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Economic platforms: what they are, how they work and why they matter

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Abstract This essay investigates economic platforms, a subject that has received much attention in recent years. Platforms are firms or organizations which connect two parts, usually a seller and a buyer. Users sign up and pay for the service offered by the platform not because the platform itself is valuable but because of the information and connections it provides. Several theories about platform optimality and structure are presented along with a small survey of the importance of economic platforms in the current economy as well as case studies on the different markets in which economic platforms operate.

Keywords: information, economic platforms, industrial organization

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1 Introduction

What is the similarity between a credit card, an online dating site and a Sony Playstation? They are all economic platforms that try to connect different clients, usually a seller and a buyer, via the platform. At a first glance, a platform might seem to be very similar to a normal grocer or store. Indeed, supermarkets exist in order to connect a farmer and a hungry consumer. However, an economic platform differs in the way the transaction is carried out. Whereas a normal store buys from one part and sells to the other, a platform rather tries to connect the buyers and sellers so that they can make a deal themselves and at the same time earn money on the connection. Unlike most stores, the platform seldom owns the good before it passes it along to the buyer. Instead they use, sometimes complex, methods of connecting the two parts and raise revenue from one or both of the two sides. Most platforms, and every platform discussed in this essay, are two-sided. The two-sidedness refers to them being a platform between two different sides, not more. While some research has been done on multisided platforms, these are beyond the scope of this essay.

The literature on platform theory has grown rapidly during the last ten years. Likewise, the number of platforms has grown, since many of them rely on advances in information technology, especially those related to the Internet. Hence, there has been a large need to investigate the theoretical underpinnings of platforms and in which ways they convey information. Although, for example, credit cards have existed for quite some time, there has been a very large increase in both the amount of individuals who have at least one credit card and the number of stores which accept some form of credit cards. Other forms of platforms that will be investigated have a much shorter history.

Far from all business ventures on the Internet are platforms, indeed many are normal stores that relies on other advantages in order to compete. For example the large bookstore Amazon.com (or the similar Swedish site Adlibris.com) is a normal bookstore except that the lack of a physical store gives them the opportunity to have large amounts of different titles while keeping labor costs to a minimum. However, the Internet has lowered the cost related to information gathering and distribution, which has made it easier for platforms to appear and also to reach a larger group of people and organizations on both sides.

Following the example of Hagiu (2007), this essay will use the term platforms for any two-sided platform and the word merchant for a more traditional store or grocer such as Amazon.com mentioned above. This is only to avoid confusion, not to say that platforms do not perform a service similar to that of a merchant.

This essay intends to provide an overview of platform theory and how important economic

platforms are in the current global economy. In section 2, a discussion of the different definitions of platforms will be given along with an example of a model that shows when platforms are superior to a more traditional way of doing business. In section 3, there will be a discussion about the different theories of optimal platform pricing and how they differ from textbook models of ordinary markets. As will be shown, the optimal platform price is dependent on the assumptions made about the market structure and therefore a number of different cases will be presented. In section 4 an empirical investigation of currently active platforms will be undertaken. This will include both listing large and fast growing platforms and a series of small case studies to show how different the areas that platforms are involved in can be. Section 5 concludes the essay and list a number of questions that remain unanswered by both this essay and previous research.

2 Platform definitions and usage

Given that this essay is about economic platforms, it seems highly appropriate to make a more formal definition of what a platform is and when they are superior compared to more traditional ways of doing business. The problem however is that there is no single correct definition of what constitutes a platform. In this section there will be a discussion of what constitutes a platform. This will be based on what previous research have shown and there will also be an introduction to a model when a platform is a favorable way of doing business.

