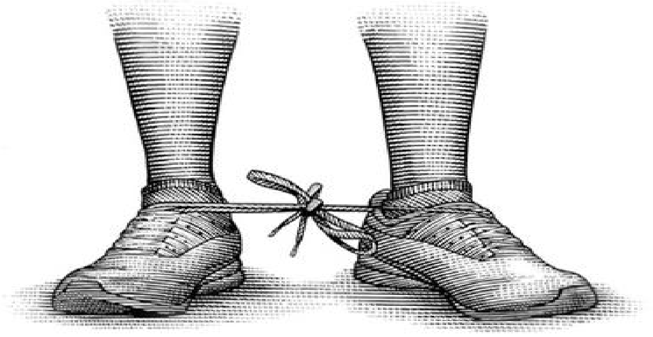
ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ

ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΗΣ ΕΠΙΣΤΗΜΗΣ

ΤΙΤΛΟΣ

Bundling, Tying and Competition Effects



ΟΝΟΜΑΤΕΠΩΝΥΜΟ: ΔΟΝΤΑ ΕΛΠΙΝΙΚΗ

Διατριβή υποβληθείσα προς μερική εκπλήρωση
των απαραιτήτων προϋποθέσεων
για την απόκτηση του
Μεταπτυχιακού Διπλώματος Ειδίκευσης

Αθήνα
Ιανουάριος, 2013

Εγκρίνουμε τη διατριβή της Δοντά Ελπινίκης.

ΥΠΕΥΘΥΝΟΣ ΚΑΘΗΓΗΤΗΣ:

Γκενάκος Χρήστος

Οικονομικό Πανεπιστήμιο Αθηνών

[ΥΠΟΓΡΑΦΗ]

ΕΞΕΤΑΣΤΗΣ ΚΑΘΗΓΗΤΗΣ:

Κατσουλάκος Ιωάννης

Οικονομικό Πανεπιστήμιο Αθηνών

[ΥΠΟΓΡΑΦΗ]

ΕΞΕΤΑΣΤΗΣ ΚΑΘΗΓΗΤΗΣ:

Ζαχαριάς Ελευθέριος

Οικονομικό Πανεπιστήμιο Αθηνών

[ΥΠΟΓΡΑΦΗ]

Ημερομηνία:

Ιανουάριος 2013

Table of contents

1 Summary 5

2 Introduction 7

2.1 Pure Bundling 7

2.2 Mixed Bundling 8

2.3 Tying and Bundling 10

3 Incentives to Bundle and Tie 13

3.1 Efficiency Reasons 13

  3.1.1 Bundling to Achieve Cost Savings and Quality Improvements 13

  3.1.2 Bundling to Reduce Pricing Inefficiencies 15

3.2 Strategic Reasons 20

  3.2.1 Bundling to Create an Entry Barrier 20

  3.2.2 Bundling to Mitigate Competition 22

  3.2.3 Bundling to Gain Competitive Advantage 23

  3.2.4 Bundling to Create Network Externalities 24

  3.2.5 Bundling and R&D Incentives 25

  3.2.6 Bundling as a Way to Obscure Prices 26

4 Tying and Price Discrimination 27

4.1 Requirement Tie-in Sales 32

4.2 Package Tie-in Sales (Bundling) 35

5 Variable proportion ties 39

5.1 What kind of Price Discrimination are they? 39

5.2 Welfare Analysis of Variable Proportion Ties 40

6 The Chicago School 45
6.1 Welfare Increasing Effects of Tying 46
6.2 The Single Monopoly Profit Theorem 48

7 The Post – Chicago School 49
7.1 Exclusion and Entry Deterrence 50
  7.1.1 Independent Products 51
  7.1.2 Complementary Products 54
7.2 Protecting Monopoly Rents in the Tying good Market 57
  7.2.1 Preserve Monopoly Position given Entry Costs 57
  7.2.2 Preserve Monopoly Position given Network Externalities 65
  7.2.3 Extend Monopoly Position 71

8 Tying Law 74
8.1 Analysis of Tying under U.S. Law 75
8.2 Analysis of Tying under E.C. Law 77
8.3 The Rule of Reason 80

9 Conclusions 82

10 References 85

1.

SUMMARY

Tying occurs when a firm sells a particular item (the tying good) only together with some other item (the tied good). Tying the sale of products or services that could be sold separately is very common in our everyday life - from left and right shoes, to bread and meals at most restaurants, the sports and cultural sections of daily newspapers or cars and radios.

In this paper I provide a careful examination of the theories that try to explain the strategic use of tying and bundling, their effects on competition and how these cases have been treated by courts both in US and EU. At first, I will investigate the reasons why a firm is willing to employ the practice of tying to promote its products or services. These reasons can be categorised into two groups: efficiency and strategic reasons. Then I will give the definition of price discrimination by economic approach and present types of tying practices for price discrimination. Requirements tie-in sales and their undesirable effects, as well as package tying (bundling) will be analysed. In addition to this, I will present the term of variable proportion ties as a form of price discrimination and their welfare effects.

In the next section, I will explore the well-known Chicago and Post-Chicago theories and their contribution to the economic literature on tying. The welfare increasing effects of tying and the Single Monopoly Profit Theorem will be featured as part of the Chicago theory, which claimed that tying can produce many benefits from a social viewpoint, at no competition cost, and that in many circumstances, it cannot be used to leverage the monopoly power. In short, the Chicago school claimed that tying should, therefore, be treated as per se legal.

Furthermore, the potential exclusion or entry deterrence of rival competitors, and in turn, the decrease of competition, as well as the strategic use of tying to preserve and extend a monopoly position in evolving industries will be analysed as part of the Post-Chicago school thinking, which showed that a firm enjoying monopoly power in the

tying good might have an anticompetitive incentive to tie. Foreclosure is presented as the basic mechanism that leads to the exclusion of actual and potential competitors from the tied good.

Last but not least, I will make an analysis of tying under the US and European Commission (EC) antitrust law and we will see their evolution. I will focus on how the courts should encounter the practice of tying and finally, I will point out the importance of the Rule of Reason approach to tying.

A lot of practical examples throughout this paper will contribute to the better understanding of the terms used by economic approach in relation to the tying strategy.

2.
INTRODUCTION

I will start by giving definitions of the terms of pure bundling, mixed bundling, tying and bundling, and by illustrating them with some simple examples. Pure bundling and mixed bundling are just mentioned as specific cases of bundling, while later on in this paper I focus my investigation on tying and bundling as non-linear pricing strategies.

2.1 Pure Bundling

According to Nalebuff (2003), pure bundling is the simplest case of a bundle: in a pure bundle, two goods, A and B, are only sold together. They are not available for individual purchase. Furthermore, in a pure bundle, the goods A and B are offered only in some fixed proportion. For example, at most all-inclusive resorts, you can only purchase the entire bundle (lodging, dining, drinks, sports, etc.) – you don't have the option to purchase items individually.

On the one hand, it is rare to see a pure bundle forced on consumers. Most often, when consumers are interested in purchasing two goods A and B separately the market makes this available, even if the price is not always attractive. But on the other hand, many goods are sold only as a bundle and this has become so commonplace that we do not even notice it. Thus, a car comes as a bundle of tyres, steering wheel, radio, engine, brakes, and much more. An airplane ticket often includes a meal and in this case, the customer cannot buy the trip and the meal separately. A university often offers a bundle of courses. A newspaper often bundles its stories together with its ads.

The bundle can be done either through a contractual bundle or through a technological one. With a contractual bundle, there is at least the possibility of disposing of the unwanted part of the bundle. If you do not like the meals that come with the vacation package, you are free to eat elsewhere (although you have to pay for it). With a technological bundle, disposal of the bundled good may be costly or even impractical.

2.2 Mixed Bundling

According to Nalebuff (2003), mixed bundling is a generalisation of pure bundling:
In mixed bundling, goods A and B are sold as an A-B package in addition to being sold individually. The package is sold at a discount to the components. This is the key part here. That is, the price of the A-B package should be lower than the individual prices of A and B products. If not, there is no strategic impact of the package and this is not considered to be bundling.

For example, the Value Meal (sandwich, fries and soda) at McDonald's is a great example of mixed bundling. Each food product is available individually but there is a significant discount for purchasing them together as part of the bundle.

Volume discounts can also be included in mixed bundling practices, such as a bigger cereal box or simply a price discount, such as: "buy two suits, get the cheaper one at 50% off". Another case of mixed bundling is when the customer has the pricing option only if he buys the full product line.

Example:
There are certain cases where mixed bundling can increase the monopolist's profit more than pure bundling or no tying at all, that is, selling both goods separately.

Here we have two products and three types of consumers who value these products differently.

	Products	
	X	Y
Consumer 1	4	0
Consumer 2	3	3
Consumer 3	0	4

The monopolist can follow three different strategies:

- No tying, that is, selling both goods separately. The monopolist has three alternatives:

1) The monopolist can set price Px=Py=3. In such case, consumer 1 buys good X, consumer 2 buys both goods and consumer 3 buys Y and profits= 2Px+2Py=12.
2) The monopolist can set Px=Py=4. In such case, consumer 1 buys good X, consumer 2 buys none and consumer 3 buys good Y. Profits=Px+Py=8.
3) The monopolist can set different prices, for example Px=4 and Py=3. Then profits=Px+2Py=10.

So, we conclude that if the monopolist does not tie the two products, the first alternative is the most profitable.

- Pure bundling, that is, only selling the two goods together.

	Products		
	X	Y	X+Y
Consumer 1	4	0	4
Consumer 2	3	3	6
Consumer 3	0	4	4

The monopolist has two alternatives:

1) Set price P(x+y)=4. All consumers buy and profits=12.
2) Set price P(x+y)=6. Only consumer 3 buy, so profits=6.

So it is more profitable for the monopolist to set price=4 for the bundle.

- Mixed bundling, that is, selling the two goods together in a package as well as separately. Now, we will see that mixed bundling is the most profitable strategy for the monopolist. With mixed bundling the monopolist can set Px=4 and Py=6, so that consumers 1 and 3 will buy products X and Y respectively. Moreover, he can set P(x+y)=6 for the bundle, so that consumer 2 buys the package of both goods. So, profits=14. In that way, the monopolist extracts the maximum of consumer's 2 surlpus and all the consumers' 2 and 3 surplus. So the conclusion is that in some cases the best strategy is mixed bundling.

2.3 Tying and Bundling

As Nalebuff (2003) says, the term tying is used in two ways. According to the first definition, it is a special case of mixed bundling. The static tied-sale, can be thought of as half of a mixed bundle or an exclusivity arrangement. The customer who wants to buy A (the tying good), must also buy B (the tied good). It is possible to buy B without A and that's why this is a tie and not a bundle. Thus, the items for sale are B alone or an A-B package. In some cases, a firm with market power in good A, uses it to create sales of good B.

The second type of tying is a dynamic form of a pure bundle. In order to purchase good A, the customer is also required to purchase good B. This dynamic form of bundling has the exclusivity feature of the static tie. What makes this different from the standard pure bundle, as well as from the static tie, is that the quantity of the tied good may vary from customer to customer based on their intensity of use of good A. Moreover, the amount of the tied good does not need to be determined at the time of the initial purchase. For example, when a photocopy machine (good A) is tied with a specific brand of paper (good B), the paper sales occur over time and vary across users and a customer does not need to determine how much paper to buy at the time he buys the machine. But under the tying contract, whatever paper was required would have to be bought from the machine seller.

This dynamic tied sale is different from the static tie also in another way. The goods involved in the dynamic tie are required to use the product. One cannot use a photocopy machine without paper, while this does not hold in the case of the static tie. In that sense, all the customers who buy good A must also buy good B. This form of dynamic tying can be interpreted as a generalised pure bundle where the bundled goods are bought in different proportions by different customers.

According to Hovenkamp et al. (2009), most ties are contractual, in the sense that the thing that binds the tying and tied product together is a contract or perhaps an intellectual property license. Some ties are "technological," which means that the two products are tied together due to product design. For example, the owner of a computer printer may be limited by virtue of product design to the use of a specific ink cartridge.

There are ways of making tied sales where the tie is implicit rather than explicit, so that they are not judged by the antitrust law. For example, if a photocopier is accompanied to a service contract, we would say that the service is tied to the copier.

The basic economic motivation behind the dynamic tied sale is to engage in price discrimination, that is charging different prices to different customers based on their valuation of the product.

Example:
Now we will see an example of how tying can be profitable for a monopolist. We have consumers who are heterogeneous and value different goods differently. Preferences are negatively correlated. Then a monopolist can increase its profits by tying the sale of one good to another.

Consumers Valuations	Products	
	X	Y
Consumer 1	H	L
Consumer 2	L	H

The monopolist may now follow several strategies:

- No tying:

1) Selling each product to both consumers, both consumers buy 2 goods and Px=Py=L, profits=4L.

2) Selling each good to only one type, each consumer buys only 1 good and Px=Py=H, profits=2H.

3) If $H<2L$, the first strategy is preferable to the second.

- Pure tying:

Selling both goods together. The monopolist charge $P(x+y) = H+L$ and profits$=2(H+L)$. That is, with pure tying profits are higher than with no bundling and the monopolist extracts all consumer surplus.

Tying is an example of non-linear pricing. Bundling is another example of non-linear pricing. While tying refers to selling more than one product together, bundling refers to selling more than one unit of the same good together. Bundling is similar to the quantity discounts in price discrimination, for example selling a ticket for 10 health club visits.

Sometimes it is hard to distinguish bundling and tying. If a cinema sells 10 entries, the bundling interpretation is that of a quantity discount, the tying interpretation is an attempt to sell the less popular movies together with the most popular, thereby increasing the demand for the bad movies.

Example:

We could now see a simple example which proves bundling to be profitable for a monopolist. Suppose $Q(p) = 4-p$ and $c=0$, the uniform price of the monopolist is $p=2$ and $q=2$, then the profits are $\pi=4$.

Now we suppose that the monopolist decides to practice bundling, that is to sell 4 units at 8 Euros or nothing. We find the consumer surplus from 4 units, which is 8 and we conclude that finally, the consumer buys the bundle and the monopolist doubles its profits and extracts all the consumer surplus.

Some **empirical examples** where competitive markets tie one product to another and everybody knows from our everyday life are: airlines (passenger seat and baggage transport), apartments (appliances and mailboxes are included with the rooms), encyclopedias (you must purchase the entire set of volumes), newspapers (the sports section cannot be purchased separately from the front page), restaurant service (water and bread frequently appear automatically, regardless of what you order), shoes (left and right shoes are not sold separately and shoe laces are included as well).

3.

INCENTIVES TO BUNDLE AND TIE

Why do firms offer bundles?

Evans et al. (2005) demonstrated that tying by a firm with market power in the tying good allows the firm to leverage market power from one good to another. But tying is a common practice in markets in which the tying good is competitive (so leverage is not possible) and in which the tied good is competitive (so leverage is not profitable). Thus, leveraging cannot be the only economic explanation for tying, nor can we assume that a firm with market power ties in order to leverage rather than for competitive reasons.

According to Nalebuff (2003), the sources of efficiencies that explain why a firm could be motivated to engage in bundling can be separated into two groups:

3.1 Efficiency Reasons

3.1.1 Bundling to Achieve Cost Savings and Quality Improvements

Perhaps the most obvious reason to bundle two products together is that this leads to cost savings or quality improvements or both.

Cost savings

Salinger (1995) recognises that cost synergies from bundling are most valuable when consumer valuations are positively correlated. Thus, if most consumers would buy both (or neither) A and B when sold separately, then any cost savings from selling them together will create an incentive for a monopolist to sell bundled products when valuations are positively correlated.

For example, in the case of automobiles, it is less expensive for the manufacturer to assemble the car than for the customer to purchase the components individually and assemble them at home. It is also true that savings in administrative costs can make it cheaper to offer all customers an ABC package compared to letting customers choose two out of three, AB, BC, CA. In this case, there is less flexibility but standardisation can mean more for all. This standardisation ends up being a bundled offering. In recent years, carmakers have learned that allowing customers to pick and choose different option packages, leads to increased complexity and cost. As a result, they found it could be cheaper to provide all of the options to all of the customers rather than let people unbundle the offering. So, they give, for example, the consumer a car with an original radio or tyres and they let the consumer remove them if he chooses so.

Nevertheless, we do not see unbundling in the market because there is little demand for it as it is not considered to be worthwhile by the consumers. A different reason why unbundling does not exist in the market is that choice itself may be a problem. We are accustomed to thinking that more choice is always a good thing. Recent work in behavioural decision theory has shown that giving the customer too many choice options will often lead to no choice at all. The customer will postpone the purchase decision. Thus, it is a profit-maximising strategy to restrict the customer choice set so as not to overwhelm the decision-maker. Bundling is one way to accomplish this (Nalebuff, 2003).

When firms engage in tying, they reduce the fixed costs of offering one or more components separately. Such product-specific scale economies provide a plausible explanation for the pure bundling. Fixed cost savings from bundling have two implications. First, it may not be efficient to provide one of the products separately even though some consumers might prefer it. Enough customers must want both of the separate items to justify the additional fixed costs. That is why it is not possible to buy left shoes alone even though some people might want to do so, those perhaps with no right leg or with a dog which has eaten their left shoe. Second, and more subtly, tying increases demand for the tied item and thereby allows the seller to achieve greater scale on it than if the seller offered the items separately.

