumer and R_1 will earn a payoff of zero in the second period, and a $\frac{1}{2}$ chance that the consumer will earn utility $\frac{\tilde{\pi}}{2}$ and R_1 earn $\tilde{\pi}$.

Turning now to the first period we consider the consumer's purchasing decision given that the two retailers have already set their prices. His utility function, with a positive quantity purchased, is thus an expec-

tation, with the consumer anticipating what may happen in the second period as noted above. His utility from purchasing product i in the first period is thus.

$$U(q_i > 0) = \frac{1}{2}\left[\left(\hat{u}q_i - \frac{q_i^2}{2} - p_i q_i\right) + \frac{1}{2}\left(\frac{\hat{u}}{2}\right)^2\right] + \frac{1}{2}\left[\check{u}q_i - \frac{q_i^2}{2} - p_i q_i\right]$$

$$U(q_i > 0) = \left(\bar{u}q_i - \frac{q_i^2}{2} - p_i q_i\right) + \frac{1}{4}\left(\frac{\hat{u}}{2}\right)^2$$

Note that the utility earned in the second period is independent of the quantity purchased in the first period (as long as that quantity is positive so that the quality of the good is revealed). We can take first order conditions to give us a demand function so that we can solve for the quantity purchased of the good he chooses to buy in the first period.

$$q_i = \bar{u} - p_i$$

So, the probabilistic outcome in this case results in the consumer having a demand function the same as if he faced a good of the average quality $\bar{u}$ for certain. Also note that the price of the product only enters the consumers utility function in terms of what he must pay to purchase the product; the consumer's beliefs on quality are independent of the price charged by either retailer. Therefore, given this utility function the consumer will thus buy whichever good is cheapest in the first period.

Retailers will anticipate this and will therefore in the first stage of the game, irrespective of their quality level, engage in Bertrand competition. Equilibrium prices will therefore be

$$p^*_{R_1} = p^*_{R_2} = 0$$

The consumer is therefore indifferent between purchasing the two goods and he will pick one at random.

$$q^*_i = \bar{u} < 0$$

Since $\bar{u} < 0$, the consumer will prefer to purchase as little as possible in the first period, but will want to purchase some positive amount so he becomes aware of the product's quality and has the possibility of earning positive utility in the second period. Therefore, the consumer will purchase the minimum quantity y of one good (chosen at random) in period 1.

His utility in period 1 is

$$U_1(y) = \bar{u}y - \frac{y^2}{2} = -x < 0$$

The consumer's overall level of utility is therefore the expected payoff in the second period minus the expected loss in the first

$$U^* = \frac{1}{4}\tilde{\pi} - x$$

Note that given our earlier assumption on x, the consumer's participation constraint is satisfied as $U^* \geq 0$.

For the low quality producer R_2, we have

$$\Pi^*_{R_2} = 0$$

Because if the consumer doesn't randomly purchase from him he makes zero; if he does purchase off him in period one he sells y units but at a price of zero, so no profit is made. Then when the quality is revealed to be low, no purchase in made in period two, so again total profits are zero.

For the high quality producer R_1 we have

$$\Pi^*_{R_1} = \frac{1}{2}\left[0 + \left(\frac{\hat{u}}{2}\right)^2\right] + \frac{1}{2}[0]$$

$$\Pi^*_{R_1} = \frac{1}{2}\left(\frac{\hat{u}}{2}\right)^2 = \frac{1}{2}\tilde{\pi}$$

Again, if the consumer doesn't randomly purchase from him he makes zero; if he does purchase off him in period one the price is zero so no profit is made initially. Then when the quality is revealed to be high, R_1 will raise his price to $\hat{p}^* = \frac{\hat{u}}{2}$ and earn full profits in period 2.

5.8.3 Proof of Lemma 3

Again we solve for the subgame perfect equilibrium here, considering the actions of consumers given the certification decisions of retailers, and then solving for the optimum money-burning decisions of firms who take this consumer behaviour into account. If R_1 engages in successful money-burning then the consumer, as noted, will believe his good is high quality and we will effectively be in the full information equilibrium we solved earlier. As shown previously, in such a situation the retailer will set a price of $\frac{\hat{u}}{2}$ and will have a flow profit of $\Pi^*_{R_1} = 2\tilde{\pi}$; the consumer will purchase off him in the first period, and then after verifying the quality is high he will repurchase in the second period. Taking into account the cost of the branding undertaken in the first stage, the retailer's profits will be $2\tilde{\pi} - \gamma$. On the other hand, if R_1 decides not to engage in branding then we will be in the unobservable quality situation just described where consumers engage in product testing, where the high quality retailer's expected profits are only $\frac{1}{2}\tilde{\pi}$.

Bearing this consumer behaviour in mind, R_1 will therefore be willing to spend an amount γ on branding if

$$2\tilde{\pi} - \gamma > \frac{1}{2}\tilde{\pi}$$

$$\gamma < \frac{3}{2}\tilde{\pi}$$

However, for such a separating equilibrium to work we also need it to not be profitable for the low quality retailer to falsely certify his good as high quality. If R_2 engages in such false certification, given the consumer's belief that any good with sufficient spent on branding is high quality, he will earn full single period profits $\tilde{\pi}$ in the first period. However, after realising the good is in fact low quality, the consumer will not repurchase the good in the second period and thus no further profits will be made. This means that his total profits from certification, net of the cost of doing so, are $\tilde{\pi} - \gamma$. On the other hand if R_2 doesn't engage in quality certification we end up in the situation above where the consumer "tests" the goods in the first period, and we have shown above that in such a situation we have $\Pi^*_{R_2} = 0$.

For R_2 to not engage in money burning we need

$$\tilde{\pi} - \gamma \leq 0$$

$$\gamma \geq \tilde{\pi}$$

So, combining these two conditions, we see that there is a set of equilibria with money burning where only the high quality retailer engages in branding and successfully signals his high quality to consumers. We therefore have

$$\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$$

$$U^* = \tilde{\pi}$$

$$\Pi^*_{R_1} = 2\tilde{\pi} - \gamma^*$$

$$\Pi^*_{R_2} = 0$$

5.8.4 Proof of Lemma 4

Only one supplier can supply R_1 in the subgame perfect Nash equilibrium, denote the supplier that does not supply as S_i, we have

$$\Pi_{S_i} = 0 - \gamma_{S_i} < 0$$

That is, he makes zero flow profits, but incurs the cost of certification, so overall makes losses. This supplier therefore has a profitable unilateral deviation: to switch to not certifying in stage 1 where he can guaranteed himself zero profits.

5.8.5 Proof of Proposition 5

The good of either supplier can be branded by R_1's private label, whether branded or not, so both can be sold for equal profit. This means that

they are perfectly substitutable, and hence the retailer has a full outside option, so can keep the entire surplus from agreement. Putting this formally, the general Nash bargaining solution, following Nash (1950), states that when a retailer with an outside-option worth O_R and a supplier with no outside option bargain over a total payoff of X, the equilibrium payoff to the retailer is

$$\Pi_R = (1 - \alpha) O_R + \alpha X$$

In the case here we have that the retailer can source equally well from both suppliers, so he has a full outside option in negotiations; $O_R = X$. Substituting this in we see that we get

$$\Pi_R = (1 - \alpha) X + \alpha X$$

$$\Pi_R = X$$

That is, the retailer takes all of the profits from the negotiations.

5.8.6 Proof of Proposition 6

We solve for the Nash equilibrium of the normal form game, there are three cases to consider. Firstly, as noted above, with $\gamma^* < \frac{3}{2}\tilde{\pi}(1 - \alpha)$ if the retailer were not certifying, the supplier would wish to; but as soon as the supplier does the retailer also wants to. Secondly, with $\gamma^* >$

$\frac{3}{2}\tilde{\pi}(1-\alpha)$, even if the retailer were not certifying, the supplier would not wish to. Thirdly is the special case when $\gamma^* = \frac{3}{2}\tilde{\pi}(1-\alpha)$, here we invoke our earlier assumption that when indifferent a firm will choose not to certify, so there is no Nash equilibrium with the supplier engaging in branding with this parameter value either.

5.8.7 Proof of Proposition 7

We compare the results of this full vertical model to those when only the suppliers were capable of certifying the quality of the product. If we have $\alpha < \frac{1}{3}$, that is if suppliers have most of the bargaining power, then the ability of retailers to create a private label has no impact on welfare, it is $3\tilde{\pi} - \gamma^*$ irrespective.

However, with $\alpha \geq \frac{1}{3}$ we found that welfare without private labels was only $\frac{3}{4}\tilde{\pi} - x$ because of the hold-up problem; this compares to $3\tilde{\pi} - \gamma^*$ when private labels are possible. Given that we have $\gamma^* \in \left[\tilde{\pi}, \frac{3}{2}\tilde{\pi}\right)$, it therefore follows that $3\tilde{\pi} - \gamma^* > \frac{3}{4}\tilde{\pi} - x$ and that private labels in this case increase welfare.

5.8.8 Proof of Proposition 8

Solving for the Nash equilibrium of the normal form game, we see that such an equilibrium exists when we have

$$\gamma^* \in \left[\frac{3}{2}(1-\alpha)\tilde{\pi}, \frac{3}{2}n(1-\alpha)\tilde{\pi}\right)$$

Note that, since we have $n \geq 2$, this region is non-empty, provided the retailer does not have all the bargaining power, that is $(1 - \alpha) > 0$.

6 Private Labels and Supplier Investments

6.1 Introduction

Private labels are products that are owned and controlled by retailers, as opposed to suppliers which is traditionally more common. These goods, often called store-brands or own-brands, have become more prominent in recent years due to their increasingly significant role in retailing markets worldwide. The industry most often associated with private labels is the grocery market, where private labels have been present in some form for several decades, but these products play a major role in a whole range of industries across the economy.

Table 3 from Kumar and Steenkamp (2007) shows the % of sales accounted for by private labels in consumer packaged goods industries, and demonstrates that they have achieved high levels of market penetration around the world, averaging 14% worldwide in 2000, forecast to reach 22% by 2010.

Kumar and Steenkamp discuss several industries where, perhaps unexpectedly, private labels are of major importance. For example they note that 45% of clothes sold in the US are private labels, with this figure reaching over 65% in some categories. This has been driven by the success of several major private label only stores such as Gap, H&M and Zara. They also discuss how Barnes & Noble are aiming for 10-12% of their book sales to be private labels by 2008. Even financial services

have seen a huge growth in private labels, with savings accounts, loans, insurance and credit cards now offered by major highstreet retailers.

Table 3: Consumer Packaged Goods Private Label Share

	Private Label Share (% of Sales)	
	2000	2010 (Expected)
Western Europe	20	30
North America	20	27
Australasia	15	22
Latin America	3	9
Japan	2	10
Eastern Europe	1	7
China	0.1	3

Furthermore, these market shares are the result of a long and steady upwards trend in their sales over the past twenty years, and this seems likely to continue as countries with less developed private label industries catch up with those countries where the segment is more fully evolved. Understanding the underlying economic dynamics behind the introduction and development of these goods is therefore crucial in obtaining a grasp of the competitive forces at play in these markets, and for guiding policy makers who are confronted with difficult questions as these products become increasingly important.

In addition, as well as having an impact within the horizontal framework of the retailing industry, private labels also have vertical implications. That is, they affect the upstream suppliers in the production chain, and their relationship with retailers at the downstream level.

One accusation levelled at private labels is that they can further contribute to the buyer power of downstream retailers, particularly large

chain stores, as they improve their bargaining position with suppliers and enable them to demand preferential terms of supply. In turn, this issue of buyer power has been a major topic of debate for competition authorities, with it having been alleged that the exercise of buyer power could reduce welfare and make consumers worse off.

For example the UK Competition Commission grocery market inquiry specifically raised concerns that buyer power could harm both suppliers and consumers. They alleged that suppliers could be hurt by buyer power as it could allow retailers to impose unexpected costs upon them, reduce their overall profitability and expose them to excessive risks. The potential detriment to consumers could then follow from this, with reduced capacity, fewer new product offerings, and lower product quality - our specific focus here.[23] To fully understand and check the veracity of these claims requires a fundamental grasp of the underlying economic logic for the creation and development of these goods, and a model which can highlight the impact of private labels upon competitors and therefore competition.

Our paper seeks to explore these issues by developing a model of the introduction of private labels by retailers, in particular by large chain-stores who have been identified as the major force behind the growth of store-brands.[24] We seek to examine how the sale of a private label by a

[23]Competition Commission (2008), The Supply of Groceries in the UK Market Investigation, paragraphs 9.3 and 9.5.

[24]Competition Commission (2008) notes how in the UK the growth in private label sales has been led by the large grocery retailers. (Appendix 9.10, paragraph 3).

retailer affects the incumbent supplier's incentives to invest and innovate, and how this in turn affects downstream competition and consumers.

We focus upon the role of improvements in quality because investment has been identified as a key feature of product competition in grocery markets, and antitrust authorities have expressed specific concern that private labels could have a potentially anti-competitive impact in this regard. However, such dynamic effects have been neglected in the private label literature in favour of a simple focus upon wholesale prices, an approach which risks overlooking a potentially key mechanism for the introduction of private labels to have an impact upon welfare.

For example the UK Competition Commission crucially considered such a question in their study into the grocery market, noting that

> "the presence of own-label products may reduce investment into innovation by branded product manufacturers."[25]

This may be particularly anti-competitive because, in addition to reducing the quality of products that consumers purchase, it can serve to further weaken competition between retailers downstream. Large stores who have their own brands are protected from such a reduction in the quality of the supplier's goods, but smaller independent retailers without private labels are forced to stock these items, and would then be at a further competitive disadvantage to the larger stores.

[25] Competition Commission (2008), The Supply of Groceries in the UK Market Investigation, Appendix 9.10: Own-Label Goods, paragraph 41.

Such an outcome may in fact be part of the motivation to establish a private label in the first place, using these goods as a competitive weapon to reduce the quality of goods sold by rivals in order to further monopolise the market. We note how this argument is intuitively similar to those of "raising rivals costs", except here the mechanism is not a higher cost but a lower quality.

The importance of own labels is recognised in Boston Consulting Group (2007), who note that private labels are now sold in all segments - including premium ones - and often compete with traditional goods on quality and branding. Hughes (1997) describes how, although when first introduced private labels were mainly low quality generic products sold cheaply, from the 1980s onwards there has been a major shift in the nature of these goods, moving upmarket and being targeted more at middle and upper class consumers.

Several papers on private labels have featured a role for product quality in some form or another, though often this simply consists of modelling private labels as being of exogenously lower quality than branded goods, reminiscent of the industry paradigm pre-1990s. This is the case in, for example, Mills (1995), Bontems, Monier-Dilhan and Réquillart (1999), Scott Morton and Zettelmeyer (2004) and Gabrielsen and Sørgard (2007). However, the focus of these papers is not upon the dynamic effects of the introduction of private labels, but on the wholesale prices paid by retailers and the final prices paid by consumers.