2.1 What is a platform?

One piece of the puzzle comes from Hagiu (2007) who defines a merchant as an economic business that owns the good it passes along in a value chain. A good example of this is most stores or grocers who, for example, buys a liter of milk from a farmer, owns the milk and then sells it to a consumer. The important aspect here is the ownership of the good, the merchant has complete control of the good and makes all decisions over prices, marketing, and whom to sell to. A platform does not have this complete ownership over the goods. The most extreme version of this lack of control is of course a dating site, where that platform (the dating site) in no way owns or have the slightest influence over the men and women using the site. The platform only distribute information and leaves the "deal making" entirely up to the individuals.

Rochet and Tirole (2006) also note the lack of a formal definition of platforms and describe older charactizations as "I know a platform when I see one". They instead propose that a platform is defined such as that the volume of transactions is determined not only

by the fees that the platform charges, but also by the structure that it imposes on the market. Both the fees that the platform charges and the structure of its design affect how many users/consumers it will receive on both ends, and the number of users/consumers on one side affects the number on the other side. Ordinary markets on the other hand have a simpler, and given, structure and only the fees affect the amount of trade.

Roson (2005) instead defines a platform much more loosely, saying that a market is two sided if the participation of one group raises the benefits for the other group if they also participate.

A platform shares many similarities with products that exhibit network externalities. A product with network externalities is a product where the utility of consumption is affected by how many others also use the product (Katz and Shapiro, 1985, 1986). A classic example is the operating system for a computer. A system with many users, like Microsofts Windows, has benefits for all user since this leads to more software being developed for this system. Hence a consumer will tend to buy a system with many users, leading to a snowball effect and elimination competition. In computer systems, Microsoft Windows controls around 90% of the market with the remaning 10% captured by Apple's OSX and different versions of LINUX and UNIX such as Unbuntu. Using this knowledge of the effects of network externalities, one could describe a platform as a firm or a organization that exhibits network externalities. However, this defintion might be too wide since it does not take the two-sidedness into account. A product with network externalities simply increases the utility of its users when more people use it. Hence it does not say much about the importance of a connection between the different sides or the price structure. As an example, a computer operating system is useful even if only one person uses it. It still allows control over the computer's hardware and so on. A credit card which is connected to neither banks nor consumer/merchants is completly useless.

Another way of describing the problems for a platform or a product with networking externalities is an analogy to the famous chicken-and-egg problem. In order to attract users on one side of the platform, the platform must have users on the other side (Caillaud and Jullien, 2003). An increase on one side will cause an increase on the other side, but where should the platform start? As will be shown below, this problem might cause to the platform charging very low (or even zero) fees for one side which is more elastic. When the platform receives a large amount of more elastic users, the other side will follow along[1].

[1]An interesting version of this method comes from night clubs in several countries. They have observed that a large amount of females attract a large group of males, whereas the opposite is not true. Hence, many night clubs forbid groups of males to enter, unless they are accompanied with a equal group of females. In Sweden this is illegal, however the practice probably occurs anyway.

A further interesting point about platforms is that the standard pricing neutrality often do not apply and neither does the Coase theorem. In a standard microeconomics textbook (e.g. Varian (2006)) it is proven that it does not matter on which side a tax is introduced. The incidence of the tax will be distributed according to the elasticities and is not dependent upon who in practice must pay the tax. This is not the case with platforms. Given that the price structure of the platforms affects participation, then it will be impossible for the platform, or any of the parts using the platform, to pass costs along. Given that different sides of the platforms have different elasticities, imposing a tax on one side leads to less users which further gives less users on the other side. Depending on these elasticities, as will be shown below, prices can be much higher on one side than the other and therefore the platform must be careful when allocating the tax. Another example why this might not be possible is transaction costs. An Internet site that would want to charge those who visit the site and therefore not only raise revenue from the advertisement will have a hard time charging the visitors. Given that the site probably has a very large number of visitors and that the price charged would have to be low, it would be very hard to get low enough transaction costs to make it viable. Hence, there are no Internet sites that charge fees just for visiting (Rochet and Tirole, 2006).