There can be significant cost savings from bundling but they are hard to be established when products are offered only as a bundle, that is when the seller practice pure bundling. There are savings in packaging costs and furthermore, limiting the possible product variants reduces costs. There are also marginal cost savings from packaging (Nalebuff, 2003).

Quality improvement

In conjunction with the cost savings, we have value enhancements. That is, cost savings lead to quality improvement. For example, by coordinating the interfaces and the commands, the software bundle can offer improved functionality and simplicity. Moreover, when two goods or services are sold as a bundle, if something goes wrong there is one person who takes the responsibility for both goods so the quality improves. For example, if the printer does not work with the computer, is it the fault of the printer or of the computer? But if they are sold as a package, then there is one number to call and the company can take responsibility.

It is possible to argue that such cost savings or quality improvements can create an antitrust issue. A firm might gain a large advantage over its rivals by putting such a package together, and this might well force rivals out of the market. However, this is disputable, as the firm will argue that it is practising tying to secure the quality of its product or service and the rivals will claim that it is doing it to stop competitors entering the market. This is no different from saying that a firm should not invest in cost-saving technology or quality improvement. In this way antitrust policy restricts competition. Thus, this is a big problem in antitrust. One way of recognising non-strategic reasons to bundle is to say that the incentive to bundle would exist absent any competitive response (Nalebuff, 2003).

3.1.2 Bundling to Reduce Pricing Inefficiencies

3.1.2.1 Bundling as a Price Discrimination Device

According to Nalebuff (2003), another reason why firms have an incentive to use the practice of bundling, which belongs to the group of efficiency reasons and has to do with pricing. According to the economics literature, bundling can be used as a price-discrimination tool by a multi-good monopolist.

A typical monopolist faces a pricing dilemma when it has to set one price in the market to all customers. If he prices the object too high, he loses sales. If he prices the object too low, he gives away profits from customers who would have been willing to pay a higher price. In the end, the monopolist chooses a price such that marginal revenue equals marginal cost, but that trade-off is inefficient. There are customers willing to buy the good at prices above cost. This also misses opportunities from the monopolist's perspective, as there are customers who are buying the good and yet are paying well below their value. In short, the monopolist would like to engage in price discrimination.

Price discrimination is necessary only if customers have different values for the good. If it were possible to reduce customer heterogeneity, then there would be less need to employ price discrimination, because if the consumers all had identical valuations, the monopolist would set a uniform price and extract all of the consumer surplus.

Bundling is a useful tool to reduce the heterogeneity in customer valuations. The reason is that the combined customer value of a bundle is often less heterogeneous than the individual values of the components. This will be especially true if the values of components are negatively correlated.

We can see a simple example:

There are four customer types in this market (Romantic, Neo-classical, Tchaikovsky lover and Sophisticated) and the product is a concert. For simplicity, we assume there is one of each type and each makes up one-quarter of the market. All the costs are fixed, and so the profit-maximising strategy is to maximise revenue. There is a wide range of valuations for any one concert - from a low of 5 to a high of 45.

Consumer type	Willingness to pay in €	
	Concert 1	Concert 2
Romantic	40	20
Neo-classical	20	40
Tchaikovsky lover	45	5
Sophisticated	5	45

If the concert organiser has to charge one price for each concert to all its customers, then he has to think in the following way:

- If price=45, then sales=1 and revenue=45
- If price=40, then sales=2 and revenue=80
- If price=20, then sales=3 and revenue=60
- If price=5, then sales=4 and revenue=20

And its optimal price is 40. It will sell two tickets to each concert and make total revenue of 160. But this misses an opportunity to sell tickets to the customers of each concert with values of 20 and 5. A simple bundle solves this problem. A bundled price of 50 leads all customers to purchase a series ticket. There is much less variation in the customer valuation for a series ticket than for an individual concert.

The seller can do even a bit better through a mixed bundle strategy, as selling a series ticket for 60 and a single ticket for 45 leads to sales of 210 (60+60+45+45). This is only 10 short of the total surplus available.

This advantage of bundling is especially apparent when the values of A and B are negatively correlated: offering an A-B bundle leads to more homogeneous valuations among consumers and, thus, the monopolist can capture more of the consumer surplus. Even if A and B have independent valuations, McAfee, McMillan and Whinston (1989) show that a multi-product monopolist still does better by selling A and B as a bundle rather than independently. This is a remarkable result. However, this result is very general in that the collection of possible independent goods that could be profitably bundled is unimaginably large. Almost any two goods chosen at random might be expected to have independent distribution of valuations. For example, pens and cars or beer and bananas. For any two goods whose valuations are independent, a monopolist can increase its profits by offering an A-B bundle at a discount relative to the optimal monopoly prices of A and B.

The remarkable result is that if A and B are each priced optimally, then the monopolist can raise its profits by selling an A-B bundle at a €1 discount to the optimal individual prices of A and B. To see the intuition for this result, consider a discount coupon that offers 1€ off the price of B to those who buy A. Taking 1€ off, costs the firm 1€ for all those who would have bought B anyway, but gains the firm some extra customers. As the price of B was set optimally, these two effects just balance out. (Although the discount is given only to those who have bought A, these consumers are a perfectly representative collection of B customers as the valuations of A and B are independent. Hence the discount and the market expansion effects still just offset each other.)

A coupon that offers 1€ off the price of B to those who buy A can also be read as one that offers 1€ off the price of A to those who buy B. If the customer buys A and B, he can save 1€. Thus the coupon will also have a market expanding effect on the sales of A. The cost of the discount has already been paid and covered by the increased sales of B. The reason why a bundle discount works is that it creates double the demand expansion for one single discount.

However, we do not see large bundles in the market, because the assumptions required, such as monopoly power in each of the goods, zero costs, independent valuations of goods are unlikely to hold.

This explanation for bundling would imply that we are most likely to observe bundling in cases where the two goods have a negative correlation in value and with bundling consumers' valuations become more homogenous, so there is a benefit for the firm. But, if the two goods that are sold together have a perfect positive correlation in value, then there is no extra ability to price discriminate by selling them as a bundle. There is no reduction in the heterogeneity of valuations. Nor is there an ability to expand the market by discounting a bundle relative to the price of the components. All customers would buy the bundle or nothing.

In practice, goods that are bundled together typically have a positive correlation in value. Consider, for example, the Microsoft Office Suite. The value of the different component programs - Word, Excel, PowerPoint - are typically positively correlated in value. We believe that this is typically the case for goods that are sold in a bundle (Nalebuff, 2003).

Another typical example of bundled services with positive correlation is when a communications company choose to offer a cable TV bundle that allows the subscriber to enjoy cable television, local telephone service and Internet access as a single product offering, rather than having to purchase three different services at a cumulative higher rate.

3.1.2.2 Bundling to Avoid Double Marginalisation

The idea that bundling can be used to avoid double marginalisation is one of the oldest results in all of economics. In 1838, Augustin Cournot showed that bundling could improve the profits of two monopolists selling complementary products.

For Cournot, the two complementary products were only of value when used together. Thus the customer will buy both or neither. For example, a lift ticket to a ski mountain and ski equipment rentals. Cournot’s insight is that two monopolists, acting independently, will set an inefficiently high price. If they merge or coordinate their pricing, they would lower the price and earn more money. That is, the lower price of lift tickets stimulates sales of equipment rentals and vice versa. This is because customers care only about the combined price when deciding to make a purchase. When firms set prices independently, they do not take into account the effect that a change in price will have on the complementary product.

The Cournot example is the horizontal equivalent of double marginalisation. Each firm causes a negative externality on the complementary products by raising its price. When the two firms combine, they internalise this effect and lower prices. The two key assumptions driving this result are that both sellers are monopolists and that these products have strong complementarities - so, consumers tend to purchase these products together. The coordinating firms make more money.

The unusual thing here is that prices fall so consumers are also better off, too. The merger or coordinated pricing leads to a situation in which everyone is better off, what is sometimes called a Pareto improvement.

Cournot's argument is not always applicable. At first, the Cournot basic result depends on the assumption that: firms set a single price in the market to all customers. But it is not always easy to engage in that agreement and if the seller has full information and can price discriminate or negotiate with each customer, then the advantage of bundling disappears. Second, in the basic Cournot model the producers of goods A and B are alone in the market, so we need to understand how the results change in an oligopoly model and which is the impact of the coordinated pricing or merger on any other firms in the market.

3.2 Strategic Reasons

3.2.1 Bundling to Create an Entry Barrier

Nalebuff (2003) considered bundling as an effective entry-deterring strategy in an oligopolistic environment. A company that has market power in two goods, A and B, can, by bundling them together, make it harder for a rival with only one of these goods to enter the market. Thus, the bundling is used to protect the market power against entry rather than extend it to another market.

We also show that bundling continues to be an effective pricing tool even if entry deterrence fails (or if there is already an existing one-product rival). A company with a monopoly in product A and a duopoly in product B makes higher profits by selling an A-B bundle than by selling A and B independently. Leveraging market power from A into B and accepting some one-product competition against the bundle is better than using the monopoly power in good A all by itself.

For example, Microsoft Office has bundled Word, Excel, PowerPoint and Outlook into a software suite. Some of these components are not considered to be the best in the market. Nevertheless, Microsoft gains an advantage by selling its office products as a bundle. That happens because of cost synergies and quality improvements, as we have mentioned before.

In addition to quality and cost, there is a strategic reason to bundle. We consider a firm that sells an A-B bundle rather than A and B individually.
If an entrant comes into the market with an A good, then it is limited to selling its product to customers who value A, but who do not particularly like B. Those customers who also like B will prefer to buy the bundle.

Example:
We assume that a monopolist firm selling A and B offers the two products as a bundle at a price of 1. There are consumers with a high valuation for good A, that is 1 and with a high valuation for good B, also 1. In that case, the firm will sell an A-B bundle to those consumers with a combined value of A+B that exceeds 1.

Now consider the market available to an entrant. If the entrant comes in with just one product, say B, then it can attract only those customers who are willing to pay its price for B and give up A. That is, we have a market available to an entrant with a single good B at price 0.50 competing against an incumbent with a bundle priced at 1. Only consumers who value good B at more than 0.50 are interested in the entrant's product. Since the incremental price of buying the bundle is another 0.50, those customers who value good A at more than 0.50 will buy the bundle. This is half of what it would otherwise attract if the entrant could sell B without having to compete against the incumbent's bundle. It is the exclusive supply of A that creates an advantage to the incumbent. Any customer who is unwilling to give up A must buy the bundle and get B in the process. Thus, those customers will not be interested in the entrant's B product. The advantages of bundling become even larger if the incumbent has an incentive to sell the bundle at a price below 1.

There is yet another advantage to an incumbent who offers a bundle. If the two goods A and B are positively correlated in value or they are complements, then customers will prefer the bundle, rather than the product B of the entrant. The entrant is limited to the consumers who like one good but not the other and there will be fewer of these consumers if the two goods are positively correlated in value or are complements.

Most bundles do include goods that have a positive correlation in value or that are complements. For example, customers who value Microsoft Word will also value Microsoft Excel and customers who are looking for accommodation would also be interested in transportation or/and breakfast.

At this point, we should notice that although the literature on bundling as a price discrimination tool emphasises that it works best when the bundled goods have a negative correlation in value, the opposite is true when bundling is used as an entry deterrent or monopoly extension strategy. Even with independent valuations, bundling is still an effective tool, but it loses its effectiveness when the goods are perfectly negatively correlated in value. The reason is that a one-product entrant has everything its consumers want when the valuations for A and B are negatively correlated. In contrast, when A and B are positively correlated, the same group of consumers are buying both A and B and, thus, a one-product entrant cannot satisfy its customers.

It is also worth noting that the bundle allows the incumbent to protect both product markets at the same time. The value of good B is what protects the incumbent against an A entrant and the value of good A is what protects the incumbent against a B entrant. Finally, it is remarkable that the bundling strategy does not deter an entrant who is able to develop both an A and a B good. However, this is typically much harder to accomplish. For example, a firm that develops a better word processing program would also need to develop a better spreadsheet program in order to compete with Microsoft Office. Developing two innovations is always harder than developing one.

3.2.2 Bundling to Mitigate Competition

If in the end the competitor enters the market, a bundling strategy will mitigate the cost of this entry. The reason for this is that when a rival enters the market, it only competes

for a limited group of customers and in turn, it ends up reducing the scope of competition.
Some of its customers are taken from the incumbent, that is those who like A, but not B, and their desire for A was strong enough to lead them to buy the bundle. Now they can just buy good A. But others come from customers who were previously left out of the market. This second category of customers are those who are not served by the incumbent as they like good A but not B and their desire for A was not so strong as to justify buying the bundle. So now, this group buys the rival's single product, but yet it does not cause the incumbent any loss in demand.

Moreover, it is noticeable that bundling becomes a way for the two competing firms to better differentiate themselves. According to Carbajo et. al.(1990), one company sells both A and B, while the rival firm only sells B. If the two goods are sold separately, then the profits in B are competed away and, thus, the first firm simply earns the monopoly profits on A. If, in contrast, the first firm only sells A and B as a bundle, then it can go after the high-value customers and leave the rival firm to pick up the low-value customers who go unserved.

In addition to this, Chen's model (1997) achieves a similar result through different means. Two companies can each produce products A and B. The two firms are duopolists in the A market, but the B market is competitive. Instead of both firms selling A (and competing away all profits), one sells just A and the other sells just an A-B bundle. In fact, the two firms commit to dividing up the A market. Firm 1 gets the A customers who do not care for B, while firm 2 takes the A customers who also like B. Here bundling is used to facilitate implicit coordination through the creation of differentiated products.

3.2.3 Bundling to Gain Competitive Advantage

The general idea of the use of bundling to create a competitive advantage is that a multi-product firm can offer more variety than a single product competitor (Nalebuff, 2003). If the products are all sold individually in the market, then the customer can get all the desired variety by freely mixing and matching. But if products are offered as a bundle, then the best way to get variety is to purchase the bundle.

Customers value variety even if they consume only some of the varieties. Customers typically only consume one variety at a time. Thus, even if the marginal cost of producing each good is significant, it does not cost anything extra to offer a customer the choice of A or B as a bundle. Apart from issues of managing complexity and capacity, there is no extra cost of creating a variety bundle. Examples of variety bundles are airline flight schedules or restaurants, where consumers could shift to other bundles which are more convenient to them. These variety bundles could happen through the direct action of the firm or through the marketplace. One difference is when the customer pays for the bundle. In the case of restaurant districts for example, the variety is offered for free in that the customer does not have to make a payment until he eats a meal at his chosen restaurant.

How this type of bundling can create a competitive advantage by lowering the willingness to pay for a rival's unbundled good? Putting the package together and letting the customer choose among this variety, puts a firm with only one product to sell at a distinct disadvantage.

While the firm might do fine if its product was perceived at the average value of a good in an (n+1)-good bundle, it may not survive if it is perceived as an incremental good to be added to an n-good bundle. The more goods that are put together in the initial bundle, the greater the value that is created.

3.2.4 Bundling to Create Network Externalities

In some cases, the variety of goods offered is actually the other people on the network: the more people, the more variety. Bundling comes into play when firms offer discounted access to the bundle of people on their network. For example, mobile phone pricing achieves this result by providing a significant discount for calling other mobiles on the same network compared to those on competing networks. Without any strategic pricing, a customer has no particular reason to care about the variety of customers on a particular network.

Another example of how network effects work is the case where a customer of Microsoft Office decides to upgrade Word. Then all of the people who exchange Word files with that person will have an incentive to upgrade. As a result, one person upgrading Word can have an important effect in an organisation. Now the bundle effect enters when the way to upgrade Word is via upgrading all of Office. That is, even though the person did not require an upgrade to Excel or PowerPoint, the customer will end up using the newer versions. That means that people who interact with that customer over Excel or PowerPoint will also have an incentive to upgrade, because of incompatibility problems. An upgrade that may have only spread across a network of Word users now spreads across Word, Excel, and PowerPoint users.

Sometimes bundling is also used to deny network effects to rivals (Nalebuff, 2003). Consider a resort hotel that includes meals as part of its package. As a result of this bundling, many fewer guests will leave the hotel to explore local restaurants. Consequently, there will be fewer restaurants that the local population can support. Given the few options that might exist, hotel guests will have even less incentive to explore. In fact, the local population might even choose to dine in the hotel, given the lack of variety in town. This further exacerbates the problem.

It is not clear that this is a profit-maximising strategy for the hotel. If potential tourists consider the package price of the room plus the food, it is not clear that getting rid of local competition will improve the hotel's profit opportunities. On the other hand, having a restaurant with a predictable and steady stream of customers can be profitable, even if it charges market rates.

3.2.5 Bundling and R&D Incentives

Moreover, Nalebuff (2003) supported that bundling gives the incumbent an incentive to innovate and thus, helps preserve and extend its advantageous position.

The general idea here can be seen through an example. Imagine that a monopolist incumbent in market A commits itself to sell good A only through an A-B bundle. This will cost it sales and, thus, not be a profit-maximising strategy in the short run. However, this bundling strategy has created a much bigger incentive for the firm to engage in R&D. Since the firm now needs to sell B in order to earn its monopoly profits on A, it becomes imperative for the firm to reduce the product cost of B. Other firms in the market will appreciate the fact that the monopolist has much bigger R&D incentives and, thus, they will back down or even give up.