In a similar vein to our paper, both Scott Morton and Zettelmeyer (2004) and Sayman, Hoch and Raju (2002) examine the issue of the positioning of goods within the product space. However, they examine the positioning in a horizontal context, with different market segments, not in the vertical context of product quality as we do. Mills (1999) discusses product quality, and notes that the incumbent supplier in an industry can have an incentive to innovate to widen the quality gap between his product and the private label to increase his profit.

Bergès-Sennou and Mitraille (2003) model the incentives of firms to invest in improving the quality of their products; they have an upstream monopolist investing in a good before selling it on downstream to another monopolist. However, they interpret a private label slightly differently to ourselves (and most of the literature) in viewing it as a long term contract between the upstream and downstream agents, where the retailer agrees to pay part of the supplier's investment costs in exchange for joint ownership of the product being sold, which serves to overcome the hold-up problem and encourage investment. This stands in contrast to our approach of modelling a private label as the retailer possessing his own good which he controls entirely, and which competes with the supplier's good in downstream markets.

Our results show that competition concerns about private labels may be misplaced, we demonstrate that the presence of private labels can in fact potentially make consumers better off. The potential competition

provided by the private label serves to spur the incumbent supplier to invest more in his product, so consumers benefit from purchasing higher quality goods.

However, we also demonstrate that the opposite is indeed possible, and that the fears of competition authorities may in some instances be justified. The introduction of a private label by a large chain retailer can in some instances cause the incumbent supplier to reduce his level of investment, which can harm consumers. Furthermore, we discuss how this can damage the profitability of smaller independent rivals to the chain, and could potentially lead to their exit and the foreclosure of downstream markets.

Therefore we ultimately find that the effect of the introduction of private labels is ambiguous, and that competition authorities should use a rule-of-reason approach in assessing the impact of these products, ensuring their findings are evidence led.

The paper is structured as follows, in Section 2 we construct the basic model. in Section 3 we examine the introduction of private labels. In Section 4 we analyse the implications of our model for consumers and discuss implications for policy. Section 5 concludes. Proofs can be found in the Appendix.

6.2 The Basic Model

6.2.1 Setup

We consider a model where upstream we have a monopoly supplier S who can produce as much of an intermediate good as he wishes at a marginal cost of zero; we denote the quality of this good as u_S. Retailers require one unit of inputs to produce one unit of output, there is no transformation cost and the quality of the final good equals the quality of the input good. Downstream there are N symmetric markets, each with two retailers, which are entirely separate on the demand side; for example we can interpret this setup as there existing several local geographic markets, for example in different towns.

There is a chain store which owns one of these outlets in each of $n_C \leq N$ of the markets, this setup follows Katz (1987) and serves to generate buyer power without seller power; all the commonly owned stores are in separate markets.

We have the following timing for the game:

- In stage 1 the supplier makes a fixed cost investment to improving the quality of his product, u_S.
- In stage 2 the supplier and retailers negotiate over supply contracts.
- In stage 3 there is downstream Cournot competition between retailers.

We focus in stage 1 upon investments that improve the quality of the

supplier's good, as R&D is a key feature of many retail markets but has been relatively ignored by the private label literature. Given the central role played by such non-price competition, it is essential for any model that attempts to understand the impact of private labels to take into account such dynamics.

This is echoed in Boston Consulting Group (2007) who note that the traditional suppliers that have been best able to cope with the growth of private labels are those that "create brand advantage by investing in genuinely superior product performance, a continuous stream of innovations", which further emphasises the importance of such competitive dynamics.

The supplier's costs of investment as a function of his desired level of quality u_S are

$$C(u_S) = \frac{\gamma u_S^3}{3}$$

Where γ parameterises the level of costs. This investment function is somewhat similar to the one used in Bontems, Monier-Dilhan and Requillart (1999), although in their paper they model the level of marginal costs not fixed costs.

While in some circumstances it may make sense to have marginal production costs increase with the quality of the good, for example if more is spent on higher quality inputs, generally speaking we argue that our approach of modelling higher quality as incurring a greater fixed cost

seems more appropriate.

For example, higher quality may come about because of investments in production technology that improve a product and make it worth more to consumers. Alternatively, money spent on investment may allow the firm to modify the good so as to be able to produce different versions of the same product that suit different categories of consumers better.[26]

On the other hand, if we interpret "quality" not as the actual quality of the good, but simply how it is perceived by consumers, then we can interpret investments as being spending on advertising and branding, which is a cost that is independent of quantity produced.

We model the vertical contracting that takes place between suppliers and retailers as standard simultaneous Nash bargaining over two-part tariffs with secret contracts.[27] That is, each contract specifies a fixed fee and a per unit wholesale price to be paid by each retailer i of (τ_i, w_i), so that a retailer that sells a quantity q_i incurs total costs of $C_i = \tau_i + w_i q_i$ when $q_i > 0$, and $C_i = 0$ when $q_i = 0$. We argue that this is a more realistic form of contracting than using linear tariffs, which is often assumed elsewhere in the literature, as it allows the vertical chain to overcome the double-marginalisation problem.[28] Bonnet, Dubois and Simioni (2006) found evidence to support the idea that firms do in fact

[26] For example size, age, gender, preferences on product colour or general branding for different tastes/interests/social groups.

[27] The assumption of secret contracts follows Hart and Tirole (1990) and McAfee and Schwartz (1994), and realistically reflects the fact that firms place great emphasis on protecting business secrets.

[28] For example see von Ungern-Sternberg (1996) and Gabrielsen and Sørgard (2007).

contract using non-linear tariffs, specifically two-part tariffs.

When the supplier negotiates with both retailers in a market he does so simultaneously, meaning that no firm has a first mover advantage and each retailer treats the outcome of the other negotiation as given and forms rational expectations about its outcome. The payoff a firm earns through bargaining are equal to its outside option (what it could earn if negotiations broke down) plus a share of the surplus; we assume that the supplier has exogenous bargaining power $1-\alpha$.[29]

We follow Singh and Vives (1984) in modelling each market as having a representative consumer with the following quadratic and strictly concave utility function[30]

$$U = u_i q_i + u_j q_j - \frac{q_i^2 + 2q_i q_j + q_j^2}{2} - P_i q_i - P_j q_j$$

This gives us an inverse demand function for firm i of

$$p_i = u_i - q_i - q_j$$

Before turning to investigate investment incentives we begin by establishing the single market equilibrium in this framework, with two retailers selling different quality goods and competing in quantities.

[29]The Nash bargaining solution, following on from Nash (1950), gives us the result that if we have a retailer with an outside-option worth O_R and a supplier with one worth O_S, and they bargain over a total payoff of X, the equilibrium payoff to the retailer is $\Pi_R = (1-\alpha) O_R + \alpha (X - O_S)$, and to the supplier is $\Pi_S = \alpha O_S + (1-\alpha)(X - O_R)$; which demonstrates the relationship between outside options, the sharing rule and bargaining payoffs.

[30]In fact, this is a slightly simplified version of their utility function obtained by setting $\beta_1 = \beta_2 = \gamma = 1$.

Lemma 9 *With Cournot competition between two retailers with differing quality levels and wholesale costs, we get the following single-market profit function*

$$\Pi_i = \left(\frac{2(u_i - w_i) - (u_j - w_j)}{3} \right)^2 \tag{2}$$

Proof. See Appendix. ■

6.2.2 No private labels

We now turn to solving for an equilibrium of the model, first considering a situation where there is no private label present, which will serve as our benchmark case for comparison later. Therefore here all retailers source from the incumbent supplier and in equation (2) we have $u_i = u_j = u_S$. Understanding the equilibrium levels of w_i and w_j is more complex however, and requires us to solve the bargaining game between the supplier and retailers.

Note that setting a wholesale price of zero to both retailers does not maximise the supplier's profits in these markets, as it would if he were selling downstream to a single retailer. Instead, the supplier would be better off if he raised the wholesale price to both retailers which would serve to damped downstream competition and prevent retailers competing away industry profits. In fact, the supplier would optimally raise the wholesale prices to the level which induces retailers to jointly produce the monopoly output downstream, hence maximising the profit of the vertical chain at the monopoly level.

However, it turns out that with unobservable contracts it is not possible for the supplier to raise wholesale prices to this level, instead in equilibrium he will sell to both at a wholesale price equal to marginal cost, and will fail to maximise industry profits. This opportunism problem was first discussed by Hart and Tirole (1990), O'Brien and Shaffer (1992) and McAfee and Schwartz (1994), and can be explained as follows.[31]

With any set of contracts that maximise industry profits, and therefore feature wholesale prices above marginal cost, there is a profitable bilateral deviation for the supplier and any single retailer. By reducing the wholesale price to a given retailer, the supplier can opportunistically increase their joint profit at the expense of rival retailers (who would face a competitor with lower production costs) and the benefits of this could be shared between the two firms by adjusting the fixed fee.

The outcome that results in such a situation depends crucially upon how retailers revise their beliefs if they receive an off-equilibrium offer from suppliers. We follow the majority of the literature and assume that retailers have "passive beliefs", that when retailers receive an unexpected

[31] Several suggestions have been made for overcoming the opportunism problem. Hart and Tirole (1990) suggest vertical integration, bringing all of the retailers under the control of the supplier, while McAfee and Schwartz (1994) suggest committing to uniform contracts across all markets (symmetric beliefs). O'Brien and Shaffer on the other hand show that vertical restraints such as closed-territory distribution and retail price maintainence can support the profit maximising outcome, whilst Marx and Shaffer (2004) show that the opportunism problem can be overcome using a menu of two-part tariffs. More recently, de Fontenay and Gans (2005) show that by scrapping the assumption that fixed fees must be paid upfront and instead allowing them to be paid after learning about the contractual terms of others, combined with making them optional and thus allowing retailers to back out of contracts, serves to remove the supplier's incentive to act opportunistically.

offer that is off the equilibrium path they do not revise their beliefs about the offers made to others.[32] This belief structure can be argued to be the most intuitively appealing, as there is no reason why a retailer should necessarily update his beliefs following a deviating offer, and is more in the spirit of equilibrium theory where we generally concentrate on unilateral deviations.[33]

Therefore, in equilibrium this bilateral deviation effect we identified above will be taken to the extreme; each retailer will be offered a wholesale price equal to marginal cost to maximise the joint profit in each negotiation. As a result of the supplier's inability to commit to not acting opportunistically, industry profits are not maximised at the monopoly level.

Note that the supplier has no incentive to raise wholesale prices above this level as doing so reduces profits earned in negotiations with the given retailer, and all other retailers have equilibrium beliefs that their rivals are being supplied at marginal cost, which this action would do nothing to affect. When contracts are secret no retailer would believe a claim by the supplier that he is supplying a rival above marginal cost, as it is not the optimum pricing strategy and they cannot observe the contract themselves. So this means that the supplier sells to all firms at a marginal

[32] For example passive beliefs are used in Segal (1999), Caprice (2006) and White (2007). Other types of beliefs have been identified; with symmetric beliefs each retailer believes that all other firms received the same deviating offer that it did. With wary beliefs a retailer that receives a deviating offer expects his rivals to receive offers that maximise the supplier's profit, given the offer he has received.

[33] Though of course, a supplier making deviating offers to several retailers simultaneously is still technically only a unilateral deviation.

price of zero, with the fixed fee determined by negotiations over the profits earned by the given retailer.

Before solving the bargaining game to calculate payoffs we have to analyse the outside options of the retailers and the supplier if negotiations break down. Firstly we can note that all retailers have no outside option; since the supplier is a monopolist if they fail to contract with him they are forced to exit the industry as they have no alternative source of inputs (given that here there are no private labels).

However, the outside option of the supplier is more complex. At first glance one may expect him to have a positive outside option, as if negotiations break down with one retailer he can expect to sell more goods through the other retailer in that market who becomes a monopolist. However, it turns out that this is not actually the case because, as explained above, we showed how both retailers are supplied in equilibrium at marginal cost, which means that the supplier makes no profit on any extra units sold.

Therefore even if negotiations with one retailer break down, and extra units are sold through his rival in that market, the supplier's profits are fixed at the level of the fixed fee paid by this retailer, and do not increase with his output. This means that we can effectively treat the two negotiations that the supplier undertakes with retailers in the same market as independent, and we have that his outside option in these bargains is also zero.

Looking at Lemma 9 we therefore have $w_i = w_j = 0$, and $u_i = u_j = u_S$. The supplier's profits are thus

$$\Pi_S = 2N(1-\alpha)\left(\frac{u_S}{3}\right)^2 - \frac{\gamma u_S^3}{3}$$

And the chain's profits are

$$\Pi_C = n_C \alpha \left(\frac{u_S}{3}\right)^2$$

From these profit functions we can establish the following result for the supplier's optimum investment level in the benchmark case.

Proposition 10 *With no private label present, the supplier's optimum level of investment is*

$$\tilde{u}_S = \frac{4N(1-\alpha)}{9\gamma}$$

Proof. See Appendix. ■

Here the motivation for the supplier to invest in increasing the quality of his product comes from a market-expansion effect; although improving quality cannot raise his market share, it can increase the total size of the market by inducing extra consumers to purchase the good.

We see that the level of this investment depends upon parameters in expected ways: it is increasing in the total number of markets from which profits can be reaped, and the strength of the supplier's bargaining power, and decreases in the cost of investment. We designate this benchmark

level of investment as $\tilde{u}_S$ because it is important in our later results.

6.3 The Introduction of Private Labels

6.3.1 Private Label Equilibrium

Next we consider a situation where the chain store possesses a private label which he may sell in place of the supplier's good, and this is of exogenous quality u_{PL}.[34] We focus upon the key question of how does the introduction of a private label affect the incumbent supplier's incentives to invest and innovate, and what effect does this have upon downstream competition and consumers?

Note that we assume that only the chain retailer possesses a private label, and we take the presence of this to be exogenously determined as our main focus is not upon this decision itself but upon its impact upon the incumbent supplier, investment levels, competition and the welfare of consumers.[35] However we note that given the setup, with a large retailer present in several markets, an outcome where only the chain establishes a private label is entirely realistic; he would be better able to pay the costs of establishing a private label as he could spread this over more

[34] Fixing the quality of one of the goods and concentrating only upon the investment incentives of the other is an approach that has been used before, for example in Bontems, Monier-Dilhan and Réquillart (1999). However, they fix the quality of the supplier's good and study incentives to invest in the private label, an approach which we argue is less interesting than studying the incentives of the incumbent supplier to invest as this has a direct impact upon the competitive position of smaller retailers.