Under many circumstances a market economy is able to unify and distribute information better then any other system available. This point was delivered in a seminal article by Hayek (1945) but is stated as early as Smith (1776). However, the existence of externalities, some argue, might lead to a sub-optimal equilibrium. A common example for this is a firm which does not pay for the pollution it produces and from which a community suffers. However, this is where the Coase theorem comes in. The Coase theorem states that when property rights are clearly defined, transaction costs are low or non-existent and all parts have perfect information, then bargaining will lead to a Pareto-optimal outcome even in the case of externalities (Coase, 1960). A common reason for the failure of the Coase theorem is the lack of perfect information which occurs when one part knows more than the other, i.e. asymmetric information, and has reasons not to share this information. The classic example is the markets for used cars, where the seller does not want to share information about the car's true quality. This lack of information might not only lead to less trade being performed, in the most extreme case the use of backwards induction leads to no trade being performed at all (Akerlof, 1970). Hence, just because the Coase theorem fails does not mean that the market is two-sided; the market for used cars is an ordinary market except that there is asymmetric information. However, in two-sided markets the Coase theorem very

rarely holds. If it was the case that the Coase theorem held, then the two parts would be able to negotiate an efficient outcome without the use of a platform. The economic platform can therefore be viewed as a firm that solves this problem and at the same time makes a profit.

It is thus possible to relate the literature on economic platforms to the literature on institutions and transactions costs. The subject of economic institutions has received a large amount of attention in recent years. Nobel prize winner Douglass C. North famously describes institutions as "the humanly devised constraints that structure human interaction". They can be either formal i.e. sanctioned by the state, or informal as in that they are sanctioned by some other collective. The existence of good institutions is vital in order for a market economy to thrive. When private property rights are not sanctioned by the state and not accepted by the public, trade becomes almost impossible which gives little room for growth (Olson, 1996). Well-defined institutions on the other hand might solve problems with externalities and the tragedy of the commons (Ostrom et al., 1992; Ostrom, 2000). Economic platforms are similar to institutions in the way that they seek to solve problems of transaction costs and information problems. Pénard (2008) discusses the guilds and their design during the medieval age. The guilds tried to uphold contracts and property rights in the presence of a weak or predatory state. Especially foreign citizens often had very weak support by the government and were therefore easy targets for bandits and thugs. But guilds that where able to threaten with a boycott against a particular city or ruler had enough influence to give its members some support. Although guilds where not flawless and did indeed restrict competition they can be viewed as institutions or platforms that tried to lower transaction costs and increase trade (Pénard, 2008).

In a similar way, there exists platforms such as Internet sites that try to lower information barriers on goods by enabling reviews. With reviews, a reputation system is created that helps consumers to avoid buying bad products or buying from a seller that has history of theft. Often these reviews rely on social norms and the reviewers are not paid any compensation (Dellarocas, 2003). For example, when one buys from an unknown seller on the platform Ebay, one does take a risk that the good will be something else than expected or that the seller will not deliver the good in time etc. The review system tries to solve this problem by allowing people who are dissatisfied with a seller to give him/her a negative review and therefore punish this seller, thus reducing their future income (Pénard, 2008; Tullock, 1985). In a similar way, the online site booking.com offers hotel bookings from all over the world. After one has visited the hotel, the consumer is allowed to give a review of the hotel. These reviews help other customers to choose a suitable hotel and helps hotels to

access to large group of consumers. The site transmits over 250 000 bookings each day and only charges the hotels, which pays a percentage of the amount that the customer has paid for the hotel room. This site therefore lowers transactions costs related to the asymmetric information in the hotel industry (Möller, 2009). While there exist large differences between economic platforms and institutions, the similarities are well worth pointing out.