Although the investment would seem to offer a sure return, we must take into account the effect of competition. If both firms reduce their costs by the same amount, then these efficiencies gains are competed away and the firms do not earn back the cost of their investment. The way to make money on this investment is to achieve more cost savings than a rival. At least, that works if the rival does not bundle.

The dynamic effect is to promote R&D by an incumbent monopolist and discourage such investments by rivals. Over time, this can create a profitable situation for an incumbent.

3.2.6 Bundling as a Way to Obscure Prices

Finally, Nalebuff (2003) considered bundling as a game against consumers, apart from a game against rivals, as bundling can help a firm obfuscate its pricing. Prices are obscured because consumers do not always comprehend the relationship between the bundle price and the price for each component. In some cases this is a legitimate activity and in others it is nothing more than a game of “bait and switch”, baiting the customer with an attractive price which is not really available. In this case, bundling should be prohibited so that consumers will be protected.

An example which illustrates obfuscation is the pricing of Microsoft Office at the time Microsoft first introduced PowerPoint. Microsoft added PowerPoint to its Office bundle while keeping the stand-alone price of PowerPoint high. This served several purposes. Consumers had the perception that they were getting something of high value as part of the bundle. If PowerPoint had a stand-alone price of $19.95, customers would have rightly wondered about the quality of the product. Thus, the use of a bundle allows a firm to introduce a new product to consumers at a great discount, without revealing the scope of the discount. Since no one buys the product at list price, it is hard to know what the market price would be absent the bundle.

As a conclusion, there is much evidence in economic literature which proves that there are serious motives for firms to use tying as a practice to promote their products or services. So in Section 4 and 5 we will analyse some types of tying arrangements and comment on their competition and welfare effects.

4.

TYING AND PRICE DISCRIMINATION

According to Evans et al. (2005), price discrimination and foreclosure are the two leading explanations for tying. But they can only explain tying by firms that have market power. However, tying is common in competitive markets and therefore cannot result mainly from foreclosure or price discrimination.

In this subsection tying will be analyzed as a method of price discrimination. At first, we will introduce the economic definition of price discrimination.

Price discrimination

Price discrimination occurs when customers in a market are charged different prices for the same good or service, for reasons unrelated to costs. For example, to see a movie at the cinema you pay €10 (regular price), but the young girl sitting next to you who is a student pays only €8 (student price) and her grandmother pays even less €7 (senior citizen price). This multiple pricing probably involves price discrimination, but not just because the prices differ: If the ratios of price to cost are different among buyers, then it is price discrimination (Shepherd et al., 2004). Price discrimination is profitable for the firms because consumers who value the good the most pay more than if prices were uniform.

According to Posner (2001), if a monopolist is not constrained to sell at a single price, he may prefer to vary his price with the intensity of the consumer desire for his product, charging more those who have poor substitutes for it and less those who have good substitutes. Suppose that the monopolist can discriminate in price perfectly and costlessly: Every sale is made at a price equal to the value that the consumer places on the purchase and no costs are incurred in verification of those values or in dealing separately with each consumer over each unit of output purchased. Then the monopolist proceeds down the demand curve (conceived for these purposes as the schedule of the willingness to pay for his product of every consumer) from its intersection with the vertical axis to its intersection with the marginal cost curve, and the demand curve in that interval will become a schedule of different prices for each unit of output. In this way the monopolist can take every bit of consumer surplus out of every transaction, yet without turning away any consumer willing to pay a price equal to the monopolist's marginal cost.

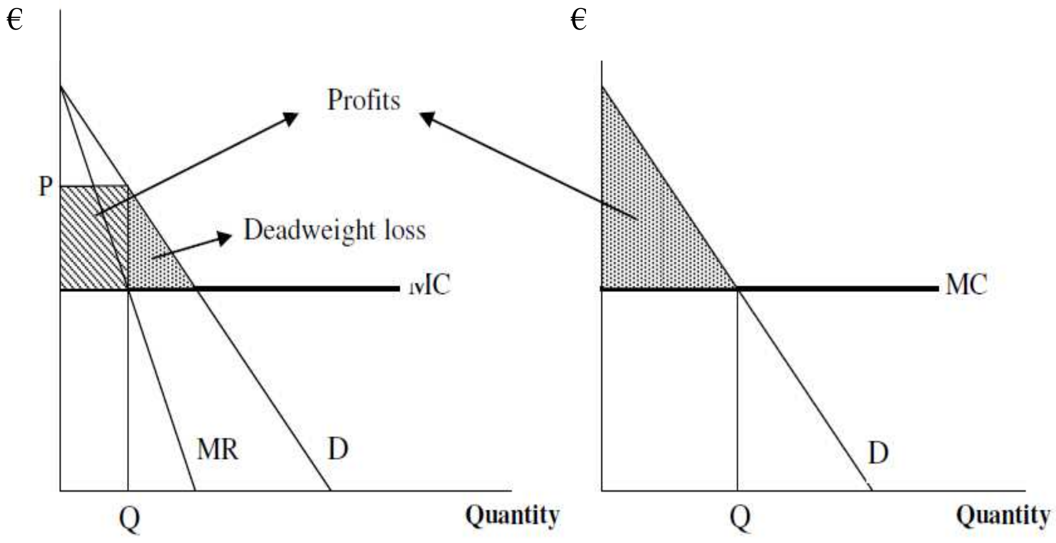


Figure - 1

Figure - 2

As can be seen from the figures, the output of the perfectly discriminating monopolist is identical to that of the competitive industry. Because with the price discrimination the monopoly can lower the price on only the one additional unit, it will do so as long as the price exceeds marginal cost. Consequently, monopolist earns its current profit plus an additional amount on the last unit. On the other hand, perfect price discrimination eliminates deadweight loss which is the social harm of monopoly. Nevertheless, monopoly profits are greater under perfect price discrimination than under single-price monopoly. In other words, perfect price discriminator leaves no consumers' surplus, but appropriates it all as producers' surplus. That is the entire surplus goes to the seller rather than to the customer.

According to Ardiyok (2008), all methods of price discrimination can be viewed as an attempt to minimize the decrease in the revenue on all existing output, where the fall in price is needed to induce the sale of one more unit.

There are many methods of price discrimination or charging non-uniform prices to customers in order to capture as much consumer surplus as possible. Perfect or first degree price discrimination is one of the three cases. With first degree, or perfect, price discrimination each unit is sold at its reservation price, that is, the highest price any consumer is willing to pay for that unit. Output in that case rises to the competitive level because every sale is made to marginal cost. However, sellers in real world cannot practically extract this reservation price even with variable proportion tie. For example, both a law firm drafting legal opinions on securities offerings and a printer of handbills about garage sales might print 1000 pages weekly. As a result, if they purchased identical printers under the same tying arrangement, they would pay the same amount per print. But given what is at stake the law firm might value the printouts at many dollars per page, while the handbill printer values them at only a few cents. The variable proportion tie will not capture these differences in valuation and will thus permit at least some consumers to retain surpluses. Examples of first degree discrimination are the old-time small-town doctor who neatly set each bill for each item in line with each patient's ability to pay. That is perfect price discrimination requires detailed knowledge about individual buyers, so it is more likely to occur when one-on-one bargaining occurs like the typical pricing practice in Middle Eastern bazaars.

There are also second degree and third degree price discrimination. Monopoly may not have detailed and enough (perfect) knowledge about each consumer's demand curve to design a pricing policy that captures all the consumer surplus of each consumer. In particular, the firm may not know the demands of each individual like a doctor in an old town. Rather, the firm makes use of its knowledge about the underlying distribution of demand in the population. In second degree discrimination, the seller can only array prices by descending price groups. Everyone is offered the same price schedule with different unit prices corresponding to different quantities or product varieties. Methods of nonlinear pricing are used to practice second-degree price discrimination. Nonlinear pricing occurs when a consumer's total expenditure on an item does not rise proportionately with the amount purchased. That is, the price per unit varies with the number of the customer buys. One example is a quantity discount or a division of transportation tickets by classes. The same structure is available to everyone but different customers make different choices based on willingness to pay.

If a firm does not have enough information to identify each customer or distribution of demand in the population there might be another chance to discriminate depending on other information about customers that the firm has. In third degree discrimination, it is assumed that the seller can divide customers into two or more independent groups based on observations about their willingness to pay, each of which has its own continuous demand function reflecting quantities sold to that group at alternative prices. That is each group is charged a unique price. Prices offered to one group are not made available to the other group. For example, the manufacturer of computer software might license it to commercial users at a higher rate and to home users at a lower rate. Third-degree discrimination is probably the most widely used of three main types, because of real market conditions which usually include asymmetry of information between sellers and buyers. Basic practices of third degree discrimination involves functional grouping of customers, such as residential versus business, or separate geographical areas. For example a firm can charge consumers in Athens higher prices than those in Patra. It has been shown that third degree price discrimination reduces welfare whenever it fails to generate more output than simple monopoly pricing.

Although all firms would like to price discriminate, many are not able to do so. Three conditions are needed for successful price discrimination (Ardiyok, 2008; Hovenkamp, 2011):

(1) The firm must have some market power that enables it to set price above marginal cost profitably.
(2) The firm must be able to identify whom to charge the higher price.
(3) The firm must be able to prevent or limit resales by customers who pay the lower price to those who pay the higher price.

The question: “are resources allocated more or less efficiently under discriminating monopoly than under uniform price monopoly?” rises. The answer depends on the type of discrimination exercised. First or second degree price discrimination generally leads to larger outputs than under uniform prices, and from there to lower dead-weight losses and improved allocative efficiency. The efficiency implications of third degree discrimination depend on the shapes of the demand and the cost curves. The closer imperfect discrimination is to perfect discrimination, the more likely it is that the price discrimination leads to a more efficient outcome than uniform pricing. In general which type of monopoly leads to greater output is theoretically ambiguous and is an empirical question. For example, third degree discrimination often permits markets to be served that would not be served under uniform price, especially when the monopolist segments its markets richly. The added revenue gained through price discrimination may be sufficient to make the difference in whether or not a service is supplied.

Not every firm which charges a non-uniform price constitutes price discrimination. There are many other explanations for prices to vary across customers. The major point is that the cost of supplying good or services to customers with different prices should stay the same.

On the other hand some forms of price discrimination are theoretically beneficial but have some application setbacks. For example leasing machines can prevent cross-selling and leases could be at different rentals, so that price discrimination could be materialized. But this method would require rather crude guesses at the risk of significant changes in elasticity during the term of the lease.

Another way is metering, and requires to be attached some devices to the machines which can measure the intensity of usage. So that, it is possible to monitor customers to determine the values they place on products. For instance, a firm that rents out copy machines may use a meter in the copy machine to keep track of the number of copies each customer makes and then set the rent depending on the number of copies made. This method of pricing maximizes profit if those who make the most copies value the machine the most. But this form of price discrimination has also some practical difficulties as the previous method.

According to Ardiyok (2008), there are other ways of discriminating prices such as two-part tariff, quantity discount, quality discrimination. But many forms of price discrimination have been challenged under the antitrust laws. In general terms for example, predation can involve a firm's charging a lower price in a market where it faces a rival than in another market where it does not. Such price discrimination that harms direct competitors is called primary line price discrimination. Secondary line price discrimination is one that leads to harm among customers. Discriminator favours one set of customers over another. A third form of price discrimination that is restricted under antitrust laws is tie-in sales or tying arrangements. In this form of price discrimination all tying products are sold at the same price and all tied products at the same price.

Ardiyok (2008) demonstrates two main types of tie-in sales for discriminating price:

4.1 Requirement Tie-in Sales

In the first type, which is called "requirement tie-in sale" the monopoly power enables the firm to discriminate in price according to the intensity of demand of tied product. It is the most common type of tying. If a customer who is exposed to requirement tie-in sale wants to purchase one product from a firm, he is obliged to make all his purchases of another product from the same seller. As customers consume different amounts of tied product with a tying product, this usage pattern may be called as variable proportion. Examples include cards tied to computers, service contracts tied to machines, and inputs into a franchise tied to the use of a brand name (Mathewson et al., 1997).

For price discrimination to be taken in this type of tying, the demands of goods must be interrelated. For example, a firm invents a machine that automatically sews buttons on shirts. Button sewing machine and buttons are interrelated and the value of sewing machine depends on the availability of buttons. With interrelated demands, the demand for sewing machine depends on both the price of sewing machine and the price of button. Similarly, the demand for button depends upon the price of both button and the sewing machine that would be used with them. This interrelationship creates incentives to price discriminate through requirement tying arrangement.

In the typical requirement tying, the firm sets a price for the first good and charges a high price for the related good. Consumers with large demand effectively pay more for the first good than consumers with small demands. Suppose that one sewing machine user makes 300 shirts per month while another makes 2000 shirts per month. It would be difficult for a company selling only sewing machines to price its machines in such a way as to extract more revenue from the more intensive user. But if the firm can tie the purchase of buttons to the purchase of its machine, it will be able to extract additional profits from the higher-volume user. As a result of this tie-in between button and button sewing machines, the monopoly of the sewing machine charges customers effectively different prices for the sewing machines, charging the most those who value the machine the most by preventing arbitrage which is hostile to price discrimination at the same time. (The seller dreams to raise the price to higher-volume users and lower it to light users, ideally charging each customer the top price he would pay. But if he adopted such a policy, the seller would shortly discover that all his sales were to light users at low prices, for customers, being also of sound mind, would find that he paid to have the light users purchase machines and resell to the heavy users. It is essential to seller’s plan that this cross-selling is stopped.) In turn, tying enables the monopoly to extract all consumer surplus from under the demand curve. This method merely transfers surplus from consumers to producers.

Furthermore, by securing a result that approximates perfect price discrimination, it can actually increase output and total surplus. If able to tie, the sewing machine monopolist reduces the price of its machine to a level near marginal cost, thereby encouraging more machine purchases than would occur if the machines were priced as simple monopoly products.

Undesirable effects

Under preceding explanations tie-in sales appear to be innocent and by price discrimination the quantity sold increases and buyers are charged according to their demands. But Ardiyok (2008) shows that sometimes this kind of arrangements may cause undesirable effects. For requirement tying, first of all the firm should have monopoly power in tying good or service market that enables it to force the buyer to buy tied good at the same time. If the tied good market is also monopolistic and dominated by the same firm there would not be a problem. But, the tied good markets are usually competitive and easy to entry. And any tying arrangement in effect forecloses competing material suppliers from selling the tied good or services to those buyers.

In the previous sewing machine-button example, we suppose that the button market is competitive. If there is not any tying arrangement, users will prefer to purchase the cheapest buttons. Since the firm has monopoly of sewing machine it would set monopoly price for it and there would be less sewing machine sale than the most efficient proportions. When the firm successfully ties the sale of sewing machine to the purchase of buttons, there are two main effects:

(a) Prices are readjusted so that sewing machine and buttons are used in more efficient proportions. In addition it encourages the sale of sewing machine.

(b) The monopolist's control is extended to the usage of button, so that more profits can be extracted from the tying arrangement.

The question is whether the first effect is procompetitive or not and, if it is how can we compare it with the second effect.

Another issue is leverage theory. According to this theory, tying provides a mechanism whereby a firm with a monopoly power in one market, the tying-good-market, can use the "leverage" provided by the market power in this monopolized market to foreclose sales in, and monopolize, the tied-good-market (Larson, 1994), that is it can create a second monopoly by requiring purchasers of the first product to purchase a second product from that firm as well. The concern about leverage emerged in patent law, where the owner of a patent could secure a partial monopoly on the unpatented supplies consumed in the operation of the patent. One problem with the leverage argument is its ambiguity. A tie can create a second monopoly in the tied product, only if the latter has no untied uses.

Besides the leverage theory, the courts focus on the matter of foreclosure which means that a firm having monopoly power in tying product uses tie-in sales to foreclose tying and/or tied product market to competitors. In what way? They deny competitors free access to the market for the tied product, not because the firm imposing the tying requirements has a better product or a lower price but because of his power or leverage in another market. At the same time buyers are forced to forego their free choice between competing products. For these reasons tying agreements sometimes are considered to be illegal and they may be condemned whenever a party has sufficient economic power with respect to the tying product to appreciably restrain free competition in the market for the tied product, even when the tie-in sale is in the interest of consumers. Over the time, courts have developed tests to simplify the review process and a per se standard despite to heavy critics.

Proving the existence of conspiracy to raise prices is enough to establish a *per se* analysis. But for tying arrangements there is a more complicated test should be done before handling the case in *per se* analysis. This test is not well designed to enable a court to determine whether a particular tying arrangement is socially harmful. Monopolists as well as consumers may find the selling of goods and services in tying arrangements to be efficient. For that reason anticompetitive impact of tie-in sales must be separately shown.

Within last years the pattern of the analysis is being gradually altered towards a rule of reason analysis for tying cases which underlines market power and separate product issues.