[35] For an analysis of the retailer's decision to actually introduce a private label see Scott Morton and Zettlemeyer (2004), where the retailer must decide whether to delist a national brand in order to stock the own label. Also see Gabrielsen and Sørgard (2007) where the retailer must decide whether to grant exclusivity to the national brand, or introduce the private label alongside it.

units.

We implicitly model the chain as engaging in self-production of his private label; he can produce it in the same manner that the incumbent supplier produces his goods. That is, the retailer can sell as much of the private label as he wishes at a marginal cost of zero. This model of self-production is relatively standard in the literature, for example in Gabrielsen and Sørgard (2007) and Sayman, Hoch and Raju (2002).

However, there is significant evidence that self-production does not entirely accurately reflect the reality of the manufacture of private labels. While it does appear that some store brands are produced by the retailers themselves, and surprisingly some are produced by branded good producers, in practice most are produced by a competitive fringe of manufacturers that specialise in private label production. For example Bergès-Sennou, Bontems and Réquillart (2004) note that in the French dairy sector all three methods of private label production exist; all large dairy farms also produce private labels, several medium and small manufacturers specialise in private labels, and at least one retailer has its own production facility.

It is important to realise though that our model also effectively describes the situation when the production of a private label is outsourced to this fringe. Competition between these many firms for the business of producing the private label will result in a Bertrand outcome where the wholesale price they charge is pushed down to the marginal cost of

production, zero. Therefore, although as we proceed we talk of retailers producing their own private labels, our model applies much more generally to the case where the production of private labels is outsourced to another firm. This is similar to Bontems, Monier-Dilhan and Requillart (1999), who model the production of a private label as being by a competitive fringe of suppliers selling it to the retailer at marginal cost.

Recognise that here we have two different types of markets; n_C markets feature the chain competing with his private label against an independent store selling the good produced by the supplier. In the other $N - n_C$ markets the chain store is not present, and instead feature two independent stores both competing with the supplier's good. To understand the overall equilibrium level of supplier investment, u_S^*, we have to solve for the equilibrium in both of these types of market before aggregating over all of them.

The following equations are based upon an assumption that after establishing the private label, the chain will actually want to use it; that $u_{PL} \geq u_S^*$. We investigate later if and when this is the case. We don't assume any sort of lock-in, and the chain is free to establish the private label and then not actually sell it, a possibility we specifically turn our attention to in the next section.

In markets where the chain is present he sells his own good of quality u_{PL} and enjoys a production cost of zero ($w_{PL} = 0$). Similarly, in those markets where the chain is present the incumbent supplier will contract

with only a single retailer, and will therefore maximise the profit of the vertical chain by setting the marginal wholesale price equal to his production cost, which is zero, $w_S = 0$. Then, as in the previous section, the fixed fee will be set at a level which splits the profit between the supplier and retailer according to their bargaining power.

In those $N - n_C$ markets where the chain is not present the supplier sells to two retailers. The outcome here will be similar to the one described above in the benchmark case with no private labels. That is, the opportunism problem results in both retailers being supplied at zero marginal cost with negotiations taking place over the fixed fee, and both bargains are effectively treated as being separate.

Again, before solving the bargaining game to calculate payoffs we have to analyse the outside options of the retailers and suppliers if negotiations break down. Firstly we can note that again all independent retailers have no outside option. Since the supplier is a monopolist, if they fail to contract with him they are forced to exit the industry as they have no alternative source of inputs. When the supplier contracts with an independent store facing the chain with his own private label, he too has no outside option; there is no alternative channel for him to use to reach those consumers. Also, as discussed above, even when he sells to two independent retailers in a market the supplier has no outside option due to the marginal cost pricing that prevails in equilibrium.

Summing the supplier's share of the profits from all of the n_C markets

where he deals with an independent store facing a chain and all of the $(N-n_C)$ markets where he deals with two independent stores facing each other, and taking into account investment costs, we get total supplier profits as

$$\Pi_S = 2\left(N - n_C\right)\left(1-\alpha\right)\left(\frac{u_S}{3}\right)^2 + n_C\left(1-\alpha\right)\left(\frac{2u_S - u_{PL}}{3}\right)^2 - \frac{\gamma u_S^3}{3}$$

We get the following expression for his first order condition, which pins down his optimum level of investment[36]

$$\frac{4\left(N - n_C\right)\left(1-\alpha\right)}{9}u_S + \frac{4n_C\left(1-\alpha\right)}{9}\left(2u_S - u_{PL}\right) = \gamma u_S^2 \qquad (3)$$

The effect of the introduction of private labels on the investment incentives of the incumbent manufacturer initially appears ambiguous. On the one hand he has reduced incentives because of a simple numbers effect - he now sells to n_C fewer stores than previously, so stands to earn lower proceeds from investment. However, on the other hand there are increased incentives because in some markets there is now a business stealing effect; those retailers he supplies that face the chain store stand to gain market share if they are supplied with a higher quality product.

[36]Note at first glance this first order condition may appear to not have a solution, as at $u_S = 0$ we appear to have a negative marginal benefit of investment. However, this is an algebraic falsehood coming from the fact that when $u_S = 0$ we have $\frac{2u_S - u_C}{3}$ negative, but $\left(\frac{2u_S - u_C}{3}\right)^2$ positive. As u_S rises, the term becomes less negative, hence the squared term becomes less positive. In actuality, when the term is negative, the retailer would not sell the good, would make zero profit, and hence the marginal benefit from this term is non-negative, combined with the non-negative other term.

We are able to state the following about the equilibrium in this case.

Proposition 11 *When we have a high quality private label, $u_{PL} \geq \tilde{u}_S$, we have $u_{PL} \geq u_S^*$ and therefore an equilibrium with the chain store selling his own store brand.*

Proof. See Appendix. ■

This result means that for the range $u_{PL} \geq \tilde{u}_S$ our earlier assumption that we have $u_{PL} \geq u_S^*$ is indeed correct, and we get the equilibrium presented. In this case the retailer prefers to sell his own good to that of the incumbent manufacturer as it is of higher quality, and therefore puts him at an advantage compared to the other retailers and allows him to earn greater profits. We can explicitly solve for the optimum level of investment by the incumbent manufacturer in this case

Lemma 12 *When the chain has a high quality private label, $u_{PL} \geq \tilde{u}_S$, in equilibrium he sells it and the supplier optimally invests*

$$u_S^* = \frac{\frac{4(N+n_C)(1-\alpha)}{9} + \sqrt{\left[\frac{4(N+n_C)(1-\alpha)}{9}\right]^2 - \frac{16\gamma n_C(1-\alpha)}{9}u_{PL}}}{2\gamma} \leq \tilde{u}_S \qquad (4)$$

Proof. See Appendix. ■

So we see here that the supplier's investment incentives have been reduced by the presence of the private label, we term this effect the *forestalling effect.* Because he sells his good through fewer outlets than in the benchmark case with no private labels, he has less of an opportunity to reclaim the costs of his investment.

Examining this solution we can also state one corollary

Corollary 1 *u_S^* is decreasing in u_{PL}.*

We have therefore established that the sale of private label goods unambiguously reduces the incentives for the incumbent supplier to invest in improving his product. Moreover, the greater the quality of the private label, the more significant this effect is. This serves to damage the competitive position of smaller independent retailers who source their inputs from this supplier; they now face selling a lower quality product while being in competition with a chain store that possesses an even higher quality good than previously.

This result has a similar intuition to the literature on raising rivals' costs, whereby firms seek to disadvantage their rivals to improve their own relative competitiveness.[37] This also relates to the concept of the waterbed effect, which is the idea that a large retailer exercising his buyer power to obtain discounts from his suppliers causes them to raise their prices to his less powerful rivals, increasing his profit still further but distorting downstream competition.[38]

More specifically, our result links into (though is still distinct from) an idea raised by the UK Competition Commission in their grocery market inquiry of a "non-price" waterbed effect.[39] This argument states that as a

[37]For example see Salop and Scheffman (1983, 1987), Sibley and Weisman (1998) and Banerjee and Lin (2003).

[38]For example see Majumdar (2006), Dobson and Inderst (2007) and Inderst and Valetti (2007).

[39]Competition Commission (2007), The Supply of Groceries in the UK Market Investigation, paragraph 5.38.

large retailer uses his buyer power to obtain preferential non-price terms of trade, smaller retailers see a deterioration in their non-price terms. Here we have shown that by establishing a private label, a large retailer is able to damage his rivals' non-price terms of trade, which serves to further improve his competitive position.[40]

We turn our attention to an analysis of our findings, and their implications for competition, consumers and policy later. First we examine the possibility of a market outcome where the chain store may optimally possess a private label, but not sell it in equilibrium.

6.3.2 Private Label Established but not Sold

Let us now consider the case when we have $u_{PL} < \tilde{u}_S$ and examine if here there is an equilibrium where the chain store possesses a private label, but does not sell it in equilibrium. We would interpret this as the chain establishing an umbrella brand which spans several product ranges, and which could be introduced into the category in question should the retailer not receive a sufficiently generous contract from the incumbent supplier.[41] This therefore gives him an outside option in his negotiations with the supplier, and allows him to secure a larger proportion of the

[40] Economides (1998) develops a model of the raising rivals' costs argument that specifically focusses upon degrading the quality of rivals' products.

[41] The concept of an umbrella brand which reaches across several product catagories (sometimes referred to as "brand extension" or "reputation stretching") has featured in several papers, for example Wernerfelt (1988), Choi (1998) and Cabral (2000). Erdem (1998) conducts an empirical analysis and finds strong support for the signalling theory of umbrella branding. In addition, Boston Consulting Group (2007) note that "large retailers have learned to create trusted ROBs [Retailer Own Brands], which serve as umbrella brands for their private-label offerings".

profits.

For such an outcome to be an equilibrium we must ultimately have $u_{PL} \leq u_S^*$ so that it is actually optimum for the chain to sell the supplier's good rather than his own. We assume this initially in our calculations and later verify that this is indeed the case.

Before we can pin down the results of the bargaining game between the supplier and the retailers we must once more turn our attention to the outside options of all parties. Again, similar to the situation analysed above, the fact that the opportunism problem results in retailers being supplied at marginal cost means that the supplier stands to make no increase in profit on extra units sold through a rival store, should negotiations with a given retailer break down. So, again we have that both negotiations can be treated separately, with the supplier having no outside option.

Here though the chain does have an outside option, as if negotiations break down with the supplier he can always sell his own private label instead. The quality of this own label is crucial in dictating how great this outside option is. Substitution of the relevant values into equation (2) gives us the value of the chain's outside option as $\left(\frac{2u_{PL}-u_S}{3}\right)^2$.

Therefore the supplier's profits as a function of his quality level is given by

$$\Pi_S = (2N - n_C)(1-\alpha)\left(\frac{u_S}{3}\right)^2 + n_C(1-\alpha)\left[\left(\frac{u_S}{3}\right)^2 - \left(\frac{2u_{PL} - u_S}{3}\right)^2\right] - \frac{\gamma u_S^3}{3}$$

Maximising this with respect to his level of investment u_S we are able to prove the following result

Proposition 13 *When we have a low quality private label, $u_{PL} < \tilde{u}_S$, we have $u_S^* > u_{PL}$ and therefore an equilibrium where it is not sold but is used as a threat to improve the chain's bargaining position.*

Proof. See Appendix. ■

This means that our earlier assumption of $u_S^* > u_{PL}$ upon which our equations were predicated was in fact correct. This result tells us that when the quality of the private label is low it will not be sold in equilibrium, but is still useful for the chain retailer. By giving him an outside option, even if it is inferior to the supplier's good, it allows him to secure a larger proportion of the industry profits.

Considering the exact level of investment that will occur in this equilibrium, we are able to show that

Lemma 14 *When the chain has a low quality private label, $u_{PL} < \tilde{u}_S$, in equilibrium he ultimately sources off the incumbent manufacturer who optimally invests*

$$u_S^* = (1-\alpha)\frac{(2N - n_C) + \sqrt{(2N - n_C)^2 + \frac{36\gamma n_C}{(1-\alpha)}u_{PL}}}{9\gamma} > \tilde{u}_S \qquad (5)$$

Proof. See Appendix. ■

We see that here the supplier invests more than in the benchmark case, that the presence of the chain's outside option actually serves to encourage further investment by the supplier. The logic for this result is that when the chain has a private label as an outside option, the supplier has two separate incentives to invest in improving his quality. Firstly there is the market-expansion incentive to invest, and this is exactly the same as it was in the base case when there was no threat of the introduction of private labels.

However, here the supplier has a second incentive to invest that he did not have in the benchmark case, and that is by investing more he reduces the value of the chain's outside option. The chain would face competing against a higher quality rival downstream if he invoked his outside option, and so stands to make a lower level of profit the greater the supplier's level of investment. Therefore the incumbent supplier will seek to spend more on improving his quality because of this effect, as it allows him to secure a larger proportion of the industry profits during negotiations.[42]

So here we have a pro-competitive effect that we term the *competition effect*; that the presence of a private label can induce the incumbent supplier to invest more than he would have had the chain's store brand not been present.

[42] A similar logic of reducing the value of the buyer's outside option is found in Inderst and Wey (2007b), though there investments affect marginal cost not quality.

Of course, to some extent it seems unrealistic that a retailer will establish a private label and not sell it at all. However, although our paper follows the majority of the literature and examines a single-product stocking model for the sake of clarity and ease of exposition, it is important to remember that in reality retailers sell a whole variety of different goods. More generally speaking, our model could perhaps be interpreted as competition for the prime shelf-space within a store.

The private label equilibrium could be interpreted as the situation where the store's own brand get the best location, with the supplier's relegated to a lower shelf. This equilibrium, on the other hand, could perhaps be thought of as the supplier's good keeping the prime selling space, but a private label being introduced onto the lower shelves ready to move up if the supplier doesn't offer a preferential input price.

6.4 Analysis and Policy Implications

Here we examine the effect of the introduction of a private label on consumers, comparing the equilibrium with them present to the benchmark case with no private labels. First we present a result that allows us to investigate how changes in the quality of the goods affects the total utility of consumers

Lemma 15 *In a market with two goods with respective qualities of* u_i

and u_j, the representative consumer's utility in equilibrium is

$$U = \frac{(u_i + u_j)^2}{18} \tag{6}$$

Proof. See Appendix. ■

This lemma tells us that the utility in a given market is a simple function of the sum of the qualities of the two products. Therefore if the quality of one good rises and the other one falls, overall utility will increase if the improvement in one is greater than the decrease in the other.

We therefore denote the total utility of consumers in the benchmark case as

$$\tilde{U} = N\frac{(2\tilde{u})^2}{18}$$

We have two cases to examine; firstly when $u_{PL} < \tilde{u}_S$ and we have an equilibrium with the chain sourcing from the supplier, and secondly when we have $u_{PL} \geq \tilde{u}_S$ and we have the private label being sold.