Summing up, the theory suggests that an economic platform is a firm or organization that (1) is two-sided (2) exhibits network externalities, (3) is in an environment where the Coase theorem is not applicable and (4) has a non-neutral price structure. This characterization is not entirely strict and therefore there are products which one cannot really determine whether they are platforms or not. On one side, the credit card is an extremely good example of an economic platform. No one would be carrying around a credit card if it was not for the service it provides when it connects consumers who wants to buy a product with merchants who wishes to sell them. Without its information distributing effect, it is only a piece of plastic. On the other hand, a newspaper might be considered a platform, connecting advertisers with readers of advertisements. But then one neglects that (most) people who buy a newspaper buy it in order to access the news inside it. It might therefore be reasonable to view a newspaper as a normal good, although one that is partly financed by advertisements and therefore has some of the platform aspects to it. In addition, while a large group of readers makes the paper more attractive to advertise in, a large amount of advertisement probably does not make the paper more attractive to the readers.

Hence, the lack of a strict definition leads to different authors having differing opinions of which firms or organizations that should be viewed as platforms. This essay therefore tries to take a mainstream view in the empirical analysis. In section 4, a number of different firms that are economic platforms will be described. These firms are however uncontroversial and are widely regarded as platforms and nothing else. It is therefore interesting to notice how different they are in terms of business models and in what ways they make a profit and which sectors they operate in.

2.2 A simple model for merchant or platform mode

When is the platform model optimal compared to the ordinary merchant model? Hagiu (2007) offers a model for when the different methods are preferable. The paper contains several conclusions, but the focus will be on his first proposition since it gives a very straightforward definition of when a merchant model is preferred over a platform model. The reason for including this model is that it gives a good explanation for why many firms will not

benefit from moving towards a platform model.

There are n identical firms who sell their products via an intermediary. They are unable to sell their products on their own. The intermediary can choose to either become a platform or a merchant. If it becomes a merchant, then it buys the firm's goods for B^s and sells it to the consumers for $p^M(n)$. In the platform case, the firm pays the platform a fee P^S in order to linked to the platform and then sells its good to a consumer for $p^P(n)$. The firm's costs for their products is fixed, f and their distribution cost is c for every good n. However, if the firms sell their goods to a merchant, then the merchants handle the distribution with costs given by the function $C(n)$.

Consumers must pay the intermediary an access fee P^C regardless of if it is a platform or merchant. The consumers gain utility $U(n)$ from having access to n different goods and are distributed by a cumulative distribution function F. This distribution can be viewed as the distribution in taste towards the goods being offered. Given this function, the number of consumers, N^C who wish to be affiliated with the intermediary for a given price p is given by

$$N^C = F(U(n) - np - P^C) \tag{1}$$

The firm's profits for the merchant mode are simply $\pi^M = B^S - f$. In the platform case however, the profits are given, for a fixed $p^P = p$ by:

$$\pi(n) = pN^C - P^S - f - c = pF(U(n) - np - P^C) - P^S - f - c \tag{2}$$

Now, in order to get the difference in the amount of consumers that will sign up for the platform, Hagiu (2007) introduces a consumer utility function: $U(n) = u_o + nu$. Then, the firm's profits as a platform are equal to:

$$\pi(n) = pF(u_0 + n(u-p) - P^C) - P^S - f - c \tag{3}$$

Notice how the platform's profits depend on the number of consumers signing up for it. Now, if firms believe that all (or almost all) consumers will sign up for the platform, then they should be willing to do so for whenever $\pi(n) \geq 0$. This will be called favorable expectations, denoted F. This price, which the platforms sets, should be equal to:

$$P^S = pF(u_0 + n(u-p) - P^C) - f - c \tag{4}$$

The platform then receives total profits from both sides equal to:

$$\pi_F^P = P^C N^c + nP^S = P^C(np)F(u_0 + nu - np - P^C) - n(f+c) \tag{5}$$

The profit maximization problem therefore becomes:

$$\pi_F^P = \max\Big[P^C F(u_0 + n(u-p) - P^C) + npF(u_0 + n(u-p) - P^C)\Big] - n(f+c) \tag{6}$$