4.2 Package Tie-in Sales (Bundling)

In the second type of tie-in sales for price discrimination, Ardiyok (2008) considers two cases: the case where a firm has adopted a pure bundling strategy, in which it sells goods only in package and consumers consume the bundle or nothing and the case where a firm has adopted a mixed bundling strategy (Adams et al., 1976), in which it sales the same goods separately as well as in packages and the price of bundle is less than the total price of the products when they are sold separately. These practices can be precompetitive or anticompetitive.

In order to be able to practice bundling, the products cannot be separated and resold to another user. Because with a resale market nobody purchases the package and the attempt to practice price discrimination through a package tying arrangement does not work. Contrary to requirement tying arrangements, package tie-in sales are vulnerable to arbitrage possibility. Also, in this type of tying, the products or services in the package are sold in fixed proportions. That is, if the buyer wants to purchase product A, seller requires him to buy a fixed amount of product B with A.

There are some variations for package tie-in sales contingent to the relation between products in bundle and the firm's monopoly power in the markets of products constituting the bundle. A firm can have monopoly either in both products or in only one of the two products.

Suppose a firm has a monopoly power in both product A and B. Let's see an example of a movie company (Stigler, 1963), which sells movies to theatres and has two movies, Spiderman and Catch That Kid. Would this monopoly earn higher profits if it sells these movies separately or as a package? The answer depends on the value that various consumers place on each of the two movies separately versus the value they place on the package. Suppose monopoly sells the movies to two types of customers:
A would pay $8000 for Spiderman and $2.500 for Catch That Kid.
B would pay $7.000 for Spiderman and $3.000 for Catch That Kid.

The amount each customer is willing to pay for Spiderman is independent of whether Catch That Kid is also purchased, and vice versa. If seller charges each customer the maximum it is willing to pay for each movie, that is practicing perfect price discrimination, the firm would get $20.500. But that may not be possible or wise. Because it might be blamed by antitrust agencies or it might be difficult to accomplish when the seller is not sure of the precise maximums of many customers.

If the seller were to price the two films separately, he would receive $5.000 from the sale of Catch That Kid, at $2.500 per buyer, and $14.000 from sale of Spiderman, at $7.000 per buyer. The total revenue is $19.000.

With package tie-in sale, a single price of $10.000 can be set for the bundle of films, and $20.000 will be received. In turn, package tie-in sale extract larger sums than otherwise would be possible. This type of tying arrangement is also an example of price discrimination, because, when both customers A an B buy the same package, they are placing different relative values on the components of the package.

Package tie-in sales for firms having monopoly in both product markets are not always the most profitable strategy. As can be seen from the hypothetical example above, this strategy enables the monopolist to price discriminate when there is a negative relationship between what each customer is willing to pay for the two items.

It must be kept in mind that when package tie-in sales are practiced in markets where the seller has monopoly then there should not be a concern for leveraging or foreclosure. New entrants are not forced to enter to both markets because the products constitute the package are not interrelated. And new entry into either of the markets changes the double monopoly situation to a single monopoly situation in which a firm has monopoly on only one product of the package. Resulting situation in which a firm to tie an unrelated, competitively available product to the sale of its monopolized product is not profitable. In other words, a monopolist cannot, through bundling, extend part of its monopoly power in one product to a competitive industry supplying the other product in the bundle (Schmalensee, 1982).

In spite of this, case law about package tying arrangements does not seem to make a distinction between double and single monopoly and between double monopoly package tie-in sales and single monopoly requirement tie-in sales in assessing leveraging or foreclosing effects.

If the price of the package in mixed bundling is exactly equal to total amount of separately sold pieces, there is no rationale to apply mixed bundling.

According to economic literature, mixed bundling is always at least as profitable as pure bundling, and frequently more so. And it was also showed by McAfee et al. (1989) that mixed bundling could be at least as profitable as pure components sales, depending on the distributions of consumers' reservation prices for the goods comprising the bundle. Conditions for optimality of mixed bundling for yielding maximum profits are also the welfare-optimal conditions (Bridger et al., 1991). Thus, mixed bundling yields greater economic welfare than either a pure bundling strategy or one in which no bundling is employed. Mixed bundling in this context only makes sense if the bundle price is a discount from the sum of the separate prices of the services comprising the bundle.

Now, according to Ardiyok (2008), we suppose that a firm has monopoly in only one of the two products. This is the case of single monopoly tying arrangements with products having interrelated demands.

Suppose that M has a monopoly in the production of left shoes (tying product) and marginal cost of making a left shoe is $1. In the industry anyone can produce right shoes (tied product) at a marginal cost of $1. Customers value pairs of shoes at $102. The options of the monopolist are a) selling the left shoes alone, b) offering both shoes and let consumers choose and c) requiring consumers to buy both. But, by choosing the first option M can extract the full monopoly profit by setting a price for left shoes of $101. Tying will not increase the profits of M in the fixed proportions case. Since tying arrangement in this setup does not increase profits, we may expect other motives to be at work.

Since the tying of goods can be a means of price discrimination, which can easily be economically efficient, care must be taken so that efficient tying arrangements are not proscribed by the antitrust laws. A review of the cases and the economics of tying, lead Ardiyok (2008) to the conclusion that the law in this field is unjustified and itself inflicting harm upon consumers. The question is: “Antitrust law is for protecting competition or competitors?”

5.

VARIABLE PROPORTION TIES

5.1 What kind of price discrimination are they? Can they be classified?

Economists generally accept that ties constitute second degree price discrimination (Tirole, 1998; Posner, 2005; Hovenkamp, 2011). According to Hovenkamp et al. (2009), tying does not involve a seller's prior segmentation of consumers based on willingness to pay, as third degree price discrimination does. In second degree, as in tying, the dominant firm selects the products and places them on the market with the same price schedule offered to all. Moreover, the profitability of a tying strategy is not affected by its ability to distinguish between consumers with different valuations. Tying can be a viable strategy even when there is no information and consumers' preferences cannot be discerned ex-ante.

Second degree price discrimination involves charging all buyers the same price schedule, and varying prices with the units bought of the product over which the seller has market power. That is not what it happening when tying is used as a *metering device* (Hovenkamp, 2011). That is, buyers are not paying less per unit if they buy more units of the good. Buyers are instead paying more for the same good, say a printer if they fall into a category of buyers who use more units of a complementary good with it, such as ink cartridges. Printers and ink cartridges are near-perfect complements. That means that most consumers use printers and ink cartridges together, although they differ in the amounts of printing they wish to do. So, all customers buy a single printing machine, but the volume of prints they consume differs according to the number of ink cartridges they purchase. In particular, the per-print price a consumer pays is determined only by the total volume of prints he produces, regardless of the value the consumer derives from the prints. More specifically, the per-print price gets progressively smaller as the total volume of prints increases. And this is exactly the sort of situation that occurs under second degree price discrimination.

For example, suppose the monopoly price for a printer is $400 and the competitive ink price is $2 per print. The monopolist uses a variable proportion tie, cutting the printer price to $300 but tying ink and increasing the price to $4 per print. For the customer, the printer is a fixed cost and the ink cost is variable, so the tie can reduce fixed costs but increasing variable costs. However, significantly, the marginal cost of $4 per print is the same for all buyers at all places on the demand curve, from those that print the most to those that print the least. Each buyer will make prints until the marginal value of the next print drops to $4. As a result, in equilibrium the less intensive user and the more intensive user both have marginal valuations of $4 for their next prints, and there is no transfer at the margin from higher to lower value customers.

Of course, tying may shift purchases from high-intensity buyers to lower intensity ones, as it reduces average prices at low quantities and increases them at high quantities. But, unlike third degree price discrimination, the marginal price of the next unit is the same for everyone. Hence there is no reason to believe that selling an additional unit to high intensity buyers would benefit consumer welfare more than selling an additional unit to lower intensity ones. Moreover, the fact that purchases are reallocated under tying does not imply that consumer welfare is harmed. In fact, because the price cut applied to the tying product is more significant to lower use customers, they often benefit from tying even if they purchase fewer units of the tied product. As a result, even when a tie reduces output of the tied product, it may increase consumer welfare.

5.2 Welfare Analysis of Variable Proportion Ties

Hovenkamp et al. (2009) claim that one misconception about variable proportion ties is that they harm all consumers who purchase fewer units of the tied product and that the only consumers who benefit are those who would not purchase either good under untied monopoly pricing. It is true that increasing the tied product’s price reduces the surplus achieved on each tied unit, but consumer surplus is also increased by the reduction in the tying product’s price. A consumer is worse off under tying only if the tie subtracts more surplus than it provides. There is a difference between a buyer’s surplus realization which remains when the tying product’s price is subtracted from it and the amount of surplus received if the price of the tying product were zero, which is the “but-for surplus”. The relevant measure of a consumer’s welfare is not merely but-for surplus, but rather the surplus realization.

According to Hovenkamp et al. (2009), there are two ways in which tying affects the welfare of consumers. At first, the price increase applied to the tied product reduces the but-for surplus levels achieved by consumers who are willing to buy the goods even under monopoly pricing. This is because increasing the tied price is like increasing the marginal cost of using the tying product, which oblige most buyers to use the tying product less (i.e. to buy fewer tied units). The extent of a tie’s impact on but-for surplus is greater among consumers who desire to use the tying product more. On the other hand, the price of the tying product falls, so that a smaller amount of a but-for surplus is subtracted upon buying the tie. Many consumers will be better off under tying, even though it causes them to purchase fewer tied units.

Hovenkamp et al. (2009) also explain that tying, impacts consumers in three different ways depending on their status under non-tying monopoly. First, there are low intensity consumer types who buy the two goods under tying, but not under monopoly pricing. For these consumers the tie is an unambiguous welfare improvement. Second, are medium intensity consumer types who achieve more consumer surplus under tying even though it leads them to buy fewer units of the tied product. This occurs because they gain more from the reduction in the tying product price than they lose from the increase in the tied product price. Finally, there are high intensity consumer types who buy fewer tied units and achieve less surplus under tying. For these buyers, the price cut applied to the tying good is too small to cover the tie’s reduction of but-for surplus.

From the seller’s perspective, the seller generally earns greater surplus from the low intensity group, because these are sales that are not made at all without tying and also from the high intensity group, because it earns more on the higher volume of tied product that they purchase. However, the seller loses money to the medium intensity group because the loss on the tying product price cut is greater than the gains on the higher tied product price. As a result, the tie is profitable if the gains from the first and third group exceed the losses from the intermediate group.

According to Hovenkamp et al. (2009), the relationship between consumer welfare and output of the tied product is uncertain. Unlike situations involving only one good, a reduction in output does not necessarily mean a reduction in consumer welfare. Welfare can increase even though output of the tied product falls, provided that the number of medium intensity consumers is sufficiently large. If, on the other hand, output levels are maintained or increased, the tie should be assumed to enhance consumer welfare unless there is reason to believe that the injuries to high intensity buyers are greater than the improvements obtained by low and medium intensity buyers.

Hovenkamp et al. (2009) demonstrates that the one case where a welfare improvement will not occur is when the tie fails to serve any low intensity customers. For example, if a printer-ink tie increased the price of a single ink cartridge by the same amount that it cut the printer's price, then a buyer who buys only one ink cartridge would not be better off under tying. Additionally, every consumer who buys more than one ink cartridge is worse off, because the average cost of printing is higher for all print quantities requiring two or more ink cartridges. In this case, tying fails to benefit any consumers, and it leaves existing customers either indifferent or worse off. Such situations are probably rare, and they can be distinguished using a simple "consumer benefit" test, which asks whether a tie succeeds in serving any low intensity consumers, who are defined to be those who will not buy under monopoly pricing. This test is passed whenever output of the tying product increases upon tying. The test is also passed whenever output of the tied product does not fall as a consequence of tying, as low and medium intensity buyers will all reduce the number of tied units they purchase, meaning that low intensity buyers must account for the difference. An increase in output of the tied product is not necessary for passing the consumer benefit test. When a tie passes the consumer benefit test, one can be sure that it serves both low and medium intensity consumers, though this does not determine the proportion of buyers who maintain low or medium intensity levels. This merely demonstrates that two consumer types benefit from tying, one of which contributes to the output of the tied product, and one of which detracts from it.

A tie that passes the consumer benefit test increases the surplus levels achieved by both low and medium intensity consumers, and reduces the surplus levels of high intensity buyers. And, because medium intensity buyers reduce the quantity of tied units they purchase, the tie's net impact on welfare is not necessarily negative when it causes output of the tied product to fall. For this reason, if a tie passes the consumer benefit test, it is generally not possible to show that welfare falls without relying on empirical evidence showing that a sufficiently high portion of buyers are high intensity consumers. This is necessary to ensure that the setbacks suffered by high intensity consumers outweigh the welfare improvements enjoyed by low and medium intensity buyers.

Unfortunately, an antitrust tribunal will almost never have information about how consumers are distributed over the various intensity levels. As a result welfare effects are probably unclear unless the gains are clearly positive among all three groupings. This could happen in a situation in which all existing users benefit from the tie because the price cut in the tying product is greater for each of them than the price increase in the tied product. This would be most likely to occur when the price cut on the tying product is significant, the price increase on the tied product is fairly modest, and the tie brought in a large number of new tying product customers. In such a case the seller would be losing money from all existing customers but earning additional profits from all customers brought into the market by the tie. That situation would create a gain to everyone, that is, all customers who purchased the tying product previously, all new customers who come into the market in response to the tying product price cut, and the manufacturer. As a result, it would increase both general welfare and consumer welfare.

What Hovenkamp et al. (2009) pointed out is that, depending on how customers are distributed among different intensity levels, it is possible that a tie increases profits, improves consumer welfare, and yet fails to increase output of the tied product. This is because a consumer's profitability does not stipulate the way in which tying affects his surplus or the number of tied units he buys. That is, there is significant ambiguity in the relationships between profits, welfare and output of the tied product. For example, some profitable consumers buy more tied units and achieve more surplus under tying (low intensity buyers), while others buy fewer tied units and achieve less surplus (high intensity buyers). On the other hand, all unprofitable consumers buy fewer tied units under tying, but some achieve more surplus (medium intensity buyers), while others achieve less (high intensity buyers). In turn, a tie that reduces output could increase consumer welfare, while one that increases output could reduce consumer welfare. Variable proportion tying presents an unusual challenge, because some consumers will typically benefit from it even though they purchase fewer tied units. Observing changes in the output of the tying product is equally unhelpful. Indeed, output of the tying product will increase under any tie that benefits at least one consumer (i.e. any tie that passes the consumer benefit test).

Nevertheless, output effects in the tied market may serve to make certain welfare effects more likely than others. The fact that a tie increases tied product output indicates that low intensity customers, brought into the market by the tie, purchase more tied units than are given up by medium and high intensity customers. This implies that a large portion of consumers are necessarily better off under the tie. As such, the tie should be presumed welfare-increasing unless there is reason to believe that high intensity buyers lose more surplus than is gained by low and medium intensity ones. On the other hand, when tied product output is unchanged or decreased, there is no serious reason to believe the tie reduces consumer welfare. A tied product output reduction suggests only that low intensity buyers are relatively few, but this does not indicate that they are more concentrated at high intensity levels than medium intensity levels, or vice versa. As such, there is still no reason to believe that high intensity customers lose more surplus than is gained by the sum of low and medium intensity ones. So, the consumer welfare effects of ties that reduce or maintain output levels should generally be considered ambiguous.

In fact, the only ties that can be categorically shown to harm consumer welfare, according to Hovenkamp et al. (2009), are those that fail the consumer benefit test, which means that they do not benefit any consumers at all.

To summarise the analysis of the effects of tying on welfare, under a variable proportion tie of printers and ink cartridges that passes the consumer benefit test, we have the following conclusions:

- Low intensity consumers will begin buying the tie, though they would not buy either good under monopoly pricing. For new customers brought into the market by the tie, the result is an indisputable increase in consumer surplus.

- Both medium and high intensity users buy fewer ink cartridges than under monopoly pricing, but medium intensity buyers achieve more surplus under tying, while high intensity buyers are harmed by the tie. The medium intensity buyers experience greater gains from the tying product price reduction than losses from the tied product price increase.

- Whether the tie increases or decreases consumer welfare depends on the distribution of buyers among the three intensity levels. This uncertainty still exists if, output of the ink cartridges falls, because medium intensity buyers buy fewer ink cartridges and are nevertheless benefitted by the tie. So, a decrease in ink sales indicates only that buyers are relatively unconcentrated at low intensity levels. Welfare could still increase if they are relatively concentrated among medium intensity levels.

- Since the firm will not tie unless it earns more by doing so, producer surplus is increased as well. The seller gains by tying from both the low intensity buyers who do not buy at all under the tie and the high intensity buyers who now pay more for ink. The seller loses from the medium intensity buyers because for them the cut in the printer price exceeds the increased profits on the ink cartridge price. As a result tying is profitable if the gains from the high and low intensity group exceed the losses from the medium intensity group.

6.

THE CHICAGO SCHOOL

Economists associated with the Chicago School (Director et al., 1956; Stigler, 1968; Posner, 1976) explained how tying could provide increased convenience and lower transaction costs. They also showed that, as a matter of theory, there are many circumstances in which businesses cannot use tying to leverage a monopoly position in one market in order to secure extra profits elsewhere - the Single Monopoly Profit Theorem. In short, the Chicago School claimed that tying conduct produces many benefits from a social viewpoint, at no competition cost, and that it should therefore be treated as *per se* legal.