6.4.1 Low quality private labels: $u_{PL} < \tilde{u}_S$

In lemma 14 we demonstrated that when a low quality private label is introduced it drives the incumbent supplier to invest more in his product than he would have if the private label had not been present; the competition effect. The logic here is that the supplier has an incentive to invest in order to reduce the value of the chain's outside option. Examining

consumer welfare in this case we can state the following result

Proposition 16 *With the introduction of a low quality private label,* $u_{PL} < \tilde{u}_S$*, consumers earn utility*

$$U = \frac{2N}{9}\left[(1-\alpha)\frac{(2N-n_C)+\sqrt{(2N-n_C)^2+\frac{36\gamma n_C}{(1-\alpha)}u_{PL}}}{9\gamma}\right]^2 > \tilde{U}$$

Proof. See Appendix. ■

So consumers here are unambiguously better off in this situation than in the benchmark case when there were no private labels. The Competition Commission investigation into the UK grocery market found evidence to supports this result. They recognised the argument that the presence of an own label can serve to spur an incumbent supplier to increase his level of innovation. They noted that

> "Asda told us that in circumstances where the viability of a branded supplier was not under threat, additional competition from own-label products might be expected to drive higher levels of innovation."[43]

Ultimately they concluded that, similar to our findings, in this situation the presence of private labels is beneficial

> "We consider that the pro-competitive effects we have identified support the existence of a number of primary and sec-

[43]Competition Commission (2007), The Supply of Groceries in the UK Market Investigation, Appendix 9.10, paragraph 39.

ondary drivers of own-label success ... the existence of pro-competitive effects of own-label products is consistent with the trends we have observed in R&D expenditure and innovation".

6.4.2 High quality private labels $u_{PL} \geq \tilde{u}_S$

However, the implications of private labels are less benign when we move from a situation when their presence is only a threat to one where they are actually sold. Lemma 12 showed us that this leads to the incumbent supplier reducing his level of investment, a forestalling effect

Proposition 17 *With the introduction of a high quality private label, $u_{PL} \geq \tilde{u}_S$, consumers earn utility*

$$U = \frac{(N-n_C)}{18\gamma^2}\left(\frac{4(N+n_C)(1-\alpha)}{9} + \sqrt{\left[\frac{4(N+n_C)(1-\alpha)}{9}\right]^2 - \frac{16\gamma n_C(1-\alpha)}{9}u_{PL}}\right)^2 + \frac{n_C}{18}\left(\frac{\frac{4(N+n_C)(1-\alpha)}{9} + \sqrt{\left[\frac{4(N+n_C)(1-\alpha)}{9}\right]^2 - \frac{16\gamma n_C(1-\alpha)}{9}u_{PL}}}{2\gamma} + u_{PL}\right)^2$$

It is ambiguous whether the introduction of a private label leaves consumers better off.

Proof. See Appendix. ■

The reason that the impact upon consumers is ambiguous here is because it is uncertain whether the decrease in the quality of the supplier's good is offset by the presence of a higher quality private label. This result supports the arguments of those who criticise the growth of private

labels as potentially damaging to the R+D incentives of suppliers and the competitive position of small firms.

The idea that the private labels in a market may be of higher quality than the traditional products produced by the incumbent supplier may at first appear unusual and potentially contrary to reality. However, commentators have recent come to recognise that this is indeed a possibility.

Examining those small manufacturers that act as specialist private label producers supplying retailers with their own products, Boston Consulting Group (2007) notes that

> "as suppliers of private-label products consolidate ... they are gaining their own momentum in terms of increased scale and capabilities".

They then go on to explicitly comment on the ability of these private label manufacturers to produce higher quality goods, commenting that

> "The most sophisticated ROB [Retailer Own Brand] players are beginning to ... out-innovate branded manufacturers"

We can state one final result about the effect of the introduction of private labels on another issue that has been of concern for policy makers, the profitability of independent retailers

Proposition 18 *If private labels are sold in equilibrium, independent retailers earn (weakly) lower profits than in the benchmark case*

Proof. See Appendix. ■

In those markets where the independent stores compete against the chain, they sell a lower quality good than previously, and come up against a rival with an even higher quality product than before, so clearly stand to lose profits. Even in those markets where the chain store is not present, the independent retailers still stand to lose out. Although they still have the same relative quality, it has fallen compared to the benchmark case and so there is a market contraction effect: fewer consumers buy the product than before and so both retailers are worse off.

We can also note that this effect gets stronger the greater the quality of the private label. If the chain retailer introduces a very high quality store brand this will, by Corollary 1, mean that the supplier will reduce his investment by a significant amount, severely reducing the profits of the independent retailers.

Although we don't explicitly model fixed costs and therefore the possibility that a retailer may wish to exit the market, intuitively one can see that this result could imply such an outcome in practice. Smaller retailers could stand to see their profits reduced to such a degree that they are unable to cover their overheads and choose to exit, allowing the chain store to gain control of the market; an outcome that is clearly of significant concern to competition authorities.

6.5 Conclusions

Private labels are an increasingly important market segment for firms worldwide, yet the implications of their growth are not fully understood by economists. Fears have been raised by competition authorities that their development could potentially have a range of anti-competitive implications, particularly that they could reduce the incentives for suppliers to invest in improving their products.

We have created a model to allow us to formalise these arguments and examine if there is any grounding to these fears. Our model featured a supplier choosing how much to invest in improving his product quality - a term we give a wide interpretation to - both when a chain retailer possesses a private label, and when he doesn't.

Contrary to much existing thinking, we illustrate a possible beneficial effect of the introduction of private labels. We demonstrated that their introduction into a market could actually spur the supplier to increase his level of investment, a phenomenon we termed the competition effect to reflect the fact that the incumbent producer must now improve his product to compete with the private label. We showed how this process can make consumers better off, as they benefit from the non-price competition which results in higher quality products.

We further discussed how our results are in line with the findings of the UK Competition Commission grocery market inquiry. They noted increasing levels of innovation taking place across a whole range of prod-

uct categories, and specifically associated this with the pro-competitive effects of private labels.

However, we also demonstrated that the fears of competition authorities could potentially be well-founded by illustrating a possible forestalling effect of private labels, which could result in suppliers optimally reducing their investment below the level prevailing without their presence. We note that the effect of this on consumers is actually ambiguous, as the higher quality of the private label could potentially offset the lower quality of the supplier's good.

Ultimately, therefore, there can be no prior assumption as to the nature of the competitive impact of private label goods. Instead we argue that regulators must keep an open mind and use a rule-of-reason approach; they should be aware of all the potential impacts of the introduction of these goods, and ensure that their assessments are evidence-led.

6.6 Appendix

6.6.1 Proof of Lemma 9

$$
\begin{aligned}
\Pi_i &= q_i(u_i - q_i - q_j - c_i) \\
\frac{\partial \Pi_i}{\partial q_i} &= u_i - 2q_i - q_j - c_i = 0 \\
q_i &= \frac{u_i - q_j - c_i}{2} \\
q_i &= \frac{u_i - c_i - \frac{u_j - q_i - c_j}{2}}{2} \\
q_i &= \frac{2(u_i - c_i) - (u_j - c_j)}{3} \\
\Pi_i &= \frac{2(u_i - c_i) - (u_j - c_j)}{3} \left(\begin{array}{c} u_i - \frac{2(u_i - c_i) - (u_j - c_j)}{3} \\ -\frac{2(u_j - c_j) - (u_i - c_i)}{3} - c_i \end{array} \right) \\
\Pi_i &= \left(\frac{2(u_i - c_i) - (u_j - c_j)}{3} \right)^2
\end{aligned}
$$

6.6.2 Proof of Proposition 10

Optimising with respect to u_S

$$\frac{\partial \Pi_S}{\partial u_S} = \frac{4N(1-\alpha)}{3}\left(\frac{u_S}{3}\right) - \gamma u_S^2 = 0$$

Give us the solution

$$\tilde{u}_S^* = \frac{4N(1-\alpha)}{9\gamma}$$

Note we do also get another solution to this equation, namely $u_S = 0$.

However, if we check the second order conditions we can note that

$$\frac{\partial^2 \Pi_S}{\partial u_S^2} = \frac{4N(1-\alpha)}{9} - 2\gamma u_S$$

Substituting in $\tilde{u}_S^* = \frac{4N(1-\alpha)}{9\gamma}$ to this equation gives us

$$\frac{\partial^2 \Pi_S}{\partial u_S^2}\left(u_S = \frac{4N(1-\alpha)}{9\gamma}\right) = \frac{4N(1-\alpha)}{9} - 2\gamma\frac{4N(1-\alpha)}{9\gamma} = -\frac{4N(1-\alpha)}{9} < 0$$

So this value is a maximum point, and so represents a solution. On the other hand if we substitute $u_S = 0$ into the second order condition we get

$$\frac{\partial^2 \Pi_S}{\partial u_S^2}(u_S = 0) = \frac{4N(1-\alpha)}{9} > 0$$

So this point represents a minimum, and is not a solution.

6.6.3 Proof of Proposition 11

We solve for the subgame perfect Nash equilibrium of the game. We have already examined the behaviour of the consumer and calculated the chain's profit function; the following is a rearrangement of the supplier's first order condition for his level of investment given in equation (3)

$$\frac{4N(1-\alpha)}{9}u_S + (u_S - u_{PL})\frac{4n_C(1-\alpha)}{9} = \gamma u_S^2$$

Compare this to his first order condition in the base case without private labels, which gave us an equilibrium of $\tilde{u}_S$ via the equation

$$\frac{4N(1-\alpha)}{9}u_S = \gamma u_S^2$$

We can see that if we have $u_{PL} - u_S = 0$ the extra term will disappear, and the first order conditions will be the same. So therefore we have

$$u_{PL} = \tilde{u}_S \Longrightarrow u_S^* = \tilde{u}_S \tag{7}$$

In which case we will have the quality of both goods being the same. We can then see that the supplier has lower incentives to invest than in the base case if the quality of the private label is greater than $\tilde{u}_S$. That is we have

$$u_{PL} > \tilde{u}_S \Longrightarrow u_S^* < \tilde{u}_S \tag{8}$$

Therefore we have that

$$u_{PL} > \tilde{u}_S \Longrightarrow u_{PL} > u_S^*$$

Therefore, with a high quality private label we have a subgame perfect Nash equilibrium where the retailer sells his own label as it of higher quality than the supplier's product.

6.6.4 Proof of Lemma 12

Again we solve for the subgame perfect Nash equilibrium of the game; taking into account the consumer's behaviour we have the following re-

arrangement of the supplier's first order condition

$$\frac{4N(1-\alpha)}{9}u_S - \frac{4n_C(1-\alpha)}{9}(u_{PL} - u_S) = \gamma u_S^2$$

$$\frac{4(N+n_C)(1-\alpha)}{9}u_S - \frac{4n_C(1-\alpha)}{9}u_{PL} = \gamma u_S^2$$

$$\gamma u_S^2 - \frac{4(N+n_C)(1-\alpha)}{9}u_S + \frac{4n_C(1-\alpha)}{9}u_{PL} = 0$$

$$u_S = \frac{\frac{4(N+n_C)(1-\alpha)}{9} \pm \sqrt{\left[\frac{4(N+n_C)(1-\alpha)}{9}\right]^2 - 4\gamma\frac{4n_C(1-\alpha)}{9}u_{PL}}}{2\gamma}$$

Which gives us the following subgame perfect Nash equilibrium level of investment

$$u_S^* = \frac{\frac{4(N+n_C)(1-\alpha)}{9} + \sqrt{\left[\frac{4(N+n_C)(1-\alpha)}{9}\right]^2 - \frac{16\gamma n_C(1-\alpha)}{9}u_{PL}}}{2\gamma}$$

Furthermore, the fact that we have $u_S^* \leq \tilde{u}_S$ directly follows from equations (7) and (8).

6.6.5 Proof of Proposition 13

We show that for $u_{PL} < \tilde{u}_S$ that we have a subgame perfect Nash equilibrium with $u_S^* > \tilde{u}_S$, which thereby implies $u_{PL} < u_S^*$ and therefore the chain sells the supplier's good as it is of higher quality than his own.

We can investigate whether in equilibrium $u_S^* > \tilde{u}_S$ simply by looking

at the first order conditions in this case compared to the benchmark case analysed earlier when there were no private labels. In particular, since the investment costs are the same in both circumstances we need only look at the benefits of investment in both cases. We have $u_S^* > \tilde{u}_S$ when

$$\frac{2(2N - n_C)(1-\alpha)}{3}\left(\frac{u_S}{3}\right) + n_C(1-\alpha)\left[\frac{2}{3}\left(\frac{u_S}{3}\right) + \frac{2}{3}\left(\frac{2u_{PL} - u_S}{3}\right)\right] > \frac{4N(1-\alpha)}{3}\left(\frac{u_S}{3}\right)$$

Which we can rewrite as

$$\frac{2(2N - n_C)(1-\alpha)}{9}u_S + \frac{2n_C(1-\alpha)}{9}u_S + \frac{2n_C(1-\alpha)}{9}(2u_{PL} - u_S) > \frac{4N(1-\alpha)}{9}u_S$$

$$\frac{4N(1-\alpha)}{9}u_S + \frac{2n_C(1-\alpha)}{9}(2u_{PL} - u_S) > \frac{4N(1-\alpha)}{9}u_S \qquad (9)$$

First recognise that we restrict out attention to the case where we have $u_{PL} > \frac{u_S}{2}$, so that the private label is actually a meaningful outside option, otherwise it is effectively not present.

We can clearly see from this that we get $u_S^* > \tilde{u}_S$ as the incentives to invest are greater here than in the benchmark. When the chain has this outside option the supplier has the same market-expansion incentive to invest as in the benchmark case, but also an additional incentive which

comes from reducing the value of the chain's private label.

Therefore we can unambiguously say that we have $u_{PL} < \tilde{u}_S$, we have a subgame perfect Nash equilibrium with $u_S^* > u_{PL}$; by possessing the private label the chain improves his outside option, but ultimately sources the good from the supplier.