Now, let's instead assume that platforms expect very few consumers to sign up for the platform, thus there are unfavorable expectations, denoted UF. Then, it will not be rational to sign up unless $pF(u_0 - P^C) - P^S - f - c \geq 0$ In this case, the platform can only charge (due to the lack of networking effects) $P^S = pF(u_0 - P^C) - f - c$. Profit maximization then becomes:

$$\pi_{UF}^P = \max\Big[P^C F(u_0 + n(u-p) - P^C) + npF(u_0 - P^C)\Big] - n(f+c) \tag{7}$$

Given this, one clearly sees that the profits are higher when firms expect many consumers to use the platform. In order to compare this one must first look at profit maximization in the merchant mode. Here, the merchant only buys the good from the firms for a given cost. The firms will sell whenever $B^S \leq f$. The merchant then sets its price $B^S = f$ which gives a profit maximizing problem equal to:

$$\pi^M = \max\Big[(P^C + np)F(u_0 + n(u-p) - P^C) - nf - C(n)\Big] \quad = \quad \pi_F^P - (C(n) - nc) \tag{8}$$

Here we can see the condition for when the merchant mode is favorable. It is either when the intermediary expects that firms have unfavorable expectations of how many consumers will sign up or when the intermediary has very large economics of scale when it comes to transportation costs i.e. when $C(n) < nc$. The first case captures the two-sidedness of the platforms; if one side does not expect the other to sign up it is not a good idea for it to pay to use the platform. The latter case is a good explanation for why firms like Wal-Mart or IKEA would not benefit from becoming a platform. Wal-mart's success comes partly from their enormous economics of scale in logistics, where they buy large amounts of their different products in order to cut costs. For them, shipping products one at a time would be far more costly than their current method. This might also be an explanation for why many of the goods being sold via platforms are fairly expensive per unit, for example video games, or goods that have very low transportation costs such as information. These are goods that one does not buy as frequently as, say, milk, and therefore transportation costs are less important.

3 Theoretical pricing models

In this section different pricing models for platforms will be discussed. Two pricing models will be presented and compared to more standard models of pricing. The first one is Armstrong (2006) which is a monopoly model of pricing, but which gives a different result compared to the normal textbook model. The second model is a more complex model from Galeotti and Moraga-González (2009) which is a game theoretical oligopoly model where the firm does not know how many competitors it will face. This model will be compared to the textbook Cournot model, which is less complex but still gives interesting results when the number of competitors increase. The main point of this section is not to introduce an enormous amount of theory but rather to see in which ways platforms differ from more traditional methods of doing business. As will be shown, platform pricing models become quite complex in the ways they handle the two-sidedness problem.

3.1 Monopoly pricing

In order to clearly see the differences between ordinary pricing models and the models designed for economic platforms, there will be a brief introduction to the standard monopoly pricing model for a linear demand curve. While this model most likely is already familiar to the reader, it is useful to directly see the differences between ordinary pricing methods and those that have been suggested for economic platforms.

3.1.1 Ordinary monopoly pricing

The profit maximizing problem for a monopolist is how to set the prices high enough to maximize profits, given that a higher price will reduce demand. For a monopolist selling a good y for a price p with constant marginal cost cy subjected to a demand function $D(p)$ the problem becomes:

$$\max \pi = py - cy \quad \text{such that} \quad D(y) \geq y \tag{9}$$

As is usual, using the inverse demand function (i.e. the price that must be charged in order to sell a given amount) gives an easier answer. Then, $D(p)$ becomes $p(y)$. Remember that with only one firm in the market, firm demand and market demand are identical. The profit maximizing output is derived from the F.O.C for equation (9):

$$p'(y)y + p(y) - c = 0$$

Given that demand is downwards sloping, $p'(y)$ will be negative. Hence, the price will be

higher than the marginal costs, c. As an illustration, now assume that the (inverse) demand function is linear and given by: $p(y) = a - by$. Then the prices and quantities becomes:

$$y = \frac{a-c}{2b} \quad \text{and} \quad p = \frac{a+c}{2} \tag{10}$$

Under perfect competition the price would be equal to marginal cost, c. As will be stated below, the platform monopolist has a bit of a different problem since it must also ascertain it captures both sides of the market in order to have a viable demand for its service.