6.1 The Welfare Increasing Effects of Tying

Ahlborn et al. (2004) presented the welfare increasing effects of tying:

(a) Reduction in production and distribution costs

Tying may give rise to both economies of scale and scope in production and distribution. For example, machines may be utilized to manufacture two or more products allowing the producer to reduce the size or complexity of its factories. Also, the specialization of labor allows manufacturers to combine the various products that are part of the tie or bundle more efficiently than end users would do. Not so long ago, for example, electrical appliances and plugs were sold separately in Europe. Such a commercial practice was everything but user-friendly or efficient.

Marketing and distribution costs may also be reduced when various products or services are combined. In media markets, for example, economies of scope between delivery infrastructures and content allow cable operators and asymmetric digital subscriber line (ADSL) providers to bundle Internet access, pay-TV and telephony, in what is known as a triple play. The software industry provides another useful example of these types of savings (Davis, et al., 2002).

(b) Reduction in transaction costs

Tying reduces the costs of searching for the most appropriate combinations of products that satisfy a complex need. And it is a response to consumers who value the ease of use of bundled product. Today, software technologies are universally offered as an integrated, "bundled" part of the operating system (Evans, et al., 2002).

(c) Product improvement

When products are tied or bundled, the whole may be worth more than the sum of its parts. The resulting combined product offers benefits to consumers above and beyond the individual components added together. To take a simple example, today consumers enjoy breakfast cereals featuring a dizzying array of combinations of ingredients (fruits, nuts, grains), shapes (flakes, squares, doughnuts), textures and tastes. For example, Apple-Cinnamon Cheerios is simply a bundle of grains, shaped into crunchy doughnuts, and flavoring (apple and cinnamon). Arguably, this product is an improvement over the first cereal products mass-produced at the turn of the 19th century and an improvement to the consumer in terms of convenience and health benefits from assembling all the ingredients for the cereal himself. According to an econometric study, the introduction of Apple-Cinnamon Cheerios in 1990 into the U.S. market increased consumer welfare by approximately $66.8 million per year. Likewise, other studies have shown that the introduction of the minivan -a product based on assembling the components of existing products (trucks and cars)- in the mid-1980s resulted in consumer welfare gains of approximately $560 million per year.

(d) Quality assurance

Because firms bring skill, knowledge, experience and other resources to tying or product integration, allowing consumers to assemble the individual components themselves may affect the quality of the final product to the harm of both producers and consumers. When the consumer assembles the product, it may not be clear if any malfunctions are the fault of the consumer or the component suppliers. Equipment manufacturers may suffer from an undeserved reputation for poor quality. Bundling components together gives both the consumer and the producer more certainty regarding product quality.

(e) Pricing efficiencies

Cournot (1838) showed that a firm monopolizing the markets for two complementary products would charge lower prices than would two separate monopolists each selling a different product. That is, complements may be priced lower if offered by the same firm in a bundle. This is similar to the well-known "double marginalization" problem in vertical integration, where a monopoly provider of two goods at different levels of supply will maximize its profits across the two goods, while separate providers will price each good at the individual profit-maximizing price (Tirole, 1988).

In media markets, for example, in an unbundled system, a change in the price charged to subscribers for a given program service will affect not merely the demand for that service but also the demand for transmission and possibly the demand for complementary program services, making it more efficient to bundle content with delivery (Owen, et al., 1992).

6.2 The Single Monopoly Profit Theorem

The second central insight of the Chicago School is that a firm enjoying monopoly power in one market (the market for the tying good) could not increase its profits and instead could reduce them, by monopolizing the market for another good (the market for the tied good). This idea is commonly referred as the *"Single Monopoly Profit Theorem"* and in principle applies to cases where the demands for the two goods are both independent and complementary (Elhauge, 2009; Ahlborn, et al., 2004; Bork, 1978; Bowman, 1957; Director et al., 1956; Klein, 1998; Posner, 1979). This theorem does not say that monopolists will not engage in tying and bundling. Nor does it say that monopolists cannot make greater profits by tying and bundling. Rather, what it says is that monopolists cannot secure greater profit merely by leveraging their monopoly from one market to another and that they must be engaging in tying and bundling to improve quality or lower cost (i.e. improve efficiency).

According to Ahlborn, et al. (2004), the intuition behind this result is simple. We consider first the case where the demands for the two goods are independent, so that the quantity demanded by consumers of one of the goods is independent of the price of the other. In that case, tying a competitively supplied good to a monopolistically supplied good is like establishing a tax on the latter. This tax would reduce consumption of the monopoly good unless consumers like the competitively supplied (tied) good and the monopoly prices the tied good competitively, that is, unless the monopoly makes no rents from the tied market.

If the demands for the two goods were, instead, complementary and the two products were consumed with fixed ratios, a monopolist could only benefit from the tied good being competitively supplied, since all of the monopoly rents available in the two markets could be captured by a monopoly in one of them. Richard Posner (1976) illustrated this result with a simple example:

Let a purchaser of data processing be willing to pay up to $1 per unit of computation, requiring the use of one second of machine time and ten punch cards, each of which costs 1 cent to produce. The computer monopolist can rent the computer for 90 cents a second and allow the user to buy cards in the open market for 1 cent a card or, if tying is permitted, he can require the user to buy cards from him at 10 cents a card--but in that case he must reduce his machine rental charge to nothing.

Perhaps, under those same circumstances, if the monopolist faced competition from a more efficient firm in the tied market, it could do no better than abandoning the market for the tied good while, at the same time, raising the price of the monopoly good.

According to Elhauge (2009), this single monopoly profit theory indicates that a firm would use tying only if there were some efficiency to doing so. It also suggests that a buyer would accept a tie only if the discount on the tying product was at least equal to the supracompetitive premium on the tied product, so the tie could not harm buyers. Thus, where the Single Monopoly Profit theory holds, it implies that the correct legal standard should be a rule of *per se* legality.

7.

THE POST-CHICAGO SCHOOL

According to Ahlborn, et al. (2004), the contribution of the Chicago School to the tying doctrine was to illustrate the efficiencies of tying so that competition authorities would reorient their toward understanding that tying and bundling behaviour was likely to be pro-competitive as a result of reducing cost or improving quality. In the 1990s, however, the so-called Post-Chicago economic literature showed that the Single Profit Monopoly Theorem is not as robust as the *Chicagoans* suggests. According to Elhauge (2009), the model indicating a single monopoly profit depends on several key assumptions (e.g. fixed usage of the tied product, strong positive demand correlation, fixed usage of the tying product, fixed tied and tying market competitiveness). Different results are reached if one relaxes these narrow assumptions. Indeed, each relaxation of one of these assumptions produces a distinctive profit-increasing effect.

Economists associated with the Post-Chicago School, developed a series of models to try to understand the competitive implications of tying and bundling when the structure of the tied market is oligopolistic, rather than perfectly competitive. They showed that a firm enjoying monopoly power in the tying good might have an anticompetitive incentive to tie when the tied good market is imperfectly competitive if, in addition, tying keeps potential rivals out of the market for the tied product or, alternatively, helps the monopolist to preserve its market power in the tying product.

The basic mechanism that leads to the exclusion of actual and potential competitors from the tied good is "foreclosure". By tying the monopolist deprives its competitors in the tied good market of adequate scale, thereby lowering their profits below the level that would justify remaining active (or, alternatively, entering) in that market.

7.1 Exclusion and Entry Deterrence

Tying arrangements can sometimes have undesirable effects which are condemned by the courts under the antitrust laws, because of its effects on market structure when they lead to the foreclosure of competitors and in turn, they lessen competition. A primary basis for this condemnation has been the courts' belief in what is known as the "leverage theory" of tying: that is, that tying provides a mechanism whereby a firm with monopoly power in one market can use the leverage provided by this power to foreclose sales in, and thereby monopolize, a second market.

Whinston (1990) assumes that scale economies exist in the production process for the tied good, and as a result, the structure of the market is oligopolistic. We will see that tying can lead to a monopolization of the tied good market. According to Whinston (1990), the mechanism through which this exclusion occurs is foreclosure. By tying, the monopolist reduces the sales of its tied good market competitor, thereby lowering his profits below the level that would justify continued operation. The particular circumstances in which tying is a desirable strategy for the monopolist, however, depend in part on whether he is able to make a pre-commitment to tie. In many situations this is indeed possible. One of the primary ways in which this can be accomplished is through product design and the setting of production processes, both of which may involve significant sunk costs. By, bundling components of its system together or by making interfaces between the separately sold components incompatible with their rivals' components, a firm can pre-commit to its marketing strategy. Kodak, for example, was accused of designing its new film and camera in a format incompatible with rival manufacturers' products (Berkey Photo v. Eastman Kodak Co, 1979).

Concerning the welfare effects in the case of foreclosure, when tying does lead to exclusion of rivals, the welfare effects both for consumers and for aggregate efficiency are in general ambiguous. The loss for consumers arises because, when tied market rivals exit, prices may rise and the level of variety available in the market necessarily falls. More generally, though, some consumers may be made better off by the introduction of tying. The effect on aggregate welfare, on the other hand, is uncertain because of both the ambiguous effects of price discrimination and the usual inefficiencies in the number of firms entering an industry in the presence of scale economies and oligopolistic pricing (Spence, 1976; Mankiw et al., 1984).

7.1.1 Independent products

At first, we consider the case of independent products. Whinston (1990) examines a simple model with two markets A and B. Market A is monopolized by firm 1 (say, because of a patent). Market B, on the other hand, is potentially served by two firms, firm 1 and firm 2. The products of firms 1 and 2 in market B are differentiated. Production in market B involves fixed costs of Ki plus an expenditure of C_{Bi} per unit for firm i. Unit costs for good A are C_A.

Consumers, who are indexed by d ϵ (0,1) with total measure 1, each desire at most one unit of good A and one unit of good B. All consumers have a reservation value of $y > C_A$ for good A, while a consumer of type d has a valuation of $u_{Bi}(d)$ for a unit of firm i's product B. Resale of products by consumers is assumed to be prohibitively costly. In the absence of tying by firm 1, consumers simply respond to individual product prices (P_A,

P_{B1}, P_{B2}). Firm i's sales of product Bi are then given by a function $X^i(P_{B1}, P_{B2}) \leq 1$, that is products B1 and B2 compete with each other for consumer purchases.

When bundling is not permitted {"independent pricing game", according to Whinston (1990)}, firm 1 will always set $P_A = y$. We also define each firm i's best response correspondence in market B by $P_Bi^*(P_{Bj})$ which solves

Max $_{PBi}$ $(P_{Bi}-C_{Bi})\ X^i(P_{B1},P_{B2})$.

Whinston (1990) assumes that this correspondence is single-valued, continuous, and differentiable with $P_{Bi}^*(P_{Bj}) \in (0,1)$, so products B1 and B2 are strategic complements.

Now we analyze the use of tying both for cases where firm 1 can pre-commit to tie and where it cannot. An important assumption is that all consumers have an identical valuation of the monopolized product, so that the monopolist, if he chooses to price his goods independently, can fully extract all of the surplus from his monopolized good.

A. Tying without pre-commitment

For the case without pre-commitment, there is a two-stage game (Whinston, 1990). In stage one, each firm simultaneously decides whether to be active in market B. If firm i, decides to be active, it incurs the cost Ki. In stage two, the firms pick prices (simultaneously if both are active). If firm 1 is active in market B, it can offer three different items for sale: good A at a price of P_A, good B1 at a price of P_{B1}, and a bundle consisting of one unit of good A and one unit of good Bi at a price of P. If firm 2 is active, on the other hand, it can only offer good B2 at price P_{B2}. We assume that firm 1 is unable to monitor customer purchases, so as to rule out the use of requirements contracts, where a consumer agrees as a condition of buying good A not to buy good B2 and also this assumption implies that a bundle will be purchased only if $P \leq P_A + P_{B1}$.

In this case, it is always worthwhile for firm 1 to make sure that all consumers purchase product A either alone or in the bundle. Given that all consumers are consuming good A, however, if firm 1 engages in tying, then consumers choose between buying only good A or the bundle from firm 1. They do so by imputing an effective price of $(P_1 - P_A)$

((P_1 - y) if P_A > y) to the product B1 portion of the bundle, so that tying is effectively equivalent to an independent pricing strategy. In conclusion, absent pre-commitment, tying is not a useful strategy for the monopolist. Any equilibrium outcome will be equivalent to one where only independent pricing is allowed.

B. Tying with pre-commitment

To analyze the case where pre-commitment is possible there is a three-stage game (Whinston, 1990). In the first stage of the game, firm 1 commits to which of the three possible products, that is good A, good B1, and a bundle, it will be able to produce. For example, firm 1 can commit itself to a position where it will only be able to produce a bundle. The second and third stages are then identical to the no commitment game, but with firm 1 only able to offer for sale those items that it is able to produce. Thus, by setting its design and production process, firm 1 is able to commit to a tying strategy.

A pre-commitment to tying can be a profitable strategy for the monopolist because of its potential for excluding his tied market rival. This exclusionary effect arises because: tying represents a commitment to foreclose sales in the tied good market, which can drive its rival's profits below the point where remaining in the market is profitable. This strategic incentive to foreclose sales in the tied good market occurs because once the monopolist (firm1) has committed to offering only tied sales, it can only reap its profit from its monopolized product by making a significant number of sales of the tied good.

The welfare consequences of tying are unclear both or consumers and for aggregate efficiency. First, consumers can lose both because of the price effects stemming from the exclusion and also because there is less variety available in market B. The price effect, however, can potentially go either way. The reason is that the same incentive to lower the effective price of good B1 that drives firm 2 from the market is also present when firm 1 becomes a monopolist in market B. In general, though, one should expect that if the gains from monopoly in market B are large, the standard price movement should be upward, making consumers uniformly worse off. The effect on aggregate efficiency is still less certain. This is due to two different common welfare ambiguities. First, the biases associated with the free entry process imply that exclusion of firms does not necessarily reduce aggregate welfare. Second, it is known from the monopolistic bundling literature that bundling in a monopoly setting has ambiguous welfare consequences.

However, these inferences are all changed if we assume the presence of heterogeneous preferences among consumers for the monopolized good. Two basic findings emerge. First, with heterogeneous preferences for the tying good, tying no longer necessarily results in strategic foreclosure and the lowering of the monopolist's tied good rival's profits (though it still does in many circumstances). If, for example, a significant number of consumers in the tied market have low valuations of the tying good, tying will not be a successful exclusionary device. In addition, a more subtle effect may prevent a commitment to tying from lowering the tied good rival's profits. This occurs when tying substantially decreases the responsiveness of the monopolist's demand to price changes relative to the level previously prevailing in the tied good market. Second, with heterogeneous valuations, tying can now also be a profitable strategy in the absence of pre-commitment. There are two senses in which this is true. First, in a purely static sense, the monopolist may find tying to be a profitable strategy given its rival's price, as it can have important competitive effects: tied product rivals can find their sales foreclosed and continued operation unprofitable. Second, even when tying is not profitable in this static sense, it may be in a dynamic sense when the exclusion of rivals through predation is possible. In such cases, tying can be a profitable strategy for the monopolist precisely because it forecloses the sales of the monopolist's tied market rival.

7.1.2 Complementary Products

Subsequently, we consider the case of complementary products used in fixed proportions.

What holds here, is that a monopolist of one component never finds it worthwhile to tie in order to reduce the level of competition in the market for the other component. The reason lies in the fact that, with complementary products used in fixed proportions, when the monopolized product is essential for all uses of the two products, the monopolist can actually derive greater profits when its rival is in the market than when it is not because it can benefit from more competition in the non-monopolized market through sales of its monopolized product from the additional surplus that its rival's presence generates (due to product differentiation). We focus on the case of pre-commitment, because any no pre-commitment outcome is equivalent to an equilibrium of the independent pricing game.

The Basic Model

According to Whinston (1990), there are two components needed to comprise a system, A and B: a system consists of one unit of each. Firm 1 is a monopolist of component A and two different versions of component B could potentially be available, B1 and B2. Each consumer demands at most one unit of the system. A consumer of type d's valuation of a system with product Bi is $u_{A\ /Bi}(d)$. When goods A, B1 and B2 are independently, priced consumers' demand for an A /Bi system is given by a function $x'(P_A + P_{B1}, P_A + P_{B2})$.

In the case of independent products we implicitly assumed that purchase of a produced bundled unit allowed the independent use of either of the products. Though natural in the case of independent products, this assumption may not hold when products must be used together. For example, the bundling of a stereo tuner and a stereo amplifier into a stereo receiver may not allow the buyer to use just the amplifier in conjunction with another manufacturer's tuner. Thus, here we assume that production of a bundled good does not allow the user to use only part of the bundle. In this model, since component A is essential to any system, firm 1 is trivially able to exclude firm 2 by committing to produce only a bundle. Nevertheless, firm 1 never finds it worthwhile to tie in order to exclude firm 2.