6.6.6 Proof of Lemma 14

Maximising the supplier's profit function with respect to his level of investment

$$\frac{\partial \Pi_S}{\partial u_S} = \frac{2(2N - n_C)(1-\alpha)}{3}\left(\frac{u_S}{3}\right) + n_C(1-\alpha)\left[\frac{2}{3}\left(\frac{u_S}{3}\right) + \frac{2}{3}\left(\frac{2u_{PL} - u_S}{3}\right)\right] - \gamma u_S^2 = 0$$

$$(2N - n_C)(1-\alpha)u_S + n_C(1-\alpha)[u_S + (2u_{PL} - u_S)] = \frac{9\gamma u_S^2}{2}$$

$$(2N - n_C)u_S + 2u_{PL}n_C = \frac{9\gamma u_S^2}{2(1-\alpha)}$$

Note here that we can clearly observe that this equation has a solution. When $u_S = 0$, we have the left hand side being greater, due to the presence of the u_{PL} term, whilst as u_S becomes very large the squared term dominates giving us a greater term on the right hand side; there must therefore be a crossing point where the two sides are equal.

$$\frac{9\gamma}{2(1-\alpha)}u_S^2 - (2N - n_C)\,u_S - 2u_{PL}n_C = 0$$

Using the quadratic formula we get

$$u_S^* = \frac{(2N - n_C) \pm \sqrt{(2N - n_C)^2 - 4\frac{9\gamma}{2(1-\alpha)}(-2u_{PL}n_C)}}{2\frac{9\gamma}{2(1-\alpha)}}$$

We now clearly only have one solution, the positive one, as the negative solution would give us a quality level below zero. We therefore have a subgame perfect Nash equilibrium level of investment of

$$u_S^* = (1-\alpha)\frac{(2N - n_C) + \sqrt{(2N - n_C)^2 + \frac{36\gamma n_C}{(1-\alpha)}u_{PL}}}{9\gamma}$$

The fact that we have $u_S^* > \tilde{u}$ follows directly from equation (9).

6.6.7 Proof of Lemma 15

We have the following utility function for the representative consumer

$$U = u_i q_i + u_j q_j - \frac{q_i^2 + 2q_i q_j + q_j^2}{2} - P_i q_i - P_j q_j$$

We need to put this in terms of just u_i and u_j by substituting in equilibrium levels for quantities and prices as a function of these quality levels.

The inverse demand curve is

$$p_i = u_i - q_i - q_j$$

So substituting in this for prices gives us the consumer's utility as a function of the quality of the goods and quantities

$$U = u_i q_i + u_j q_j - \frac{q_i^2 + 2q_i q_j + q_j^2}{2} - u_i q_i + q_i^2 + q_i q_j - u_j q_j + q_j^2 + q_j q_i$$

$$U = \frac{2q_i^2 + 4q_i q_j + 2q_j^2 - \left(q_i^2 + 2q_i q_j + q_j^2\right)}{2}$$

$$U = \frac{q_i^2 + 2q_i q_j + q_j^2}{2}$$

$$U = \frac{\left(q_i + q_j\right)^2}{2}$$

We showed previously in our proof of lemma (9) that the equilibrium quantity sold is

$$q_i = \frac{2\left(u_i - w_i\right) - \left(u_j - w_j\right)}{3}$$

$$q_i = \frac{2u_i - u_j}{3}$$

Substituting this into our utility function therefore gives us

$$U = \frac{\left(\frac{2u_i - u_j}{3} + \frac{2u_j - u_i}{3}\right)^2}{2}$$

And therefore we have the required result, that the utility in a market is a function of the sum of the qualities of the two products.

$$U = \frac{(u_i + u_j)^2}{18}$$

6.6.8 Proof of Proposition 16

When private labels are established but not sold, then in all markets both retailers sell the supplier's good and we have $u_i = u_j = u_S^*$. We can calculate U by substituting u_S^* from equation (5) into equation (6). The second part of the proposition follows from the fact that $u_S^* > \tilde{u}_S$ as established in Lemma 14.

6.6.9 Proof of Proposition 17

By substitution of u_S^* from equation (4) into equation (6).

6.6.10 Proof of Proposition 18

Here we have that an independent retailer i earns a profit of

$$\Pi_i = \alpha \left(\frac{2u_i - u_j}{3} \right)^2$$

This profit is clearly increasing in his own quality, and decreasing in his rival's quality, as would be expected. In the benchmark case we had

$$u_i = u_j = \tilde{u}_S$$

So independent retailers earned a profit of

$$\Pi_i = \alpha \left(\frac{\tilde{u}_S}{3} \right)^2$$

Here, with the chain establishing and selling a private label, we know from Lemma 12 that we have $u_S^* \leq \tilde{u}_S$. We have two different cases to examine; first let us look at those markets where the chain is not present.

We now have independent retailers earning a profit of

$$\Pi_i = \alpha \left(\frac{u_S^*}{3} \right)^2$$

Which is clearly (weakly) lower than the profits they earned previously, because their common quality level has decreased.

In those markets where the independent retailers face the chain the decrease in profits is even more pronounced, they now earn

$$\Pi_i = \alpha \left(\frac{2u_S^* - u_{PL}}{3} \right)^2 \leq \alpha \left(\frac{u_S^*}{3} \right)^2 \leq \alpha \left(\frac{\tilde{u}_S}{3} \right)^2$$

They now compete with a lower quality level, u_S^*, against a rival with a higher quality level, u_{PL}, so earn (weakly) lower profits than before.

7 Private Labels and The Countervailing Buyer Power Merger Defence

7.1 Introduction

The term countervailing power was coined by Galbraith (1952), who introduced the idea that powerful retailers can act as a counterbalancing force against the market power of sellers, and can extract lower prices from them. The idea was widely dismissed at the time, and in the decades since economists have overwhelmingly focussed their interests upon the role of sellers in markets, rather than buyers.

However, more recently attention has returned to the treatment of the role of buyers in markets, partially driven by the development of huge retail chains, whose growth has raised significant questions for antitrust practitioners, who frequently disagree on how to approach these issues. Economists have begun to examine in detail the conditions under which buyer power is likely to exist, and its likely effects on both the upstream and downstream markets.

The focus of this paper is particularly upon the use of buyer power as a merger defence in competition cases. This can take two forms, firstly buyer power can be used as an efficiency defence in downstream merger cases. That is, the parties can argue that the merger will create buyer power and that this is a good thing as it will allow them to obtain lower prices from their suppliers, which will feed through into lower prices,

higher output, and increased welfare.

The second way that buyer power can be used as a merger defence is through the idea of countervailing power, and this is the idea we focus upon in this paper. This is used in upstream merger cases, and the argument is that if there (already) exists buyer power downstream this will counteract any increase in upstream market power, leaving the merged firm unable to raise prices. Countervailing buyer power has long been recognised by antitrust authorities around the world as an important argument for allowing an otherwise problematic merger between two upstream suppliers of a good to go ahead, and has been the key argument in several significant cases.

This argument has, however, received relatively little attention from economists; Davis and Wilson (2006) note that "The effects of countervailing buyer power are not well understood either theoretically or empirically". The notable exception is Inderst and Shaffer (2007b) who provide an overview of the use of buyer power as a merger defence; particularly they examine the key factors that need to be considered when using the countervailing power argument, and discuss its use in practice. However, to our knowledge, there has been no research by academics to inform the debate amongst practitioners by examining the argument formally which could shed light upon the key factors that must be considered and the conditions under which the argument stands up to scrutiny.

In this paper we do just that, and in doing so we model a new effect;

we show that following an upstream merger in an industry faced with a buyer that is able to successfully exercise countervailing power, competition downstream can still be reduced and prices to consumers can still rise. The point we illustrate is that, although incumbent retailers may be powerful and may be able to prevent increases in wholesale prices following a merger, any potential entrant that did enter downstream (and who would thus likely be smaller and not possess the same degree of countervailing power) would be affected by higher input prices following the merger. Therefore, although the merger upstream would not result in higher wholesale prices in the industry, it would serve to create a barrier to entry to firms entering downstream.[44] Any firm considering entry at the retail level knows that, following the merger, the input price it would receive would be significantly higher than it would have obtained previously; this then makes entry less profitable and thus less likely.

We then take the analysis one step further and argue that if the downstream market is a contestable one, that the pricing of the monopolist is constrained by the threat of entry, the price charged to consumers will rise following the merger. The reduced threat of entry, following from the higher input price the entrant would receive upon entry, has served to weaken the constraint upon the monopolist's pricing, and allowed him to increase it closer to the monopoly level.

Note that such an idea, of potential entrants operating at a cost

[44] Similarly, Innes (2006) shows how a non-horizontal merger can create a barrier to entry.

disadvantage acting as a barrier to entry, has been specifically recognised by the UK competition authorities. Competition Commission (2007) states that "retailers may gain a cost advantage over their competitors, that can act as a barrier to entry or expansion, by purchasing goods from suppliers at lower prices." Interestingly, they also recognise that incumbent firms may price to just deter entry, and thus that the price of a potential entrant can therefore be key in determining the prevailing price in a market: "In the case of a single grocery retailer with a significant cost advantage, this might allow it to maintain prices above its average cost, but just below the prices of any potential entrant."[45]

We then proceed to analyse an alternative setup where we show that some mergers which occur in the apparent absence of countervailing buyer power can actually still be defended using this argument. The intuition runs as follows; when pricing is constrained by the threat of entry the key factor that determines the retail price is not the level of costs of the incumbent firm, but those of the potential entrant. Therefore, if the potential entrant has countervailing power, so his costs and thus his threat of entry are unchanged following the merger, the incumbent retailer is unable to raise his price even if his costs do go up. Thus such mergers, which initially appear to be troubling because of the lack of apparent countervailing power, will not result in any increase in retail price and can be safely allowed to proceed by the competition authorities.

[45]Paragraphs 6.29 and 6.16; Competition Commission (2007), The Supply of Groceries in the UK market investigation: Provisional findings report.

We choose to model buyer power as the incumbent retailer possessing a private label good which the potential entrant does not, and this serves to increase his range of options for sourcing his inputs, which improves his bargaining position. This is another contribution of our paper; private labels are an increasingly important element of grocery markets worldwide, and have received insufficient attention from economists. Here we throw light upon this important aspect of the relationship between suppliers and retailers, and in particularly demonstrate their role as a potential source of buyer power.

However, it is important to realise that the effect we demonstrate doesn't rely upon the presence of private labels. Rather, it applies no matter what the source of the buyer power; it could also be the potential to integrate backwards, to cover the fixed cost of switching to an alternate supplier, or to sponsor upstream entry. All that is necessary to generate our results is that any rival retailer, upon entry, would not possess the buyer power of the incumbent, and would thus be exposed to higher input prices.

Also observe that this result does not rely upon an assumption of linear tariffs; that the entrant will be less competitive following the merger because his unit costs will be higher. Instead, this result can arise even when the entrant's post-entry competitiveness is unaffected, for example with an increase in the fixed fee for two-part tariffs with the unit price unchanged. The intuition is that what matters is that there is some

price rise, not the nature of the increase; the reduced profitability of entry means the potential entrant is less likely to recover his entry costs, and thus to enter in the first place. The fact that our results are robust to the nature of contracting between suppliers and retailers is unusual in the literature; most work relies upon a particular assumption that firms use either linear or two-part tariffs. This again serves to demonstrate the strength and widespread applicability of our results.

We therefore conclude that the use of the countervailing buyer power merger defence is more complex than previously thought. Antitrust authorities should be more sceptical of any merger defence based upon such countervailing power, as a merger which appears to raise no competitive concerns due to the presence of such power can still result in anticompetitive effects and higher retail prices to consumers. On the other hand, we demonstrate how some mergers which may appear problematic may not actually result in a substantial lessening of competition through an innovative application of the countervailing power idea to potential entrants. These results suggest that when this argument is used in a merger case practitioners must pay attention to the role of entry in constraining pricing in the retail market, and the ability of any potential entrants to similarly exercise countervailing power over the merged entity.

The rest of the paper is organised as follows. In Section 2 we present the basic model, where we highlight this new effect of countervailing power being unable to prevent a merger creating a barrier to entry. In

Section 3 we generalise the model to bargaining between suppliers and retailers, obtaining interesting new insights. In Section 4 we discuss an extension of the model where we show that even if countervailing power is not present it can potentially still be used as a merger defence. In Section 5 we examine the existing treatment of the countervailing power defence by antitrust authorities and highlight some cases where it has been decisive, and then present recommendations for policy makers on how this argument should be dealt with in practice. In section 6 we conclude.

7.2 The Basic Model

We have three upstream suppliers; S_1 and S_2 both produce a branded good, while S_3 (who could represent a competitive fringe) produces an unbranded good. All three suppliers can produce at a constant marginal cost of c, and consumers will only purchase branded goods from retailers.[46] Competition between suppliers takes the form of simultaneous take-it-or-leave-it contract offers to the retailer(s), we make no assumptions about the type of contracts used; for example they may either be a linear tariff w_i, or a two-part tariff (w_i, τ_i).[47]

[46] Such an assumption is confirmed by a casual observation of shopping patterns. This can be understood as consumers desiring a brand to reassure them of a product's quality; several recent scares about the safety of Chinese products have brought this issue back to the headlines.

[47] Many of the results obtained in the buyer power literature depend crucially upon the type of contracts used; on the other hand our results are very general and work for any type of contractual form. There is limited and mixed evidence on what type of contracts are used by firms in practice; Smith and Thanassoulis (2006) examined the UK market for milk and found support for linear tariffs, noting that firms use a

Downstream we have one incumbent monopolist R_1, there is also one potential entrant R_2 who can enter the industry at a sunk cost of F. Denoting monopoly profits in the downstream industry as Π^M, we assume that $\Pi^M > F > 0$.[48] We further assume that the incumbent retailer R_1 has some buyer power over the suppliers; here we model this as him possessing a private label. A private label, or own-brand, is a good where the product is branded by the retailer and not by the supplier; these products have become increasingly important in economies worldwide.[49] For example their market penetration in grocery markets now stands at around 18% in the US, 28% in Germany and about 40% in the UK.[50]

We assume that R_1 can use his private label to sell the unbranded good produced by S_3 no different to as if he were selling the goods of the other suppliers. R_2 does not have this private label and thus, if he enters, he is unable to sell S_3's good. Downstream competition takes place in prices, and we assume the retailer(s) face a generalised inverse market demand curve $P(Q)$ with the standard assumption that $P'(Q) < 0$.

We consider the impact of a merger between S_1 and S_2 upon the down-

simple per-unit price with no fixed fee element. On the other hand, Bonnet, Dubois and Simioni (2006) study the bottled water market in France and find evidence for non-linear tariffs, particularly two-part tariffs.

[48]The assumption that $\Pi^M > F$ ensures that the threat of entry by R_2 is credible; otherwise he could never profitably enter.

[49]Bergès-Sennou, Bontems and Réquillart (2004) provide a survey of the literature on private labels. Scott Morton and Zettlemeyer (2004) and Gabrielsen and Sørgard (2007) present models which attempt to explain why retailers may want to introduce private labels.

[50]See Boston Consulting Group (2007).

stream industry and consumer welfare.[51] The key question is whether the countervailing buyer power possessed by the incumbent monopolist downstream is sufficient to prevent the exercise of market power by the merged entity, an increase in retail prices and thus ultimately a reduction of overall welfare following the merger.