3.1.2 Platform monopoly pricing

A good and simple model for platform monopoly pricing is found in Armstrong (2006). This model is both easy and intuitive and has been quoted in several papers. Similar results are derived in Rochet and Tirole (2003, 2006) and Roson (2005) but for simplicity only Armstrong's model will be derived. The model starts with stating the utility functions for the two different types of consumers that exist in the model:

$$u_1 = \alpha_1 n_2 - p_1 \quad \text{and} \quad u_2 = \alpha_2 n_1 - p_2 \tag{11}$$

where p_1 and p_2 are the respective prices; α_1 and α_2 are the benefits a type one consumer get with interacting with a type 2 consumer and vice versa. In order to get the demand function for the platform, Armstrong assume that the number of consumers is determined by:

$$n_1 = \phi_1(u_1) \quad \text{and} \quad n_1 = \phi_2(u_2) \tag{12}$$

ϕ_1 and ϕ_2 are some increasing functions dependent on u. The platform does not have a uniform cost like in the similar Rochet and Tirole (2003) model but it is different for the two groups; f_1 and f_2. Hence, the profit becomes:

$$\pi = n_1(p_1 - f_1) + n_2(p_2 - f_2) \tag{13}$$

Here, Armstrong chooses to express the platform offering net utilities (the utility the consumer has left after having paid the price) rather than prices, so as the profit becomes:

$$\pi(u_1, u_2) = n_1 \left[\alpha_1 n_2 - u_1 - f_1\right] + n_2 \left[\alpha_2 n_1 - u_2 - f_2\right] \tag{14}$$

which can be written as

$$\pi(u_1,u_2)=\phi_1(u_1)\left[\alpha_1\phi_2(u_2)-u_1-f_1\right]+\phi_2(u_2)\left[\alpha_2\phi_1(u_1)-u_2-f_2\right] \tag{15}$$

From this equation it is possible to calculate the optimal prices using the F.O.C for equation 15:

$$\frac{\partial\pi}{\partial u_1}=\phi_1'(u_1)\left[\alpha_1\phi_2(u_2)-u_1-f_1\right]+\phi_1(u_1)\cdot(-1)+\phi_2(u_2)\alpha_2\phi_1'(u_1)=0 \quad \rightarrow \tag{16}$$

$$\phi_1'(u_1)\left[\alpha_1\phi_2(u_2)-u_1-f_1\right]+\phi_2(u_2)\alpha_2\phi_1'(u_1)-\phi_1(u_1)=0$$

$$\phi_1'(u_1)\left[p_1-f_1\right]+\phi_2(u_2)\alpha_2\phi_1'(u_1)-\phi_1(u_1)=0$$

$$\phi_1'(u_1)p_1=\phi_1(u_1)+f_1\phi_1(u_1)'-\phi_2(u_2)\alpha_2\phi_1'(u_1)$$

$$p_1=\frac{\phi_1(u_1)}{\phi_1(u_1)'}+f_1-\phi_2(u_2)\alpha_2$$

$$p_1=f_1-\alpha_2 n_2+\frac{\phi_1(u_1)}{\phi_1(u_1)'} \quad \text{and by symmetry} \quad p_2=f_2-\alpha_1 n_1+\frac{\phi_2(u_2)}{\phi_2(u_2)'} \tag{17}$$