If a commitment to tying causes firm 2 to be inactive, firm 1 can do no worse-and possibly better -by committing to producing only independent components. The basic idea behind this result is: If firm 2 did not exist, firm 1 could do as well as it does through bundling by setting independent prices that had component B1 priced at or below cost and component A's price set at a high level. It would simply earn all of its profits on sales of component A (consumers' purchases depend only on the sum of the prices). But, if pricing in this manner leads firm 2 to be active, this can only raise firm

1's profits since firm 1 would then sell more component A's (on which it makes profits) and fewer component B's (on which it has a negative margin). Intuitively, firm 1 is able to benefit through sales of its product A from the increase in surplus generated by firm 2's presence.

While firm 1 never gains from committing to tying here if this forces firm 2 to be inactive, firm 1 may commit to tying in order to price discriminate. For example, suppose that some set of consumers get positive benefits only out of an A /B1 system, while the remainder get positive benefits only out of an A /B2 system, and that the latter group's valuation of its desired system is much higher. Then firm 1 will want to set very high price for good A in order to extract surplus from this latter group, and a very low price for good B1 in order to get an optimal A /B1 system price for the former group.

Nevertheless, when the monopolized product is no longer essential for all uses of the non-monopolized components, tying once again emerges as a profitable exclusionary strategy. There are two cases in which tying can prove to be not only an effective exclusionary device but also a profitable one.

In one case, the presence of an inferior, competitively supplied alternative to the "monopolized" component (firm 1’s product A), say product A2, leads to results that parallel those of the independent products case. Suppose that the cost of component A2 is also C_A, but compared with the valuations for A1/B1 and A1/B2 systems, a consumer's valuation for a system that has product A2 in it rather than A1 is lower. Consider, first, the independent pricing game (which, yields an outcome identical to what occurs if firm 1 produces A and B1 only independently). In this game, firm 1 always sets $P_{A1} < y$ and makes all component A sales. When firm 1 sets $P_{A1} < y$ in this equilibrium, the inferior alternative (product A2) is irrelevant for pricing and profits. In the case where $P_{A1} = y$, however, the presence of the inferior product A2 constrains firm 1's equilibrium pricing and profits. This could mean that, firm 1 would prefer to have firm 2 out of the market (firm 1 can no longer necessarily benefit through its component A1 sales from the surplus created by the presence of firm 2). So the presence of component A2 can make competitive interaction here look very much like the independent products case considered earlier.

In the other case, the existence of a second use for the non-monopolized product - the component B- can give the monopolist an incentive to tie in order to eliminate competition in this other market. Now we suppose that there exists an alternative use for component B that does not rely on the simultaneous purchase of component A. One example of such a use is a replacement parts market for existing owners of a system who need to replace only component B. Because component A is not essential for the use of product B in that market, firm 1 is not able to benefit from firm 2's presence in this market through sales of good A. Firm 1 may now find it worthwhile to exclude firm 2, if it can, in order to monopolize this other market for product B. Furthermore, because component A is still essential for certain uses of product B, firm 1 may have the means to accomplish this end: by offering to sell component A only in a bundle with component B1, firm 1 directly forecloses firm 2's sales in the joint use market (foreclosure of these sales is complete regardless of firm 1's bundle price), which may drive firm 2's profits below the level that justifies its continued operation.

7.2 Protecting monopoly rents in the tying good market

In this section, we will see how a firm that is currently a monopolist in its primary market can use tying of a complementary product to preserve its monopoly position by deterring future entry into the primary market.

7.2.1 Preserve Monopoly Position given Entry Costs

Strategic use of tying of complementary products to preserve initial monopoly position given entry costs for the complementary good

The model, according to Carlton et al. (2002), is as follows:

We assume a two-period game in which a firm operates in both its primary market and a market for a complementary good. In the first period the firm is a monopolist in the primary market due to a patenting, but in the second period there is the potential for entry by an alternative producer. The complementary good can also be produced by both the monopolist and the alternative producer where the alternative producer can enter the complementary market in either the first or second period. There is a sunk cost for the alternative producer associated with the entry into each market, denoted E_{ap} and E_{ac} , when referring to the production of the first unit of the primary good and the first unit of the complementary good respectively. The monopolist has also entry costs for producing in each market, but we assume that these costs are small enough that he always enters both markets in the first period. We denote the sum of the monopolist's costs as E_m. The firms will compete a la Bertrand. The monopolist and the alternative producer have the same constant marginal cost for producing the primary good, c_p and the complementary good, c_c. We assume that while the primary products of the two firms are of equivalent quality, the alternative producer has a superior complementary good.

The monopolist has no incentive to tie if there is no threat of entry into the primary market in the second period. Consumers only derive a positive benefit from consuming a system of one primary unit and one complementary unit. We suppose that they are indifferent between a unit of the primary good produced by the monopolist or by the alternative producer, but they prefer the complementary good of higher quality produced by the alternative producer. If consumers are indifferent between producers concerning both primary and complementary products, there would never be entry in this model.

More precisely, we assume that a consumer derives a gross benefit from a system in which the complementary good is produced by the monopolist equal to V, while his gross benefit from a system in which the complementary good is produced by the alternative producer is $V+\Delta$. There are two cohorts of identical consumers with N_1 and N_2 consumers each group respectively and consumers in cohort 1 are in the market in period 1, while consumers in cohort 2 are in the market in period 2. There is a discount factor δ for both firms, $0<\delta<1$, where $\delta N_2 (V - c_p - c_c) > N_1\Delta/2$. This restriction ensures that the primary market monopoly is more valuable to the monopolist than the potential benefits associated with having the alternative producer offer its higher-quality complementary product.

In the beginning of the first period, the monopolist decides whether to offer a tied product or whether to offer the products individually. There is no reason for a firm to offer both tied and individual products in this model, because consumers are identical rather than heterogeneous (Adams et al., 1976). We assume that this decision is committing for both periods 1 and 2. Alternatively, the monopolist could make its product choices for period 2 at the beginning of period 2. We also suppose that if a consumer purchases a tied good consisting of one unit of the monopolist's primary good and one unit of its complementary good, then the consumer cannot add a unit of the alternative producer's complementary good to the system. In other words, we assume that if the two goods are tied, a consumer cannot undo the tie (Whinston, 1990). This means that if the monopolist offers only a tied product, then in the first period the alternative producer will not be able to sell any units of the complementary good. In contrast, in the second period the alternative producer would not be locked out of the market because it can produce both products.

In fact, according to Carlton et al. (2002), when a firm commits to bundle its products, this bundle can either be incompatible with the alternative producer's complementary good, that is consumers cannot undo the tie or compatible with the alternative producer's complementary good, that is consumers can undo the tie. In the former case, there is the added constraint that the alternative producer cannot sell complementary units in the first period even if the incremental benefits associated with the alternative producer's superior complementary product exceeds the marginal cost of production. In the latter case, the act of tying is similar to setting the price of the complementary good to zero.

In the first period, according to Carlton et al. (2002), if the monopolist decides not to bundle its products, then the alternative producer must decide whether to enter the complementary market or not. If the alternative producer decides to enter, then prices are determined by Bertrand competition. In the second period, the alternative producer decides whether to enter the primary market or not and if it did not enter the complementary market previously, whether or not to enter the complementary market. We suppose that if the alternative producer acts in both markets in the second period, it offers individual products. As in the first period, if both firms are active in the second period, then prices are determined by Bertrand competition. This is a two-stage game, where we are looking for pure-strategy subgame-perfect Nash equlibria.

We have assumed that the entry cost of the alternative producer is part of the product design or R&D cost so the alternative producer only takes its tying decision after it observes the design of the monopolist's product to see if it can incur the entry cost or not.

As we have mentioned before, in this model if two firms act at the same period, prices are determined by Bertrand competition. Sometimes Bertrand competition does not result in a unique set of prices. Let's say for example, that the monopolist produces independent products and the alternative producer has entered the complementary market in period 1. One equilibrium set of prices in period 1 is that the monopolist charges $V-c_c$ for its primary product and the alternative producer charges $\Delta+ c_c$ for its complementary product. In such an equilibrium, the alternative producer receives all the surplus associated with consumers preferring its version of the complementary product. Another set of equilibrium prices could be that the monopolist charges $V+\Delta- c_c$ for its primary product and the alternative producer charges c_c for its complementary product. In this case, the monopolist receives all the surplus associated with consumers preferring the alternative producer's version of the complementary product. In these equilibrium prices, consumers purchase the complementary good from the alternative producer as long as the monopolist charges more than c_c for its complementary product.

We assume that if the alternative producer has only entered the complementary market, then the prices that arise divide evenly across the two producers the surplus associated with consumers preferring the alternative producer's version of the complementary product (Nash, 1950). The same qualitative results would follow from any division that gave each firm a strictly positive proportion of the surplus, but the results would not follow if the surplus was either all received by the monopolist or all received by the alternative producer. In the former case, tying would not decrease the alternative producer's return to entering the complementary market in the first period and as a result tying would not affect the alternative producer's primary-market entry decision in the second period. In the latter case, if the monopolist offered individual products and the alternative producer were to enter the primary market in the second period after entering the complementary market in the first, there would be no increase in the proportion of the surplus received by the alternative producer. The result is that even if the monopolist did not tie, the alternative producer would never enter the primary market.

Analysis

Carlton et al. (2002) have assumed that the monopolist's entry costs are small enough that it always enters both markets in the first period and we focus on the alternative producer's entry decisions and the extent to which the monopolist will use tying to deter entry by the alternative producer into both the primary and the complementary markets. This strategy increases the monopolist's profitability by preserving its monopoly in the primary market in the second period.

We begin with a benchmark analysis. According to this benchmark analysis (Carlton et al., 2002) the alternative producer can never enter the primary market due to entry costs, but there is still the possibility that the monopolist will use tying to deter entry into the complementary market. However, in the absence of an entry threat into the primary market, the monopolist never ties in order to deter entry into the complementary market. The logic of this finding is closely related to Whinston's argument about tying and complementary goods where all uses of the complementary good require the primary good and he shows that the monopolist has no incentive to tie because the monopolist is actually helped when the alternative producer enters the complementary market. The monopolist can sell individual products by setting the price for the complementary good at marginal cost and the price for the primary good at the optimal bundle price minus the complementary good price. Given this, the monopolist can guarantee itself the same profits as it can by tying. If in equilibrium the alternative producer sells its complementary good, this can only help monopoly profitability, so the monopolist has no incentive to tie. That is, deterring entry into the complementary market in the first period reduces the monopolist's first-period profits.

We now consider the case where the alternative producer has the option of entering the primary market in the second period. According to Carlton et al. (2002), when the alternative producer enters both the primary and complementary markets, overall monopoly profitability is hurt and as a result the monopolist sometimes has an incentive to tie so as to deter entry into both markets by offering a tied product.

If the alternative producer has decided to enter the complementary market in the first period, then it depends on the entry cost of entering the primary market to decide whether to enter or not the primary market in the second period.

If the alternative producer has entered both markets by the beginning of the second period, sales of the primary product may be split across the two firms and as a result now, second-period monopoly profitability is below second-period monopoly profitability in the absence of any entry. Also, the alternative producer's second period profitability depends on whether it had entered the complementary market in the first period. If it had not, then the alternative producer bears that entry cost in the second period with a resulting decrease in second-period profitability.

So Carlton et al. (2002) conclude that the monopolist sometimes has an incentive to deter entry into the complementary market in the first period, where this arises not from the effect of this entry on first-period profitability but rather because of the effect on second period and overall profitability. That is, the benchmark analysis, tells us that deterring entry into the complementary market in the first period reduces the monopolist first-period profitability. However, this action reduces the alternative producer's return to operating in the primary and complementary markets in the second period, with the possible result that entry into both markets is deterred, in which case second-period and overall monopoly profitability increase. This argument sometimes results in the monopolist offering a tied product.

If the alternative producer would enter the primary market in the second period given that the monopolist offers individual products and the alternative producer had previously entered the complementary market, then the monopolist sometimes offers a tied good and in this way deters entry into both markets. In particular the monopolist does this when the alternative producer's cost of entering the complementary market falls in an intermediate range. The logic is that if this entry cost is low, the monopolist has no incentive to tie because the alternative producer would respond by entering both markets in the second period, while if this cost is high there is no incentive for the monopolist to tie because the alternative producer would never enter either market even if the monopolist offered individual products. For intermediate values, however, the alternative producer will enter both markets if the monopolist offers individual products, but never enter either market if the monopolist ties.

For tying and no entry to be preferred by the monopolist over the alternative producer entering the complementary market in the first period and the primary market in the second, it must be the case that the loss in second-period monopoly profits if the alternative producer is in both markets in the second period is bigger than the gain in the first-period monopoly profits if the alternative producer enters the complementary market in the first period.

According to Winston's analysis, an alternative producer of a complementary good faces a single cost for entry into two distinct markets: a systems market in which the monopolist's primary good is essential and a market for the complementary good by itself. The monopolist ties its primary and complementary goods, with the result that the alternative producer does not incur the entry cost and the monopolist increases its profits in the separate market for the complementary good. The difference is that in terms of this analysis, the return to tying is determined by the profitability of monopolising the systems market rather that the complementary market, that is tying preserves monopoly of the primary good.

When the monopolist has an incentive to tie? What is the effect of social welfare from a prohibition on tying?

Carlton et al. (2002) demonstrate that when the monopolist has an incentive to tie, a prohibition on tying increases social welfare. Suppose the government imposes a ban on tying and, as a result, the alternative producer enters the complementary market in period 1 and the primary market in period 2. In period 2, the alternative producer earns Δ per consumer, which is exactly his social contribution in period 2. In period 1, he earns $\Delta/2$ per consumer, which is half his social contribution in period 1, while he incurs costs E_{ap} and E_{ac}. That is, because of a positive externality associated with entry into the complementary market in the first period, the alternative producer will only enter the two markets when the societal benefits exceed the cost. Hence, banning tying is socially optimal.

What would happen if consumers preferred both the alternative producer's complementary product and its primary product?

Since the alternative producer's second-period profit associated with being active in both markets in the second period would still be lower if it had not entered the complementary market in the first period, the monopolist by tying and deterring entry into the complementary market in the first period, would still reduce the alternative producer's return to be active in both markets in the second period. As a result, Carlton et al. (2002) argued that the monopolist would sometimes use tying to deter efficient entry into both markets. Similarly, suppose consumers preferred both the alternative producer's complementary product and the monopolist's primary product. Then all the major results of the analysis would still hold as long as the consumers did not prefer the monopolist's primary product by too much.

Throughout we assume that the monopolist and the alternative producer cannot sign a long-term contract at the beginning of the first period that commits the monopolist to offer a tied product containing the monopolist's primary good and the alternative producer's complementary good and that specifies both the first-period and second-period prices the monopolist must pay for the alternative producer's product. If such a contract were feasible, then tying its own primary and complementary goods would never be equilibrium behaviour for the monopolist. The reason is that both firms can be made better off than having the monopolist tie its own primary and complementary goods and the alternative producer's second-period profits can be made sufficiently high that it has no incentive to enter the primary market in the second period. Such a contract might not be employed in a real-world setting, as it might be ruled illegal by the antitrust authorities as a way of achieving an illegal collusive outcome in which the monopolist pays the alternative producer not to entry the primary market. Also, the monopolist would not want to enter into such a contact unless the quality of the alternative producer's complementary good was exactly specified, which is not really feasible.

Finally, this analysis suggests that the use of tying to preserve a monopoly position will be most effective in industries characterized by substantial innovation where product lifetimes are short and the imitation lag is long, so that it takes a producer substantial time to copy a competitor's new-product introduction. Given this, it is high-technology industries such as computing where this argument is most important. The reason is that such industries are often characterized by frequent new-product introductions that limit product lifetimes by making old products obsolete, while at the same time the complex nature of the products can result in substantial imitation lags. As tying stops the alternative producer from earning profits from sales of complementary units before primary-market entry is possible, his return to ever entering the complementary market is lowered. Given this, suppose that product lifetimes are very long while imitation lags are short, so the alternative producer can enter the primary market soon after the monopolist initially sells his primary product and can then sell his primary product plus his superior in that case, tying has little ability to reduce the alternative producer's return to entering the complementary market, with the result that tying in order to deter entry of efficient rivals into the primary and complementary markets is rarely observed.

7.2.2 Preserve Monopoly Position given Network Externalities

Strategic use of tying of complementary products to preserve initial monopoly position when network externalities exist

The presence of network externalities for the complementary good can similarly result in the strategic use of tying to deter entry into the primary market.

Model and analysis

Carlton et al. (2002) assume that the alternative producer faces no entry costs for the complementary good and we make the following changes to the previous model. We suppose that N_{mj} is the number of consumers in cohort j who own a system consisting of one unit of the primary good and one unit of the monopolist's complementary good, where the consumer derives a gross benefit equal to $V + u(N_{m1} + N_{m2})$, $u' > 0$, while N_{aj} is the number of consumers in cohort j who own a system consisting of one unit of the primary good and one unit of the alternative producer's complementary good, where the consumer derives a gross benefit equal to $V + \Delta + u(N_{a1} + N_{a2})$. In this specification, u(.) embodies network externalities, that is the gross benefit a consumer derives from a system is positively related to the number of other consumers with a similar system. One example of a complementary good with network externalities is an applications program, such as Word, where files can be traded among users. We also assume that $N_1 = N_2 = N$ and $\delta=1$, that is cohorts are of equal size and there is no discounting.