The timing of the game is as follows:

- In stage 1, all suppliers make simultaneous take-it-or-leave-it contract offers to the incumbent retailer, R_1.
- In stage 2, R_1 chooses which of these offers (if any) to accept. He then sets his retail price to consumers, P_1.
- In stage 3, the potential entrant R_2 decides if to pay a sunk cost F to enter the market
- In stage 4, if R_2 has entered then the branded suppliers make simultaneous take-it-or-leave-it contract offers to him. Note that the unbranded supplier makes no effective offer to the entrant, as since he lacks a private label R_2 is unable to sell these goods.
- In stage 5, if R_2 has entered he chooses which offer to accept from those offered by the branded suppliers (if any), and then sets his retail price P_2.

[51] Since our focus in not on the decision to merge itself, but on its effect upon the downstream market and retail prices, we simply take this merger decision to be exogenous and don't concern ourselves with whether it is actually profitable. A whole literature on exogenous merger models exists, starting with Salant, Switzer and Reynolds (1983) and followed by Perry and Porter (1985) and Farrell and Shapiro (1990). Kamien and Zang (1990) develop a model with endogenous mergers, and Gowrisankaran (1999) presents a model that is both endogenous and dynamic.

Although we use take-it-or-leave-it offers from the suppliers here in the basic model our results do not depend critically upon this assumption, later we relax this and examine a more generalised bargaining framework. The main point to note here is our sequential framework, that prices are set by the incumbent and then a potential entrant makes an entry and pricing decision.

This formulation follows the literature on contestable markets, developed in Baumol, Panzar and Willig (1982), which assumes that incumbent retailers are vulnerable to "hit and run" entry, where entrants can undercut their prices and steal business without them being able to respond for some period of time. This threat of losing business to entrants then disciplines incumbent firms to price at competitive levels; in a perfectly contestable market where entry is entirely costless even an incumbent monopolist is forced to price at the competitive level.

Criticisms of this theory have focussed upon the fact that after entry occurs the incumbent retailer would immediately respond to the entry by reducing price. This in turn would mean the entrant would earn zero profits (should competition be in prices) and thus he would be unable to recover even extremely small costs of entry, so entry would never happen . Therefore, the critics allege, pre-entry prices provide no guide to post-entry prices, and thus it is not possible for an incumbent firm to price to deter entry.

However, if for example there is some degree of price stickiness on

the part of the incumbent retailer he will not be able to respond to the incumbent's undercutting price for some time. This price stickiness would serve to make the market contestable, and therefore again means the threat of entry can influence the incumbent's pre-entry pricing.[52] Note that we don't make the extreme assumption of perfectly contestable markets, but simply the more relaxed and generalised assumption that entry can take place at sunk cost F.

Furthermore, it is important to recognise that the use of contestable markets theory is not actually necessary for the essential result in our paper, which is that a merger can still be anti-competitive even with apparently effective countervailing power, because of the fact that it creates a barrier to entry downstream. The use of a contestable downstream market is simply a means to model directly the impact of this barrier upon the downstream market and highlight its anti-competitive nature.

7.2.1 Pre-Merger Equilibrium

Let us first consider the situation prior to the merger between the two suppliers. The incumbent retailer benefits from competition between all three suppliers and gets offered a linear price of

[52] See also Milgrom and Roberts (1982) who consider a game of incomplete information, where the incumbent's choice of price pre-entry can signal something about the profitability of entry. The incumbent can possibly then deter entry by pricing lower than otherwise, in order to falsely signal that the market is not as profitable as it actually is. Therefore, this framework also provides a motivation for the threat of entry to constrain pre-enty pricing.

$$w_1^* = c$$

Note that this outcome occurs whether we assume suppliers use two-part tariffs or linear tariffs. With linear tariffs the wholesale price will be pushed down to marginal cost through a process of Bertrand competition between the three suppliers. With two-part tariffs the wholesale price will always be set to marginal cost c to maximise the profit of the vertical chain, Bertrand competition will then occur with respect to the fixed fee τ_{i1} that each supplier S_i offers R_1 and we will end up with $(w_{i1}, \tau_{i1}) = (c, 0)$.

Similarly, if R_2 does enter he too will benefit from competition between the two branded retailers (but not the unbranded retailer, whose good he is unable to stock), and will be offered the same contract

$$w_2^* = c$$

Upon entering, R_2's optimal strategy would be to minimally undercut R_1 by charging $P_2^* = P_1 - \xi$. We consider the limiting case, where

$$P_2^* = P_1$$

Here the incumbent retailer will make zero profits, therefore R_1 has an incentive to price so as to deter entry in the first place. In the absence of the threat of entry, the incumbent retailer would charge the monopoly

price

$$P^M = \arg\max_{P_1}(P_1 - c)Q(P_1)$$

This gives us our first interesting result

Lemma 19 *R_2 will enter if $P_1 > P^*$; where P^* is defined implicitly by the minimum value that satisfies $(P^* - c)\,Q(P^*) = F$.*

Proof. See Appendix. ■

Following on from this, we can now find a second result for the pre-merger equilibrium.

Lemma 20 *The incumbent retailer will set $P_1 = P^*$ in equilibrium to deter entry, where $P^M > P^* > c$.*

Proof. See Appendix. ■

Note that entry never occurs in equilibrium, though the threat of entry plays a key role in determining the equilibrium outcome. Having solved for the pre-merger situation we will now proceed to examine the post-merger outcome, and will compare the results found in Lemmas 19 and 20 to the outcome following the concentration.

7.2.2 Post-Merger Equilibrium

Examining the post-merger situation we get one immediate result.

Lemma 21 *Countervailing buyer power has prevented the wholesale price to the incumbent retailer rising, we still have $w_1^* = c$.*

Proof. See Appendix. ■

Examining what happens following entry, we see that as previously if R_2 enters he will set a price to just marginally undercut the incumbent retailer

$$P_2^* = P_1$$

However, despite the result of Lemma 21 when we come to analyse the entry decision of R_2 we find that the merger has indeed had an anticompetitive effect.

Proposition 22 *The merger creates a barrier to entry*

Proof. See Appendix. ■

The intuition for this result is that after the merger R_2 would upon entry face a monopoly input supplier who will be able to extract all of his profits after entry. The entrant would therefore be unable to recoup any costs incurred in entering, and so he would never choose to do so.

Thus we have established a key point, that countervailing buyer power on its own is not sufficient to prevent anticompetitive effects resulting from the merger. Although the incumbent firm is able to use his countervailing power to keep his input prices down, any potential entrant without the same power is unable to do this; therefore the merger has resulted in a barrier to entry and the potential competitor is less likely to enter the industry post-merger.

Note that the barrier to entry does not come from the reduced competitiveness of the entrant per se; although we focussed upon linear pric-

ing we also noted that using two-part tariffs the merger can simply result in a higher fixed fee to R_2, leaving him equally competitive. Rather, the barrier to entry comes from the fact that entry is less profitable than it was previously and thus the potential entrant is less likely to recover his costs of entry.

Competition authorities should attempt to avoid such an outcome because barriers to entry are generally always anticompetitive; by restricting competition they convey increased market power upon incumbent firms, a point we illustrate in our next result.

Proposition 23 *The merger leads to higher retail prices; the (superficially successful) countervailing buyer power is insufficient to prevent this.*

Proof. See Appendix. ■

Note that the countervailing power has not failed in a narrowly defined sense, by lemma (21) we see that it has prevented wholesale prices to the incumbent firm increasing. The reason it has failed is because preventing wholesale prices rising is insufficient to guarantee no increase in retail prices. In this setup we see that the major factor determining retail prices is not the retailer's costs, but the competitive constraint imposed by the potential entrant. Therefore, as the merger serves to weaken this constraint retail prices will rise even in the absence of an increase in costs. This strictly reduces overall welfare as there has been an increase in deadweight loss; those consumers that strictly preferred to purchase

at the old price, but choose not to at the new monopoly price, are worse off.

It should also be recognised that although the above result concentrates upon perhaps the simplest and often most important variable in a market, the price, the barrier to entry the merger creates can have additional negative effects. For example, in addition to the simple static effects demonstrated above there may also be some additional consequences if we consider the market in a dynamic setting; for example the reduced competitive constraints that result from the barrier to entry can weaken incentives for incumbent firms to invest in improving product quality and consumer choice over time.

7.3 A Bargaining Model

Our basic model demonstrated our key insight, that countervailing buyer power may be insufficient to prevent anti-competitive effects arising as a result of an upstream merger. To simplify the exposition we assumed that suppliers made take-it-or-leave-it offers to retailers; we now relax that assumption and instead have suppliers and retailers bargaining over their contracts.

We use the standard Nash bargaining solution, and set the exogenous bargaining power of retailers equal to α. We thus endogenise the bargaining outcome through an analysis of outside-options, with this rule dictating how any incremental surplus above the sum of the outside-

options of the two parties is split between them.

To analyse the bargaining outcome it is now necessary that we are more precise about the types of contracts used by firms. We solve for the two standard cases in the literature: linear tariffs (the simplest form of contract), and two-part tariffs (the simplest form of contract that overcomes double marginalisation and allows the setting of the marginal wholesale price and the distribution of profits to be done separately).

7.3.1 Two-Part and Linear Tariffs

First let us proceed by analysing the case when suppliers and retailers contract using two-part tariffs. As noted previously, the marginal wholesale price will always be set at $w_{ij} = c$ so as to maximise the profit of the vertical chain. The bargaining will take place over the fixed fee, which will determine the distribution of profits between suppliers and retailers.

Firstly, let us recognise that the pre-merger situation will be no different with bargaining. Both the incumbent retailer, and R_2 should he decide to enter, benefit from the possibility of sourcing off at least two perfectly substitutable suppliers. They therefore have a full outside-option, and thus still take all of the profits from the contract by paying no fixed fee. That is, there is no surplus to be split by the sharing rule.

Post-merger, the same is true for the incumbent retailer, he is still able to source from the competitive fringe and thus still has a full outside-option and pays no fixed fee. However this is not true for the potential entrant, should he decide to become active in the industry he will now

only be able to source off the merged entity S_{1+2} and thus the surplus will be split according to the sharing rule. We get the following result

Lemma 24 *If two-part tariffs are used and firms bargain over contracts, upon entry R_2 earns a flow profit of $\Pi_{R_2} = \alpha\Pi_{R_1}(P_1)$.*

Proof. See Appendix. ■

Now let us proceed to consider the case of linear tariffs; this case is generally more complex to analyse as changes in the tariff usually lead to changes in output and prices, which serves to alter the size of the surplus the parties are splitting.[53] Notice that as recognised above for two-part tariffs, with linear tariffs both retailers in the pre-merger situation, and for the incumbent in the post merger situation, the situation is unchanged using bargaining compared to the analysis in the basic model. However, again if R_2 enters introducing bargaining will alter the distribution of profits. We show the following

Lemma 25 *If linear tariffs are used and firms bargain over contracts, upon entry R_2 earns a flow profit of $\Pi_{R_2} = \alpha\Pi_{R_1}(P_1)$, the same as when two-part tariffs are used.*

Proof. See Appendix. ■

[53] Dobson and Waterson (2007) illustrate how to solve a complex bargaining problem with linear tariffs.

7.3.2 Entry and Pricing

Lemmas 24 and 25 showed that, irrespective of whether two-part or linear tariffs are used, R_2 would upon entry earn a flow profit of $\alpha\Pi_{R_1}(P_1)$. We therefore get the following result

Proposition 26 *With bargaining the merger has again created a barrier to entry; R_2 will now only enter if $\Pi_{R_1}(P_1) > \frac{F}{\alpha}$.*

Proof. See Appendix. ■

Note that pre-merger R_2 would have entered if $\Pi_{R_1}(P_1) > F$, so the entry condition is now weaker. The incumbent firm will have to be charging a higher price, and earning greater profits, to attract entry. Note that the barrier to entry is greater (that is, the entry condition weakens more) the smaller the retailer's exogenous bargaining power. This makes intuitive sense as since he stands to make a smaller proportion of whatever profits are available, that level would have to be higher to attract him into the industry.

Now examining the pricing decision of the incumbent retailer, we again find that he will wish to price to just deter entry. We get that

Proposition 27 *With bargaining the merger results in the incumbent retailer pricing such that $\Pi_{R_1}(P_1) = \min\left\{\frac{F}{\alpha}, \Pi^M\right\}$.*

Proof. See Appendix. ■

So generally we have that the merger has again resulted, through the barrier to entry effect, in a higher retail price in the downstream market;

note again that this result does not depend crucially upon assumptions regarding the nature of contracting. Recognise in particular that the weaker retailers are in bargaining with their suppliers (i.e. the smaller α), the greater the rise in price the concentration results in.

With $\alpha = 0$ we are back to the case we examined in the basic model, where suppliers could make take-it-or-leave-it offers to retailers, and the merger resulted in the price rising to the monopoly level. We get one corollary from this result

Corollary 2 *Countervailing buyer power is only an entirely effective merger defence here if the retailers have all the bargaining power in their negotiations with suppliers, which corresponds to* $\alpha = 1$*: retailers making take-it-or-leave-it offers.*

So, here the only time that the countervailing power defence stands up to scrutiny is if retailers have all of the bargaining power, that is they take all of the incremental surplus from their negotiations with suppliers. Here a reduction in competition between suppliers doesn't affect the potential entrant, as the input price he obtains is unaffected by the degree of competition upstream.

7.4 An Alternative Model

In the basic model presented above we demonstrated a limitation of the countervailing buyer power merger defence, showing that even when the incumbent retailer possesses buyer power and is able to use it to prevent

an increase in his wholesale price following the merger, the concentration can still lead to higher retail prices.

Now we turn to another example and find an unexpected application of the argument. We show that even if an incumbent firm possesses no buyer power, and is unable to prevent an increase in his wholesale price following the merger, this defence can still be used to argue that the retail price will not rise and that the merger should be allowed.

Consider a setup similar to the one examined previously, but now assume that the incumbent retailer R_1 possesses no buyer power, but the potential entrant R_2 does; again in the form of a private label good that allows him to source off the competitive fringe of unbranded goods. Such a case is entirely possible; for example when the potential entrants to an industry are very large firms active in retailing a wide range of other products to consumers, and who have invested large sums of money over time to build up a strong brand image. These retailers will be able to enter the industry and sell unbranded goods sourced from the competitive fringe under their own brand name, which they will likely have developed elsewhere as an over-arching "umbrella brand" which spans a wide range of product categories.[54]

[54]That retailers have brands that reach across produce catagories has long been recognised and analysed by economists. For example Wernerfelt (1988) and Cabral (2000) develop models of umbrella branding (or "reputation stretching") and show how the firm can use its reputation from one product to signal the high quality of another one. Such a move can be credible, as if the second product turn out to be low quality that will negatively affect consumers' beliefs over the quality of the original product, and reduce their willingness to pay. Choi (1998) develops a model where umbrella branding (or "brand extension") relies upon the fact that a cheating firm loses out through being unable to use the brand name to introduce high quality products in the future.