We assume that when there are multiple equlibria for a subgame that starts with consumer purchase decisions, we rule out the equlibria that are Pareto dominated for the consumers purchasing in that period. In addition to this, in this model Bertrand competition will sometimes not result in a unique set of prices. If this happens in period 2, we assume that the prices that emerge split evenly across the two sellers the surplus associated with consumers preferring the alternative producer's version of the complementary good. Also, we now assume that
$V = u(N) - c_p - c_c > 2\Delta$.

Here the size of the second-period surplus associated with consumers preferring the alternative producer's complementary good depends on first period consumption decisions. That is, due to network externalities this surplus is larger if cohort 1 consumers purchased the alternative producer's complementary product and smaller if they purchased the monopolist's complementary product. We assume that in the first period the monopolist's product choices whether to tie or not are made before prices are chosen, however results will be unchanged, if theses choices are made at the same time prices are chosen. This means that the analysis here applies equally well to ties achieved through product design, where it is most natural to assume that tying occurs prior to pricing, as to ties achieved through contracting, where it is most natural to assume that tying and pricing decisions are made simultaneously. Another thing to notice in this model is that although the alternative producer does not face an entry cost for the complementary good, he does face an entry cost for the primary good. That means that the alternative producer cannot produce primary units in the first period but by incurring a cost E_{ap} at the beginning of the second period, he can produce primary units at a constant marginal cost of c_p in the second period.

Carlton et al. (2002) pointed out one important thing: even if the alternative producer could never enter the primary market, the monopolist has an incentive to tie in order to deter entry into the complementary market, even though the monopolist's primary product would be essential in both the first and second periods. The logic here is that if the monopolist sold individual products and set the price for the complementary good at cost, then monopoly profitability could actually be lower than when the monopolist ties. The reason is that if cohort 1 consumers purchase the alternative producer's complementary good, then, due to network externalities, the value to any particular consumer of a system composed of both of the monopolist's products would be lower that the corresponding value when the monopolist ties.

Firstly, we consider what happens if the alternative producer enters the primary market in period 2. Firstly, if cohort 1 consumers purchase complementary units from the alternative producer, then entry into the primary market in the second period hurts the monopolist's second-period and overall profitability. Secondly, if cohort 1 consumers purchase complementary units from the monopolist, then the alternative producer would not enter the primary market in the second period because such entry results in negative profits. Together these two outcomes suggest that the monopolist will sometimes deter entry into the primary market in period 2 by behaving in a manner that causes cohort 1 consumers to purchase complementary units from the monopolist, so that the alternative producer loses money in the second period if it enters the primary market. The surplus associated with the alternative producer's complementary units in the second period which is positively related to its return to entering the primary market, will be lower if cohort 1 consumers purchased complementary units from the monopolist. The monopolist could use either a real tie or a virtual tie achieved through first-period pricing. The result is that the alternative producer does not enter the primary market in the second period and this in turn increases overall monopoly profitability. The monopolist could use either a real tie or a virtual tie achieved through first-period pricing. The logic is that if the monopolist's complementary good in the first period is priced sufficiently low, then the alternative producer cannot profitably sell complementary units. However, this is not always feasible as the monopolist can not set a negative price for the complementary good.

A point that can be put into consideration in this analysis is that the monopolist can use a virtual tie through pricing to deter entry, while in the entry-cost case this strategy is not effective. The reason is the different goals the monopolist is trying to achieve through tying in the two cases. In the network externalities case, the monopolist's goal in tying is to force cohort 1 consumers to purchase the complementary good from the monopolist because this is what stops entry into the primary market in the second period. This can be achieved either by areal tie, in which case cohort 1 consumers are directly forced to purchase the complementary good from the monopolist, or by a virtual tie, in which cohort 1 consumers purchase the complementary good from the monopolist because its price is set s low. However in the entry-cost analysis, the monopolist's goal is to stop the alternative producer from entering the complementary market in the first period, as in that case this is what stops entry into the primary market in the second period. This can only be achieved by a real tie because the alternative producer will not enter the complementary market in the first period if it cannot sell any complementary units in the first period. A virtual tie will not be effective because once the alternative producer has entered the complementary market in the first period, the monopolist's incentive is not to employ a virtual tie but rather price in such a fashion that the alternative producer sells complementary units. That is, a virtual tie will not be a credible or time-consistent strategy.

Another point to consider is that tying as an exclusionary strategy does not require the monopolist to commit to tying its products prior to the first-period pricing decisions. Rather the monopolist can decide on the tie at the same time prices are chosen. According to Carlton et al. (2002), this is also related to the goal of tying in this model. Hence this analysis is consistent both with ties achieved through contacting and product design.

An important question is whether there is a return to prohibiting tying from a social welfare point of view, that is prohibiting real ties and virtual ties, the answer is ambiguous. Carlton et al. (2002) explain that if the alternative producer sells complementary units in the first period and enters the primary market in the second, there are two countervailing effects on social welfare. If the monopolist does not tie and the alternative producer sells complementary units to all cohort 1 consumers in the first period, part of the alternative producer's return to entering the primary market in the second period is capturing more of that part of the second-period surplus due to network externalities and the alternative producer's first-period sales of complementary units. But that part of the second-period surplus is not a net increase in social welfare due to the alternative producer selling complementary units. The result is that the alternative producer's return to entering the primary market can exceed the increase in social welfare associated with the alternative producer's superior complementary product, which in turn means that if the monopolist ties and stops the alternative producer from selling both products, social welfare can actually increase.

Case study of Microsoft

Microsoft tied its Internet Explorer browser to its Windows operating system and used a variety of other practices to increase the usage of its Internet Explorer browser in order to preserve its monopoly position in the market for personal computer operating systems. According to Carlton et al. (2002) the argument focused on what is called the "applications barrier to entry". This refers to the idea that it is difficult for firms to enter the operating-systems market because of the large number of applications programs that run on Windows but would not run on competing operating systems.

The Justice Department's argument was that a rival Internet Explorer browser has the potential to create competition for Windows by avoiding the applications barrier to entry. That is, programmers would have an incentive to write applications that would run on a rival browser if the rival browser were sufficiently popular. In turn, once enough such applications were written, the rival firm could develop an operating system compatible with the browser that would not be subject to the applications barrier to entry because of the applications written for the browser. The last step of the argument is that the operating systems monopolist, Microsoft, to keep this sequence of events from occurring, would have an incentive to monopolize the browser market, where the tying of its operating system with its browser would be one way of achieving this goal.

Let the primary good be the operating system and the complementary good be the browser. Assume that the alternative producer can enter the primary market in period 2 only if it sells complementary units in period 1. In other words, without selling browsers in the first period the alternative producer cannot enter the operating systems market in the second period because of the applications barrier to entry. However, if the alternative producer sells browsers in the first period, then the applications written for the browser allow the firm to enter the operating systems market in the second period without being subject to the applications barrier to entry. We also assume that a consumer can undo ties. That, in the real world, means a consumer who purchased a bundle consisting of Windows and Explorer had the ability to add Netscape's Navigator to the system. We now incorporate into the analysis a fixed cost associated with selling complementary units, which captures real-word activities such as software support, advertising etc.

In this case study the monopolist, Microsoft, uses either real or virtual tie, in order to stop the alternative producer, Netscape, from eventually entering the operating systems market and in this way, Microsoft preserves its monopoly. The impact of tying on social welfare is ambiguous as before. The reason tying can increase social welfare is that the alternative producer has a socially excessive return to entering the primary market, while for others this can decrease social welfare. In other words, Netscape's eventual entry into the operating-systems market could have decreased social welfare and Microsoft's tying to deter entry could have increased social welfare, but this is just a theoretical possibility.

Also, in this analysis, according to Carlton et al. (2002), a real tie and a virtual tie work exactly in the same way. This is because of the assumption that consumers can undo ties, which means that a real tie is identical to setting the price of the complementary good to zero.

In the actual case, Microsoft's initial behavior concerning Windows95 and Internet Explorer was to tie the two products and forbid computer manufacturers to remove Internet Explorer from their computers. Early in 1998, in the middle of the Justice Department's contempt proceedings related to that behavior, Microsoft removed the restriction on manufacturers with respect to Windows95. During this period, Internet Explorer was free for purchases of Windows95 and the result was that Microsoft's share of the Internet browser market continued to grow even after manufacturers were allowed to remove Internet Explorer from their computers. This is consistent with the idea that in industries with network externalities, real ties and virtual ties achieved through pricing can be close substitutes.

Another point in this case has to do with the network externalities associated with browsers. In the real world, the network externalities associated with browsers are primarily indirect. Each browser has its own set of interfaces that programmers use when developing content for Web sites, where this content has to conform to the browser's interface. Network externalities are present because if one browser becomes significantly more popular, then Web site developers will be inclined to focus on developing content that conforms to the more popular browser's interfaces rather that incurring the costs of developing content for multiple browsers.

7.2.3 Extend Monopoly Position

Strategic use of tying of complementary products to extend a monopoly position into a newly emerging market

How can a dominant firm use strategic tying to remain dominant in industries undergoing rapid technological change?

We first consider the entry-cost model. According to Carlton et al. (2002), in this model, the newly-emerging –market product uses the same complementary good. We have a monopolist of a primary product in period 1 and a single alternative producer that could enter the complementary market in period 2. The monopoly faces no threat of entry into its primary market and thus tying is not needed to deter entry into that market. We assume that there is a newly emerging market that is associated with the same complementary good as does the primary market. The newly emerging market does not exist in the first period but both the monopolist and the alternative producer can enter this market at the beginning of the second period at an entry cost. A new-market unit can be either used by itself or in combination with a complementary unit. Consumers are indifferent between a new-market unit produced by the monopolist and a new-market unit produced by the alternative producer, but they prefer the alternative producer's complementary good for their new-market systems. We assume that $N_1 = N_2 = N$ and $\delta=1$, that is cohorts are of equal size and there is no discounting.

If the alternative producer could never enter the newly emerging market, the monopolist could have no incentive to deter entry into the complementary market by tying, as the monopolist earns higher profits when the alternative producer enters the complementary market. That is, since the monopolist is able to capture some of the surplus associated with consumers preferring the alternative producer's complementary product, the monopolist's profitability rises when the alternative producer enters the complementary market.

We now consider what happens when the alternative producer has the option of entering the newly emerging market in the second period. If the alternative producer enters the complementary market in the first period and the entry cost is sufficiently small, then only the alternative producer will enter the newly emerging market in the second period. The reason is that the alternative producer will necessarily enter the newly emerging market given that it has a superior complementary product, while because the monopolist's complementary product is inferior, it does not enter the newly emerging market if it expects the alternative producer to enter. If the alternative producer never enters the complementary market and the entry cost for the newly emerging market is sufficiently small, then only the monopolist enters the newly emerging market in the second period.

As far as the monopolist's choice of whether or not to tie its primary and complementary products is concerned, we have to take into account the results above. In particular, if the monopolist offers individual products and as a result the alternative producer enters the complementary market in the first period, then the alternative producer monopolizes the newly emerging market in the second period. But suppose the monopolist ties its primary and complementary goods. Then the alternative producer has no incentive to enter the complementary market in the first period and its return for being active in the complementary market in the second period is lower. The reason is that it now bears the complementary market entry cost if it is active in the complementary market in the second period and also, it cannot sell any complementary units in the second period for use in primary-market systems. The result is that the alternative producer never enters either the newly emerging or complementary market and this allows the monopolist to extend its monopoly position into the newly emerging market.

The implications of tying on social welfare in this case are ambiguous as well. If the monopolist offers individual products and the alternative producer enters the complementary market in the first period, then the alternative producer monopolizes the newly emerging market in the second period. Sometimes the alternative producer would enter the complementary market in the first period even when the entry cost is so high that entry reduces social welfare.

Now we have the situation where the newly-emerging-market product is subject to network externalities and it is superior to a primary-complementary-good system. According to Carlton et al. (2002), in this model, we assume that in the first period there is a primary market that is monopolized and a complementary market characterized by network externalities. The monopolist faces no threat of entry into its primary market, so tying is not needed to deter entry into that market. At the beginning of the second period each firm can invest an entry cost and acquire the ability to produce a new-market product, where a producer's new-market product is a perfect substitute for a system consisting of a primary unit and a unit of the producer's complementary good. Because of network externalities and this perfect substitutability, a consumer's gross benefit from a producer's new-market product in the second period is positively related to the number of consumers in the second period who purchase new-market products built by the same producer who built the system's complementary good.

Cohort 2 consumers prefer new-market products produced by the first- period seller of complementary units and if all cohort 1 consumers purchased complementary units from the monopolist and entry cost is sufficiently small, then the monopolist invests whether or not it expects the alternative producer to invest. Further, because the alternative producer's new-market product is inferior in this case, the alternative producer will not invest if it expects the monopolist to invest. So only the monopolist invests in the second period. Similarly, if all cohort 1 consumers purchase the alternative producer's complementary product and entry cost is sufficiently small, then in the second period only the alternative producer invests and all cohort 2 consumers purchase only the alternative producer's new-market product. As for whether tying is an efficient strategy for the monopolist to extend its monopoly position, if the entry cost is sufficiently small, then in the first period the monopolist ties in order to stop the alternative producer from selling complementary goods and the firm establishes a monopoly position in the newly emerging market in the second period. The main result, according to Carlton et al. (2002), is that by tying its primary and complementary products, the initial monopolist can sometimes establish a monopoly position in the newly emerging market in the second period and thus retain its monopoly profits in the second period even after its primary product becomes obsolete (Levinthal et al., 1989; Waldman, 1993, 1996; Choi, 1994).

The tie here can take the form of either a real tie or a virtual one achieved through pricing. In this case, if the alternative producer sells complementary units in the first period, then it monopolizes the newly emerging market in the second period and this, results in a decrease in overall monopoly profitability. In order to stop this, in the first period the monopolist uses tying to ensure that cohort 1 consumers purchase complementary units from the monopolist and in turn the firm monopolizes the newly emerging market in the second period. Social welfare in this case is definitely increased by a prohibition on tying.

8.

TYING LAW

Implications for Tying Law Antitrust Issues – Economic Analysis

For a long period of time, competition laws on both sides of the Atlantic have failed to recognize that tying involves costs *and* benefits. They have taken a hostile approach towards tying under the assumption that "tying agreements serve hardly any purpose beyond the suppression of competition (Standard Oil Co. of California et al. v. United States, 1949).

Illegal tying is one of the most common antitrust claims. We will see the approach to tying on both sides of the Atlantic, U.S. and E.C. tying law and consider their recent evolution. According to Ahlborn et al. (2004), there is a close proximity of the analytical framework between U.S. and E.C. tying law. The European Commission and the European Court have dealt with tying in a very small number of cases, none of which is particularly recent, so at first we will take a closer look at the U.S. Law.

8.1 Analysis of tying under U.S. Law

According to Ahlborn et al. (2004), the assessment of tying arrangements under U.S. antitrust law has undergone significant changes over time. We can distinguish at least three different approaches.

First, the early period of **the per se approach**: early cases reflect a strong hostility toward tying arrangements. Northern Pacific Railway v. United States (1958) is a good example of the early approach. The railroad was the owner of millions of acres of land in several North-western States and territories. In its sales and lease agreements regarding this land, Northern Pacific had inserted "preferential routing" clauses. These clauses obliged purchasers or lessees to use Northern Pacific for the transportation of goods produced or manufactured on the land, provided that Northern Pacific rates were equal to those of competing carriers. The Supreme Court took the view that Northern Pacific had significant market power. According to the Court, not only was its land strategically located and within short distance but the existence of this host of tying arrangements was itself compelling evidence of Northern Pacific's great power. No other explanation has been offered for the existence of these restraints. It concluded that the preferential routing clauses amounted to illegal tying. According to Simowitz, et al. (2010), one of the defining characteristics of a *per se* offense, is that market power need not be proven.

The basic requirements that must be met in order for tying to be per se illegal are as follows: In the first place, in order to have a tying arrangement, according to Ahlborn et al. (2004), there must be two separate products or services that the seller can tie together. Any tying arrangement by a seller with significant market power in the market for the tying product was per se illegal provided the effects of the arrangements in the market of the tied product exceeded a certain minimum threshold - "a 'not insubstantial' level of commerce", no matter what the circumstances of a given case were.

Exceptional justifications and defenses: U.S. courts have, in certain cases, accepted justifications for tying arrangements that would otherwise be caught by the prohibition. During the development period of a new industry, a tying arrangement was held to be justified for a limited period given that selling an integrated system would help in assuring the effective functioning of advanced equipment (Jerrold Electronics Corp. et al. v. United States, 1961).

Second, **the modified per se illegality approach**: With the United States Supreme Court's decision in Jefferson Parish in 1984, however, the United States law on tying adopted a modified per se illegality rule that recognizes the welfare enhancing effects of tying (Jefferson Parish Hosp. Dist. No. 2 v. Hyde, 466 U.S. 2, 1984). Jefferson Parish moved to an approach in which the criteria for tying are used as proxies for competitive harm and, arguably, efficiencies. According to Hovenkamp, (2011), the tying seller may have no market power to exploit. In Jefferson Parish, the tying seller was a hospital facing substantial competition and thus was probably unable to charge patients (or their sophisticated insurers) supracompetitive prices. A 30% market share led the Court to conclude that the defendant did not have the requisite market power. That is how the hospital escaped per se illegality.