Analysing the model, we see that the pre-merger situation is the same as before, with the incumbent receiving a competitive wholesale price and limit pricing at $P_1 = P^*$ to just deter entry.

Consider now the post-merger situation; upon entry R_2's optimum strategy is still to marginally undercut R_1 and charge a price of $P_2^* = P_1$. However, the entrant now benefits from Bertrand competition between the merged supplier, S_{1+2}, and the competitive fringe, S_3, and is thus now still able to secure a competitive wholesale price of c. Therefore, he has the same entry decision rule that he had pre-merger, that is he should enter if

$$P_1 > P^*$$

Where P^* is again defined implicitly by the minimum value that satisfies the following equation.

$$(P^* - c)\, Q(P^*) = F$$

Therefore, when we turn to consider the pricing decision of the incumbent monopolist we get the following result

Proposition 28 *If the incumbent retailer does not possess countervailing power, but the potential entrant does, then the merger does not lead to an increase in prices to consumers; R_1 will still price at $P_1 = P^*$ to deter entry.*

Proof. See Appendix. ■

The key insight here is that it is not the incumbent retailer's costs that are the key driver for his price setting, it is the competitive constraint placed upon him by the threat of entry. Since the countervailing power of the potential entrant allows that threat to remain undiminished following the merger the incumbent retailer is unable to increase his price.

The merged supplier S_{1+2} will set a wholesale price to $R_1$of

$$w_1 = P^*$$

The merged entity hereby appropriates all of the profits earned in the industry. He will not find it profitable to set a higher wholesale price as this will drive R_1 to set a higher retail price which will induce entry by the incumbent who will undercut R_1, and the merged entity will have to engage in Bertrand competition with S_3 to serve R_2 and will earn zero profits.

So this model presents an unexpected case when the countervailing buyer power defence may be applicable, even though the incumbent retailer possesses no buyer power. This is in contrast to the earlier model where we demonstrated that sometimes the defence may not be applicable, even though it appears to be.

7.5 Analysis and Implications for Policy Makers

7.5.1 The Countervailing Power Defence in Practice

Before proceeding to discuss the implications of our findings for policy makers, we first investigate the existing manner in which the countervailing buyer power argument has been used in practice in both Europe and the US. We investigate several mergers in which the argument has appeared, discuss its importance to these cases and examine the manner in which it was used.

We note how it was ultimately treated by regulators and the courts, and then later draw together these insights with those of our model to present some suggested guidelines for how competition authorities should treat this argument in the future.

United States In the United States, although the Horizontal Merger Guidelines make no explicit mention of countervailing buyer power as a merger defence it has been used several times in practice.

For example in the *Country Lake Foods* case the court considered a merger between two firms in the fluid milk processing industry and recognised the countervailing power of the large food corporations who purchased the milk from these processors. The downstream industry had a three-firm concentration ratio of over 90%, and the court recognised their ability to enter the processing market themselves. The merger was eventually allowed to proceed, with the court commenting that it found

the countervailing buyer power defence the "most persuasive argument" that the firms put forward.[55]

Similarly, in the 1990 *Baker Hughes* decision the Judge noted that the main purchasers of complex mining equipment were sophisticated firms who would insist upon receiving confidential bids for each contract. Furthermore, it was judged that these purchasers would likely be able to encourage successful entry into the U.S. market by Canadian suppliers should the merger result in higher prices. Note that in this case the countervailing power was connected to the retailers' sophistication, not simply their size, which re-emphasises the point that understanding and being precise about the source of any hypothesised buyer power is essential whenever applying the concept in practice.[56]

Furthermore, in *U.S. v. Calmar* the court recognised the countervailing power of the downstream firms, noting that following any increase in the price of pump dispensers and sprayers the buyers of these products would react by either vertically integrating or entering into joint ventures to produce the goods themselves.[57]

However, the limitations of the countervailing power defence have also been recognised in several cases, for example in *United Tote.* Here, among the customers for pari-mutuel computer systems the largest purchasers controlled about half of the betting volume, with the rest accounted for

[55]United States v. Country Lake Foods, 754 F. Supp. 669 (D. Minn. 1990).

[56]United States v. Baker Hughes, Inc., 908 F.2d 981 (D.C. Cir. 1990). See Kleit and Coate (1993).

[57]United States v. Calmar, Inc., 612 F. Supp. 1298 (D.N.J. 1985).

by small and medium-sized buyers. It was recognised by the court that there was already a difference between the amount paid by the largest tracks and the rest, and so it refused to rely on the larger retailers to protect the more vulnerable smaller buyers and ordered a divestiture to undo the merger.[58]

In a related vein, Steptoe (1993) notes that in the recent Kodak decision, although it was not a merger case, the Supreme Court made a point of direct relevance to the use of the countervailing power defence

> "[I]f a company is able to price-discriminate between sophisticated and unsophisticated consumers, the sophisticated will be unable to prevent the exploitation of the uninformed."[59]

Europe The European Commission has used the countervailing buyer power argument in several cases. For example, in the market for liquid packaging board the Commission first cleared the merger between Enso and Stora, and then later cleared a merger to near-duopoly between Korsnäs and Assi Domän Cartonboard.[60] These cases featured buyers of differing power downstream, and in line with its guidelines the Commission specifically considered the ability of the smaller retailers to constrain price rises post merger.

Firstly, they examined the possibility of retailers switching suppliers;

[58] United States v. United Tote, Inc., 768 F. Supp. 1064 (D. Del. 1991).

[59] Eastman Kodak Co. v. Image Technical Servs., Inc., 112 S. Ct 2072, 2086-87 (1992).

[60] See Baker and Lofaro (2000) for a discussion of the Enso/Stora case; and Karlsson (2006) for details of Korsnäs and Assi Domän Cartonboard.

they concluded that even the lesser amounts bought by these smaller retailers were crucial for the profitability of the suppliers. They noted that the industry is characterised by high fixed costs and therefore high mark-ups on each unit sold; therefore the loss of only a small volume of sales can have a significant effect upon supplier profits.[61]

In addition, the Commission also found that the smaller retailers were still large enough to support an upstream entrant if necessary; therefore they too had sufficient buyer power to protect themselves from price rises. Interestingly, the Commission also noted that it wouldn't be in the best interests of the merged entity to price discriminate and raise prices to less powerful buyers even if they could. They pointed out that this could be counter-productive in the long run as it could serve to drive the smaller retailers out of business, leaving the suppliers facing a monopsonistic buyer.[62]

This is not the only European case where countervailing power has been important however.[63] In 2000 Philip Morris notified the Commission of its intention to purchase consumer products (particularly biscuits) producer Nabisco and combine it with its subsidiary Kraft Foods; this raised competitive concerns within the chocolate confectionery market in

[61] This relates to the issue of economic dependency, for example as discussed in OECD (1998).

[62] This relates to the work of Chemla (2003) who examines a supplier's incentives to encourage downstream competition. He shows that as competition downstream falls, industry profit increases (because it is not dissipated by competition between retailers), but the supplier's share of this profit falls, as his bargaining position weakens. It is this latter effect that the Commission appears to be referring to, although Chemla notes that which of these two effects dominates depends upon the specifics of the bargaining game between suppliers and retailers.

[63] For a discussion of several of the following cases, see Scheelings and Wright (2006).

the Netherlands. The merger was allowed to pass, with one of the most persuasive arguments being that of countervailing power

> "[Most stores] are in a position to exercise sufficient bargaining power for these types of products. Large retailers account for nearly [50-60] % of chocolate confectionery purchases in the Netherlands... Since the success of a chocolate confectionery manufacturer's products depends largely on access to shelf-space, retailers can exercise strong buying power."[64]

Similarly, in 1999 Granaria, Ültje, Intersnack and May Holding proposed a joint venture to process, market and distribute nut snacks; combining their existing business operations in this area. The venture was estimated to result in the parties possessing large market shares in many European markets, particularly in Denmark, France and Germany where it was expected to be over 40%.

However, despite this the Commission cleared the firms to go ahead because it noted the countervailing power of retailers. In particular, it commented that a significant element of this power was derived from the fact that the retailers possessed private labels - the specific form of countervailing power we focus upon in our model.

> "In conclusion, the nut snacks sector is characterised by

[64]European Commission (2000), Case No COMP/M.2072 - Phillip Morris/Nabisco, para. 25.

the very strong presence of retailers' own labels. By controlling their own brands, the retailers are able to use multiple suppliers and to switch between suppliers. Combined with the high level of concentration of the retailers as customers of the parties, this creates significant countervailing purchaser power...The Commission therefore considers that the concentration will not provide the parties with the power to increase prices of their nut snacks above the competitive level."[65]

A similar finding was made by the Commission in the merger between Friesland Coberco and Nutricia in 2001. In this merger the parties business areas overlapped in both the flavoured dairy drinks and coffee whiteners markets (in the "retail" channel and the "food service" channels in both cases). However, the Commission ultimately cleared the merger, partially on the basis of the countervailing buyer power of the retailers that the firms sell their products too. Again, the role of private labels was identified as key, for example it was commented in the market for coffee whiteners that

"Sustainable price increases from the parties are not likely due to the strong countervailing power of the customers. The four biggest customers account for [70-80]% and [80-90]% of total sales in the retail market of FCDF and NDDG respec-

[65] European Commission (2000), Case No COMP/JV.32 - Granaria/Ültje/Intersnack/May Holding, para. 60.

tively, which demonstrates the strong position of these buyers vis-à-vis the merging parties. As in the case of flavoured dairy drinks these customers are large retail chains in the Netherlands such as Albert Heijn, Superunie, Schuitema and Laurus, which can again express their buying power through their own private labels. According to the market test every retail chain has at least one private label for coffee whiteners, which together account for [30-40]%- [60-70]% of the market as mentioned above."[66]

The various cases discussed above serve to demonstrate the importance of the countervailing buyer power defence in antitrust. Although they don't relate to the precise mechanism that we present in our paper, of the merger having an anticompetitive impact through the creation of a barrier to entry, they do illustrate the need for economists to more fully analyse the argument to understand under which conditions it is more likely to be valid in order to give policymakers clearer guidance. Our model does more closely relate to two of the cases above, Granaria, Ültje, Intersnack & May Holding ,and Friesland Coberco and Nutricia, as in these cases the source of buyer power was the presence of private label goods which is what we focus on in our model.

[66]European Commission (2001), Case No COMP/M.2399 - Friesland Coberco/Nutricia para. 45.

7.5.2 Recommendations for Practitioners

Based upon insights from the literature, the findings of our model and practical evidence from the cases we have examined we now make several recommendations for the use of the countervailing power defence by practitioners.

The first key point is that any argument that there exists buyer power downstream must show that the conjectured power is "effective". That is, by some means retailers would be able to prevent suppliers increasing their wholesale prices following the merger. Note that it is not sufficient to argue that a retailer possesses countervailing power simply because of his size; though size may indeed be a good place to start when assessing buyer power, it is not in itself a sufficient condition for buyer power to exist. Doyle and Inderst (2007) note that such a size argument would need to be precise about the mechanism through which a powerful buyer could leverage his size to enable him to secure discounts during negotiations.[67]

Generally, it is important that any claim of buyer power is backed up by clearly and transparently presenting a detailed theory as to how a retailer has power over his suppliers. Possibilities include the threat of integrating backwards as modelled in Katz (1987) and used in the *Country Lake Foods* and *Calmar* cases, buyer sophistication as recognised by Nordemann (1995) and used in the *Baker Hughes* case, the ability to sponsor entry upstream as discussed by Inderst and Shaffer (2007b) or

[67] In a bargaining framework, the argument would have to demonstrate how size would improve the retailer's outside option, or deteriorate the supplier's.

damaging the supplier's outside option as in Inderst and Wey (2007a). Other possibilities recognised in the literature include the retailer's position as a gatekeeper as noted by Majumdar (2006), the supplier being economically dependent upon the retailer as recognised in OECD (1998) and used to some extent in *Enso/Stora*, a supplier's convex cost function as in Inderst and Wey (2007a), a retailer's multiple sourcing strategy as discussed in Inderst (2007b) or the possession of a private label as in our paper and used in *Granaria/Ültje/Intersnack/May Holding* and *Friesland Coberco/Nutricia*.

The advantage of such transparency is twofold; firstly, as in any economic debate it lays open the arguments for discussion, allowing all parties concerned to analyse the assumptions underlying the model, and to empirically analyse whether the proposed theory seems to accurately reflect reality. But secondly, and crucially, it is important to recognise that buyer power is not a homogenous concept, and that the implications of buyer power may depend crucially upon the exact mechanism at work. The implications of an upstream merger may differ depending upon the nature of the buyer power in question: buyer power originating from private labels could potentially have different consequences than countervailing power based upon retailer sophistication.[68]

A key point to bear in mind when applying this argument is that the buyer power in question must cover all of the retailers in the downstream

[68]For example, one key issue is whether the merger would somehow destroy the hypothesised buyer power, which may depend upon the mechanism at work.

market as discussed in Inderst and Shaffer (2007b) and mentioned in the United Tote case. This issue is explicitly recognised in the EU merger guidelines which state that

> "Countervailing buyer power cannot be found to sufficiently off-set potential adverse effects of a merger if it only ensures that a particular segment of customers, with particular bargaining strength, is shielded from significantly higher prices or deteriorated conditions after the merger".

If powerful buyers are able to keep their input prices down, but smaller or less powerful buyers are not, then this will serve to create an imbalance in the downstream market. Stronger retailers will benefit from the raised costs of their smaller rivals, and will likely be able to increase their market share further, creating worries of market power downstream.[69] Crucially, our results suggest that this question of "how wide is the shield" of countervailing power should be extended still further beyond current market participants to also include potential entrants.

Finally, our findings highlight the importance of distinguishing between the implications of countervailing buyer power for wholesale prices and for final prices. Traditionally the two are implicitly considered to be the same; so that retail prices will not rise if and only if wholesale prices remain unchanged. Conventional thinking would therefore give us

[69] Indeed, the fact that the powerful retailer has been able to keep his input prices from rising could result in those of his less powerful rivals increasing even more than they would have had he not possessed the buyer power, a "waterbed effect"; see Majumdar (2006).

the following table of buyer power and price effects, which only depends upon the countervailing power of the incumbent.

Table 4: Effect on Prices of a Merger - Traditional Analysis

		Entrant	
		With BP	Without BP
Incumbent	With BP	Unchanged	Unchanged
	Without BP	Increase	Increase

Our results challenge this view, emphasising the need to also focus attention upon the role of entrants and potential competitors. We get the following table of effects.

Table 5: Effect on Prices of a Merger - Our Analysis

		Entrant	
		With BP	Without BP
Incumbent	With BP	Unchanged	Increase
	Without BP	Unchanged	Increase

Our analysis mirrors traditional analysis when both the incumbent and potential entrant possess the same degree of countervailing power, but disagree when they differ. When the incumbent possesses power but the entrant doesn't, our results suggests that retail prices may still rise. This is because, although the countervailing power has prevented input prices rising to the incumbent, reduced competition now allows him to increase his margins and charge more for the product. Similarly, when it is only the entrant that possess buyer power, our results suggest retail prices will not rise because the increase in input prices are prevented from being passed on by the threat of entry, and therefore the incumbent suffers a margin squeeze.

Therefore, our results emphasise the need to understand the nature of the buyer power in detail, to examine the implications of the merger for wholesale prices, but also to remember that the competitive conditions downstream still play a key role in determining if there will be any change in the level of retail prices.

7.6 Conclusions

We have shown that the use of the countervailing buyer power merger defence is more complex that previously thought. Some mergers which may appear harmless due to the ability of powerful buyer to prevent wholesale prices rising may still result in anticompetitive effects. This is because any potential entrants to the industry that lack buyer power would face higher wholesale prices following the merger; this serves to create a barrier to entry in the retail market. In addition, if the threat of entry is key in constraining the pricing of incumbent firm (that is, if the market is contestable), then this barrier to entry will allow these firms to increase their retail prices following the merger.

However, we also demonstrated a situation where the countervailing power defence may be applicable where at first glance it appears irrelevant. That is, even if incumbent firms possesses no buyer power, retail prices may not rise following the merger if the potential entrant does have countervailing power. The logic is that the entrant's threat of entry is, with countervailing power, undiminished following the concentration

so the incumbent retailer is unable to raise his retail price even though his own costs will have risen. These results hold whether we use linear or two-part tariffs, which is unusual in the literature.

We noted in our discussion that in any such case it is important to be precise about the source of buyer power, simply arguing that a retailer possesses countervailing power because of his large size in insufficient. If such a size argument is used, it is important that the exact mechanism whereby a large retailer leverages his size to obtain preferential prices from his suppliers must be carefully explained.

In fact, in our main model we used the presence of private label goods - not size related - as the source of buyer power, and we argued that the main result of the paper carries over to different models of buyer power. That is, it could also be the potential to integrate backwards, to cover the fixed cost of switching to an alternate supplier, or to sponsor upstream entry. All that is necessary to generate our results is that any rival retailer would, upon entry, not possess the buyer power of the incumbent, and would thus be exposed to higher input prices.

However, we also emphasised that whenever practitioners use the concept of buyer power in practice they must be precise about the exact theory or model they are using. This precision will ensure their reasoning stands up to scrutiny (for example preventing simplistic "buyer size is buyer power" fallacies), and will also make it easier to understand and predict market outcomes, as crucially different types of buyer power can

have different market consequences.

7.7 Appendix

7.7.1 Proof of Lemma 19

After entering R_2 would face the same production costs as R_1, c, and would be charging the same price, P_1; his flow profits will therefore equal those of R_1, had entry not occurred. R_2 will enter if his flow profits after entry would cover the sunk cost of entering the market, which will therefore happen if R_1 prices above this level.[70]

7.7.2 Proof of Lemma 20

We saw in Lemma 19 that entry will occur if R_1 prices above this level, and if this happens then he will earn zero profits. Furthermore, since we have $P^* < P^M$ we have that profit is increasing for $P \in [0, P^*]$, so the incumbent will never want to price below P^*. Therefore in equilibrium he raises his price as far as he can, but provided that it is still just not worth R_2 paying the entry cost.

7.7.3 Proof of Lemma 21

The incumbent retailer still benefits from Bertrand competition between the merged entity and the unbranded supplier, and so he still gets offered

[70] We implicitly adopt the tie-breaking rule here that if the R_2 is indifferent, he will not enter. This is to simplify the exposition and remove the need for the incumbent to engage in "$-\varepsilon$" pricing, but doesn't affect the results. Furthermore, it actually makes sense: a firm would never go throught he time consuming, costly and risky business of entering a market if it expected to earn no extra profit from doing so.

a linear price of c.

7.7.4 Proof of Proposition 22

Following the merger, upon entry R_2 would face a monopoly supplier, so his wholesale price would no longer be competed down to the competitive level. Instead the supplier S_{1+2}, knowing exactly what price R_2 will set upon entry, will proceed to extract the full amount of the profit by charging him a wholesale price equal to $w_2^* = P_1$.[71] That is, the merged entity will take all of the flow profits from R_2, so following entry the entrant makes losses equal to F, and will therefore never choose to enter the market as he cannot recover the cost of doing so. This compares to the pre-merger situation where we showed in Lemma 19 that he would enter the industry if $P_1 > P^*$.

7.7.5 Proof of Proposition 23

The threat of entry now no longer constrains the pricing of R_1, who is free to raise his price to the monopoly level $P_1^* = P^M$.

7.7.6 Proof of Lemma 24

The outcome of the bargaining process is given by that value of the tariff which maximises the Nash product.

[71] This is not the only contract offer that the supplier can use to extract the full surplus. He could instead offer the two-part tariff $(c, \Pi^*(P_1^*))$, which yields the same amount of profit. We focus upon the linear offer because it is the simplest form of contract available, and so we require no assumption on the sophistication of contracts used. This type of contract is, of course, a subset of all more sophisticated contractual forms; for example this linear contract is a two part tariff offer of $(P_1, 0)$.

$$\tau_2 = \arg\max_{\tau_2} \left\{ \left[\Pi_{R_2}(\tau_2) - O_{R_2} \right]^{\alpha} \left[\Pi_{S_{1+2}}(\tau_2) - O_{S_{1+2}} \right]^{1-\alpha} \right\}$$

Where O_{R_2} and $O_{S_{1+2}}$ represent the outside-options of R_2 and the merged supplier S_{1+2} respectively should negotiations break down. However, note that if the entrant fails to source off this supplier, he has no other means of supply and is thus unable to sell anything; we therefore have that $O_{R_2} = 0$. Similarly, if the supplier fails to strike a deal with this retailer he is not able to somehow sell more of the good elsewhere; note that even if it was he who made a deal with the incumbent retailer it was for zero per-unit profit, thus any deal (or failure to deal) with R_2 doesn't affect this. Therefore we also have $O_{S_{1+2}} = 0$.

Taking first order conditions with respect to τ_2 we get that

$$\alpha \Pi_{S_{1+2}}(\tau_2) \frac{\partial \Pi_{R_2}}{\partial \tau} + (1-\alpha) \Pi_{R_2}(\tau_2) \frac{\partial \Pi_{S_{1+2}}}{\partial \tau} = 0$$

Furthermore, we can note that $\Pi_{S_{1+2}}(\tau_2) = \tau_2$, as the marginal wholesale price just covers the cost of production. We also have $\Pi_{R_2}(\tau_2) = \Pi_{R_1}(P_1) - \tau_2$, because upon entry R_2 will earn whatever profit the incumbent would have earned had entry not occurred, as he too has marginal cost c and prices at P_1 (as previously established), and pay the fixed fee to the supplier. We therefore have $\frac{\partial \Pi_{R_2}}{\partial \tau} = -1$, and $\frac{\partial \Pi_{S_{1+2}}}{\partial \tau} = 1$. This gives us

$$(1-\alpha)\left(\Pi_{R_1}(P_1)-\tau_2\right)-\alpha\tau_2=0$$

$$\tau_2^*=(1-\alpha)\,\Pi_{R_1}(P_1)$$

This gives us

$$\Pi_{R_2}=\alpha\Pi_{R_1}(P_1)$$

So, because of the fact that neither party has an outside-option the total profit is simply split by the exogenous sharing rule. As you would expect, each firm earns more profit the greater their bargaining power is.

7.7.7 Proof of Lemma 25

Similar to the previous proof, we have the wholesale price determined by the following

$$w_2=\arg\max_{w_2}\left\{\left[\Pi_{R_2}(w_2)-O_{R_2}\right]^{\alpha}\left[\Pi_{S_{1+2}}(w_2)-O_{S_{1+2}}\right]^{1-\alpha}\right\}$$

Which again reduces to

$$\alpha\Pi_{S_{1+2}}(w_2)\frac{\partial\Pi_{R_2}}{\partial w_2}+(1-\alpha)\,\Pi_{R_2}(w_2)\frac{\partial\Pi_{S_{1+2}}}{\partial w_2}=0$$

Here we have $\Pi_{S_{1+2}}=(w_2-c)Q(P_2)$ and $\Pi_{R_2}=(P_2-w_2)Q(P_2)$.

Unlike most situations, here changes in the wholesale price do not affect prices or quantities because, as previously noted, we have that the entrant would set his price as $P_2^* = P_1$, irrespective of the level of wholesale price (provided $w_2 \leq P_1$). We therefore get $\frac{\partial \Pi_{R_2}}{\partial w_2} = -Q(P_1)$, and $\frac{\partial \Pi_{S_{1+2}}}{\partial w_2} = Q(P_1)$, which gives us

$$\alpha(w_2 - c)Q(P_1)\left(-Q(P_1)\right) + (1-\alpha)\left(P_1 - w_2\right)Q(P_1)Q(P_1) = 0$$

$$(1-\alpha)\left(P_1 - w_2\right) = \alpha(w_2 - c)$$

$$w_2^* = \alpha c + (1-\alpha)\, P_1$$

This makes intuitive sense; since we know what the price will be it is simply a question of how this mark-up will be divided between suppliers and retailers. We get that the wholesale price is a weighted average of the marginal cost (the lowest it could be) and the retail price (the highest it could be), with the bargaining power as the weight. Substituting this wholesale price into the entrant's profit function we determine that upon entry he will earn

$$\Pi_{R_2} = \alpha(P_1 - c)Q(P_1) = \alpha\Pi_{R_1}(P_1)$$

7.7.8 Proof of Proposition 26

Upon entry R_2's flow profit is $\alpha\Pi_{R_1}(P_1)$, which is greater than the entry cost F when the condition is met.

7.7.9 Proof of Proposition 27

We saw with Proposition 26 that R_2 will enter if $\Pi_{R_1}(P_1) > \frac{F}{\alpha}$, therefore the incumbent retailer will find it optimal to limit price at $P_1 = P^{**}$, where P^{**} is defined as the lowest value of P that satisfies $(P - c)\,Q(P) = \frac{F}{\alpha}$. This is unless $\frac{F}{\alpha} > \Pi^M$ in which case the retailer will price at the monopoly level as the threat of entry no longer binds at all as the potential entrant will never be able to profitably enter.

7.7.10 Proof of Proposition 28

Now, as previously, R_1 prices to just deter entry, since if entry occurs he makes zero profits. Thus, unless his wholesale price is higher, he charges the maximum price he can which still deters entry, P^*.

8 Final Conclusion

This thesis has examined the important issue of private labels, a topic which raises many currently unanswered questions such as what these goods are, why are they introduced into a market, and what impact do they have upon competition? Reflecting the multi-faceted nature of the debate itself, we have presented three separate models which examine different aspects of the private label question.

In the first paper we took a new perspective upon the role of branding in retailing, and argued that it played a role of quality certification, reassuring consumers that are wary of purchasing a low quality product. We interpreted the presence of a private labels as the retailer taking over the role of quality assurance from the supplier, and investigated what his motivation for doing so could be. We demonstrated that by establishing his own brand the retailer improves his negotiating position with suppliers as it increases the number of manufacturers that he is able to source his inputs from.

Without his own brand the retailer is effectively only able to sell the goods of suppliers that have established their own brand, consumers would be unwilling to purchase the unbranded goods of rival suppliers. However, with his own brand he is able to market the goods of these alternative suppliers under his own label and certify their quality himself. This therefore increases competition between suppliers, improves his outside option during negotiations, and allows him to keep a greater

proportion of the industry profits for himself.

Using this model to examine the impact of the introduction of private labels upon welfare, we showed that they can only serve to make people better off. In some circumstances their presence leaves firms and consumers no better or worse off than the situation without them, however in other cases the introduction of store brands can strictly improve economic welfare. This will be the case when the market would otherwise suffer from a hold-up problem, with suppliers' possessing too little bargaining power leaving them unwilling to undertake the investments necessary for brand-building themselves, meaning the good would be sold uncertified leaving everybody worse off.

In the second paper we examined how the presence of private labels in a market affects competition between retailers. However, unlike the majority of the literature that simply focuses upon prices, we examined the effect of their presence upon non-price competition and dynamic incentives, particularly with respect to product quality. To do this we adopted a vertical framework and analysed how the sale of a store brand by a chain retailer affects the incentives to invest of the upstream manufacturer that supplies the other downstream retailers.

We demonstrated the complexity of the issue by illustrating several possible effects. For example a competition effect could lead to their introduction resulting in greater investment by the supplier, meaning consumers are strictly better off. This could arise if the private label

threatens to steal market share from the incumbent supplier who now competes more vigorously and improves his product more than if he were a monopolist.

Furthermore, we also showed that a retailer may well have an incentive to invest in a private label even if he never ends up actually selling it, as then it plays the role of an outside option in his negotiations with the supplier. The higher the quality of the store brand the more powerful the threat to introduce it, which means the retailer can secure larger discounts from the manufacturer. The supplier may then in turn have a greater incentive to invest in improving the quality of his product as this serves to reduce the value of the retailer's outside option, allowing him in turn to gain a greater share of the industry profits.

However, we also demonstrated that the introduction of private labels is not necessarily pro-competitive. Instead of there being a competition effect there could also potentially be a forestalling effect, where the introduction of these goods leads to the supplier cutting back his investment resulting in smaller retailers downstream seeing their competitive positions deteriorate. This could be the case because with the introduction of a store brand the supplier sells his product through fewer outlets, and so has reduced opportunities to recoup his investment.

In the third paper we examined the implications of private labels for the wider issues of buyer power and merger control. Since the possession of a store brand can allow a retailer to source from alternative suppliers

it can grant him a degree of buyer power. Therefore if there was a merger taking place between suppliers that the competition authorities were sceptical about, it could be argued that it should be allowed to proceed as this situation could constitute an example of the presence of countervailing buyer power.

This is the idea that an otherwise problematic merger should be allowed to complete because the merged entity will be unable to raise wholesale prices post-merger because the powerful retailer possess countervailing power and will not allow him to do so. We demonstrate that private labels can play such a role, potentially enabling the retailer to prevent any increase in his input prices, but that this is not necessarily sufficient to ameliorate the anti-competitive effects of the merger. We show that the merger can serve to raise barriers to entry to the downstream market, which can then potentially reduce the competitive constraints acting upon the retailer allowing him to raise retail prices.

We also illustrated a potentially unexpected application of the countervailing power argument, which is that even if the incumbent retailer cannot prevent an increase in his input prices, final prices may not rise if the threat of entry remains undiminished post-merger. That is, for a countervailing power argument to be applicable it is not actually necessary for the incumbent retailer to have the power, instead it can be sufficient for a potential entrant to instead.

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