Also, the separate-product test was used as a proxy for competitive harm (on the basis that tying arrangements do not foreclose manufacturers of tied products if there is no consumer demand for the stand-alone tied products in the first place) and for the net welfare effect of a tying arrangement as well. If the separate-product test is not satisfied (i.e. there is no separate demand for the "tied" product), then this leads to the conclusion that (1) there is no competitive harm, given that there is no separate market for tied products that could be foreclosed, and (2) tying is welfare enhancing (otherwise consumers would request products separately).

The modified per se approach raised the standard for establishing illegal tying and reduced the risk of false positives. Nevertheless, it remained fundamentally a per se approach. It did not assess the impact of the individual tying arrangements in the circumstances of a given case. Moreover, it assumed that on average the competitive harm of tying arrangements is greater than their efficiency gains, at least where the criteria for tying were satisfied.

According to Evans, et al. (2005), as a matter of theoretical and empirical economics, the modified per se test is not capable of identifying anticompetitive tying except by happenstance. The single-product test, which examines whether the tying and tied good are part of a "single product," is not a reliable proxy for examining whether there are efficiencies or not. Although there may be a demand for the tied product separately (e.g., shoe laces), it may be inefficient to provide the tying product (e.g., shoes) separately (Areeda observed the logical inconsistency in the single product test, 1745). Thus, the efficient offering may be the bundle, which is the subject of legal concern, and the tied product. The coercion prong of the modified per se test is flawed as well. The decision not to offer a particular product configuration is routine, so there is no basis for presuming that coercion is a source of anticompetitive harm.

Third, **the rule of reason approach:** Microsoft III introduced a rule of reason approach towards tying, recognizing that, at least in certain circumstances, even the modified per se approach would lead to an overly restrictive policy toward tying arrangements. The plaintiffs alleged that Microsoft had violated U.S. antitrust law by contractually and technologically bundling the Internet Explorer with its Windows operating system (United States v. Microsoft Corp., 1999). In its 2001 decision in Microsoft III, the D.C. Circuit Court of Appeals, to take the efficiency effects of tying into account, adopted a rule of reason approach to the analysis of tying cases with respect to computer software platforms (United States v. Microsoft Corp., 2001). U.S. antitrust policy towards tying had a long journey from the hostile approach of the early per se rule to a modified per se rule willing to consider the possibility of tying efficiencies.

8.2 Analysis of tying under E.C. Law

According to Ahlborn et al. (2004): EU has used different policy instruments to deal with tying, the dominance provision under article 82 (Treaty Establishing the European Community, 1997). The Commission has issued three negative decisions concerning tying:

- Napier Brown v. British Sugar, Commission Decision 1988.
- Eurofix-Bauco v. Hilti, Commission Decision 1988.
- Tetra Pak II, Commission Decision 1992.

All three involved contractual tying, two of which deal with the tying of consumables to the primary product (Eurofix-Bauco/Hilti, Tetra Pak II). In addition, the Commission has dealt with a number of tying cases in which the company under investigation abandoned the alleged tying behavior and no formal decision was taken. Of particular interest is the IBM case, which raised the issue of product integration (or technological tying).

Nothing suggests that the position of the European Commission and the European Courts has become less hostile over the years.

E.C. competition law uses almost the same analytical framework for tying as U.S. antitrust policy. This however does not mean that the E.C. approach toward tying is the same as the U.S. approach. The same overall framework may lead to different policies depending on the interpretation of the various elements:

Market power

Article 82 of the E.C. Treaty is applicable only to the extent that the Commission is able to establish dominance in a particular market. Not surprisingly, in all tying cases, dominance in the market for the tying product has been a prerequisite for a finding of abusive tying: Tetra Pak was held to have abused its dominant position in the market of machines for packaging by tying the sales of cartons to the sales of their machines, British Sugar had abused its dominant position in the sugar market by tying distribution services to its sales of sugar.

It is worth noting, however, that in certain cases, the Commission has defined the market so narrowly that a finding of dominance was inevitable. Furthermore, the Commission made clear that a finding of dominance in a market for consumables was not necessarily dependent on a finding of dominance in the primary market.

Tying

Faull et al. (1999) stated that tying has been defined by the Commission as (a) bundling two (or more) distinct products and (b) forcing the customers to buy the product as a bundle without giving them the choice to buy the products individually.

The question of whether two products are separate is generally assessed on the basis of "commercial usage" (Treaty Establishing the European Community, 1997 O.J. (C 340) 173, at article 82(2)(d)). The Commission and the Court discussed the concept of "commercial usage" in detail in the Tetra Pak 11 case. Tetra Pak had argued that the tying of machines and cartons did not contravene article 82 on the basis that the products were connected by commercial usage. In support, Tetra Pak cited its competitor Elopak, which had stated that the combined sale of machine and cartons was a more efficient way of competing. Both the Commission and the Court held that the products were not linked by commercial usage. The Court based its view on the fact that there were independent manufacturers who specialized in the manufacture of non-aseptic cartons designed for use in machines manufactured by other concerns and who do not manufacture machinery themselves.

The Court then continued: Even if such a commercial usage were shown to exist, it would not be sufficient to justify recourse to a system of tied sales by an undertaking in a dominant position. Even usage that is acceptable in a normal situation, on a competitive market, cannot be accepted in the case of a market where competition is already restricted.

According to Ahlborn, et al. (2004), two important points stem from the Court's assessment in Tetra Pak II. First, the Court seems to define commercial usage rather narrowly: to establish commercial usage, it is not sufficient to show that tied sales are the predominant business practice in the markets in question (or comparable markets). As long as some untied sales occur in the relevant markets (in the *Tetra Pak II* case, 12%), the criterion of commercial usage is not satisfied. Second, contrary to the express wording in article 82(d), the Court does not regard absence of commercial usage as a prerequisite for tying. Rather, commercial usage seems to be treated similarly to "objective justifications", which may or may not take tying beyond the scope of article 82.

Anticompetitive effects

It is not clear to what extent it has to be demonstrated under EC law that tying leads to anticompetitive effects in any particular way.

Objective justifications

In principle, dominant firms accused of abusive tying may raise the defense of objective justifications. In practice, however, there is so far no example of a successful defense. Here, the small number of EC tying cases makes it very difficult to determine whether the threshold of an objective justification is particularly high or whether in the few cases under consideration the justification raised by the dominant firms were just not supported by facts.

8.3 The Rule of Reason

According to Evans, et al. (2003), the recent literature on the economics of tying has drawn three main conclusions. First, tying is a common business practice that is most often efficient. Second, tying may cause anticompetitive effects, but only under restricted circumstances that are hard to verify in practice. Third, given that tying may give rise to both pro-competitive and anticompetitive effects, no per se rule is conceptually appropriate for the antitrust assessment of tying. Economic theory supports a rule-of-reason approach to tying in which the potential anticompetitive effects and efficiency benefits of tying are carefully balanced given the facts of the case. Theory and evidence, as Nalebuff et al. (2003) showed, conclude in favour of a rule-of-reason approach to the analysis of tying by firms with market power.

It is very important to discriminate factual evidence and theoretical speculation, because a Rule-of-Reason approach to tying which does not make this discrimination is not a reasonable test. Even more, it would cause the same kind of harm as a *per se* illegality rule and many socially beneficial ties would be prohibited.

Implementing a Rule of Reason approach

According to Evans, et al. (2003), there are two alternative ways of implementing a rule-of-reason standard in tying cases: a **balancing test** and a structured test. The former is a simple cost-benefit test, where the social costs and benefits of the defendant's tying practices are balanced in one step. However, this is an extremely complex practice.

The **structured rule-of-reason test** involves three stages. The first two stages screen out ties that could not be anticompetitive given the facts of the case. At first, Ahlborn, et al. (2004); Evans, et al. (2003), presented a set of criteria that are necessary for the anticompetitive effects of a tying arrangement to be possible, which have to do with market circumstances (such as market power for the tying firm, status of competition in the tied market, commitment to tie, competitor's ability to match the tie, entry barriers) and which are not empirically demanding.

The second screen considers if an anticompetitive effect is plausible, that is whether tying is likely to have such an effect. This can only be answered by positing a "theory" concerning how the tying arrangement will lead to anticompetitive effects and determining whether that "theory" applies to the factual circumstances at hand. An appropriate framework would be Carlton-Waldman model (2002). This screen is empirically demanding, but one must confront the theory with the facts.

Assuming that the case survived the first two screens, the defendant would need to be subjected to a third screen to determine whether there are efficiency benefits that offset the anticompetitive effects. According to Ahlborn, et al. (2004); Evans, et al. (2003), this final screen requires determining whether the tie generates efficiencies (as most ties do) that can only be achieved through a tie, and whether these efficiencies are greater than the anticompetitive effects of the tie.

In deciding which is the correct test for the competitive assessment of tying, we compare the relative strengths and weaknesses of these two tests and conclude in favour of the structured rule-of-reason approach, as it reduces the likelihood of costly mistakes. The structured rule-of-reason test dismisses cases when the market structure insures that whatever anticompetitive effects could arise are smaller than the imprecision of the models we might use to detect them.

9.

CONCLUSIONS

This dissertation is an attempt to look into the strategic use of tying by firms and its effects on completion. The purpose of this paper is to investigate the effects of tying arrangements under certain circumstances, concerning market conditions and market structure, the market power of the firm which ties, the demand correlation of goods, that is whether the goods are independent or complementary, the existence of pre-commitment on tying strategy. I examined how the effects of tying arrangements on competitors and consumers are differentiated in each case, based on famous models which illustrate each situation and pointed out how the practice of tying is treated by courts.

With this paper I tried to review the literature on the economics of tying and present the evolution of theories that try to explain tie-in sales over the decades. I made a careful examination of the theories of Chicago and Post-Chicago School and presented the standpoint of each, as far as the competitive implications of tying and bundling are concerned. Economists in both Schools developed a series of theories and models trying to support their views. On the one hand, *Chicagoans* claimed that tying arrangements could be socially beneficial at no competition cost and they supported the Single Monopoly Profit Theorem which unsettled the incentive of leveraging monopoly power. In short, they suggested that tying causes no harm, so it should be treated as *per se* legal. On the other hand, economists associated with the Post-Chicago School showed that tied-in sales can lead to anticompetitive effects, such as entry-deterrence or even foreclosure of competitors and/or extension of monopoly power, which change the market structure and lessen competition and in this case, they are condemned by courts.

In the last part of this thesis, I investigated what the literature has to provide on the tying law and antitrust issues both in US and EU and which is the best way for courts to treat tying cases. The evolution of the assessment of tying arrangements under antitrust law is presented starting from the *per se illegal* approach and ending up with the *Rule-of-Reason* approach. It is apparent that tying typically involves both costs and benefits. The courts have to weigh any potential efficiencies from the tie and any possible losses, which is challenging due to the difficulty of measuring both the relevant efficiencies and the relevant losses. Economic theory does not yet provide unambiguous answers about how to distinguish pro-competitive from anticompetitive tying and which is the appropriate treatment of individual cases. Trying to turn the theoretical possibility for harm into a prescriptive theory of antitrust enforcement is a difficult task. The consensus among economists is that no per se rule is conceptually appropriate for the antitrust assessment of tying. Theory and evidence conclude in favour of a *Rule-of-Reason* approach to the analysis of tying.

In conclusion, the main inferences in this thesis are: The pervasiveness of tying in the economy shows that it is generally beneficial; otherwise it could not survive in competitive markets. The economics literature is clear that tying often improves economic efficiency. Of course tying may also be used for anticompetitive purposes, but only under restricted circumstances that are hard to verify in practice. Thus, given that tying may give rise to both efficiency benefits and anticompetitive effects, one must conduct a detailed investigation of the facts of the case at hand to conclude whether tying is indeed harmful or beneficial. Such investigation is best conducted under a *Rule-of-Reason* standard where both the potential pro-competitive and anticompetitive effects of tying are rigorously balanced in light of the appropriate factual evidence.

References

Adams, W., and Yellen, J. (1976). “Commodity Bundling and the Burden of Monopoly”. Quarterly Journal of Economics, 90, 475-498.

Ahlborn, H., Evans, D., and Padilla, J. (2004). The Antitrust Bulletin, The antitrust economics of tying: a farewell to per se illegality.

Ardiyok, S. (2008). “Tying as Price Discrimination in Antitrust law”. Bilken University The Law School; ACTECON Competition and Regulation Consultancy.

Bork, R. (1978). The Antitrust Paradox 372-375, 380-381.

Bowman, W. (1957). “Tying Arrangements and the Leverage Problem”. 67 Yale L. Journal 19, 20–23.

Bridger, M., and Vogelsang, I. (1991). Telecommunications Pricing: Theory and Practice 109.

Carbajo, J., D. De Meza, and D. J. Seidman. (1990). “A Strategic Motivation for Commodity Bundling”. Journal of Industrial Economics 38, 283–298.

Carlton, D., and Waldman, M. (2002). “The strategic use of tying to preserve and create market power in evolving industries”. RAND Journal of Economics 33, 194-220.

Chen, Y. (1997). “Equilibrium Product Bundling”. Journal of Business, 70, 85-103.

Cournot, A. (1838). Recherches sur les principes mathématiques de la théorie des richesses. English ed.Bacon, N. (Ed.), Researches into the Mathematical Principles of the Theory of Wealth, MacMillan, New York, 1897.

Davis, S., Murphy, K., and MacCrisken, J. (2002). “Economic Perspectives on Software Design: PC Operating Systems and Platforms, in Microsoft". Antitrust and the New Economy 361 (David S. Evans ed., 2002).

Director, A., and Levi, E. (1956). “Law and the Future: Trade Regulation”. 51 Nw. U. L. Rev. 281, 290-92.

Elhauge, E. (2009). “Tying, Bundled Discounts and the Death of the Single Monopoly Profit Theorem”. 123 Harvard Law Review, Harvard Law and Economics Discussion 629.

Evans, D., Padilla, J., and Polo, M. (2002). “Tying in Platform Software: Reasons for a Rule of Reason Standard in European Competition Law”. World Competition 25, 509.

Evans, D., Padilla, J., and Salinger, M. (2003). “A pragmatic approach to identifying and analyzing legitimate tying cases”. Forthcoming in European Competition Law Annual 2003: What is an Abuse of a Dominant Position? Hart Publishing, Oxford.

Evans, D., and Salinger, M. (2005). “Why Do Firms Bundle and Tie?”. Evidence from Competitive Markets and Implications for Tying Law. Yale Journal On Regulation 22, 37.

Faull, J., and Nikpay, A. (1999). The EC Law of Competition 166-67.

Hovenkamp, E., and Hovenkamp, H. J. (2009). “Tying, Price Discrimination and Antitrust Policy”, University of Iowa.

Hovenkamp, H. J. (2011). “Tying and the Rule of Reason”, University of Iowa – College of Law.

Klein, B. (1998). “Tying”, 3 The New Palgrave Dictionary of Economics and the Law 630, 630-631.

Larson, A. (1994). “Antitrust Tie-in Analysis after Kodak: A Comment”. Antitrust Law Journal 63, 239- 240.

Mathewson, F., and Winter, R. (1997). “Tying as a Response to Demand Uncertainty”. RAND Journal of Economics 28, 566-567.

McAfee, R. P., J. McMillan, and M. Whinston. (1989). “Multiproduct Monopoly Commodity Bundling and Correlation of Values”. Quarterly Journal of Economics 104, 371-384.

Nalebuff, B. (2003). “Bundling, Tying and Portfolio Effects”. Yale University, DTI Economics Paper No.1, Part 1- Conceptual issues.

Nalebuff, B., and Majerus, D. (2003). “Bundling, Tying and Portfolio Effects”. DTI Economics Paper No. 1, Part 2 – Case Studies.

Owen, B., and Waldman, S. (1992). Video Economics 219.

Posner, R. (1976a). Antitrust Law: An Economic Perspective.

Posner, R. (1979b). “The Chicago School of Antitrust Analysis”. 127 U. PA. L. REV. 925, 926.

Posner, R. (2001c). Antitrust Law, 292-3 (2d ed. 2001).

Posner, R. (2005c). “Vertical Restraints and Antitrust Policy”. 72 Univ. Chi. L. Rev. 229, 236.

Schmalensee, R. (1982). “Commodity Bundling by Single-Product Monopolies”. Journal of Law & Economics 25, 67.

Shepherd, W., and Shepherd, J. (2004). The Economics of Industrial Organization 205, 5th ed.

Stigler, G. J. (1968). “A Note on Block Booking,” in The Organization of Industry by G. J.

Stigler, ed., Homewood, IL: Richard D. Irwin, 165-170.

Stigler, G. J. (1963). United States v. Loew’s Inc.: A Note on Block-Booking, SUP.CT.REV.152.

Tirole, J. (1988a). The Theory of Industrial Organization, 333-35.

Tirole, J. (1998b). The Theory of Industrial Organization 147.

Whinston, M. (1990). “Tying, Foreclosure and Exclusion”. The American Economic Review 80, 837-859.

Whinston, M. (1989). “Tying, Foreclosure and Exclusion”. Northwestern University – Departement of Economics; National Bureau of Economic Research.