First, a brief reminder of the formula for the elasticity of demand might be in order (Mas-Colell et al., 1995):

$$\epsilon=\frac{\partial y_i(p_i)}{\partial p_i}\cdot\frac{p_i}{y_i(p)}$$

for some good y_i whose demand is affected by the relevant price. Normally, one thinks of y_i as a good which a consumer buys, such as an apple or an orange. However, in this case the point of view is the monopolist platform, so the relevant measurement is the number of consumers, n_1 and n_2. Remember that the number of consumers is dependent on $\phi_1(u_1)$ and $\phi_2(u_2)$. Therefore, the elasticity of demand becomes:

$$\epsilon_1=\frac{\partial n_1}{\partial p_1}\cdot\frac{p_1}{y_1}\rightarrow\epsilon_1=\frac{\partial\phi_1(u_1)}{\partial p_1}\cdot\frac{p_1}{\phi_1(u_1)} \tag{18}$$

$$\epsilon_1=\frac{\partial\phi_1\left(\alpha_1 n_2-p_1\right)}{\partial p_1}\cdot\frac{p_1}{\phi_1\left(\alpha_1 n_2-p_1\right)} \tag{19}$$

$$\epsilon_1=\frac{p_1\phi_1'\left(\alpha_1 n_2-p_1\right)}{\phi_1\left(\alpha_1 n_2-p_1\right)} \quad ; \quad \epsilon_2=\frac{p_2\phi_2'\left(\alpha_2 n_1-p_2\right)}{\phi_2\left(\alpha_2 n_1-p_2\right)} \tag{20}$$

Therefore one can prove that:

$$\frac{1}{\epsilon_1}=\frac{\phi_1(u_1)}{p_1\phi_1'(u_1)}$$

$$p_1 = f_1 - \alpha_2 n_2 + \frac{\phi_1(u_1)}{\phi_1(u_1)'}$$

$$p_1 - (f_1 - \alpha_2 n_2) = \frac{\phi_1(u_1)}{\phi_1(u_1)'}$$

$$\frac{p_1 - (f_1 - \alpha_2 n_2)}{p_1} = \frac{1}{\epsilon_1} \quad ; \quad \frac{p_2 - (f_2 - \alpha_1 n_1)}{p_2} = \frac{1}{\epsilon_2} \tag{21}$$

Equation 21 is identical to the so called Lerner index (Mas-Colell et al., 1995; Varian, 1992). This index is normally used in order to define monopoly power or how much prices differ from the marginal costs mc, in the following form:

$$L = \frac{p - mc}{p}$$

From this index one can derive that, given the definition of the elasticity, that:

$$L = \frac{1}{\epsilon}$$

Looking at equation 21 one can notice two cases when p_i should be low, perhaps lower than costs f_i. This is either due to one side having very high elasticity and prices therefore needs to be low in order to get any customers. The other case is when the benefits to the other side is very large and low prices on one side can be compensated on the other side. Armstrong (2006) gives as an example the yellow pages, which is given away for free to households and the revenues are completely derived from the firms who pay for the advertisements. In a similar way, most credit cards have very low fees for the individual owner but quite high usage fees on the merchant who charges a customer using their card. Comparing this equation to the ordinary monopoly pricing above, the major difference is the two-sidedness of the market. The monopolist still charges a mark up on their cost, but must also be careful in order to get both sides on board and may therefore need to subsidize the other. While the differences might not seem big, this does create very different business methods such as giving the product away for free for one part and so on.

3.2 Oligopoly pricing

In this section there will be a brief discussion of the Galeotti and Moraga-González (2009) model which is a game theoretic monopoly model with differentiated products. There exists several firms and several consumers, but only one platform. This model will be compared with the standard Cournot model for oligopoly pricing. While they are a bit different in

their design, they share one important characteristic; which is how prices change when more actors enter the market.

3.2.1 Cournot oligopoly pricing

The Cournot competition model is perhaps the oldest model of oligopoly pricing that is still being used today, drawing on the works of Cournot (1838). The model is still useful, which is the reason why it is presented in most modern textbooks. It is also called quantity competition since the firms compete by setting the quantity that they want to produce and then allow the market to set the corresponding prices. In this section, the model is introduced with two firms competing in one market. This is the simplest form, but it also explains in a good way how prices will change when more firms enter the market. With two firms, each producing output y_1, y_2, and having constant marginal costs gives profit functions for firm i:

$$\pi_i(y_1, y_2) = \max p(y_1, y_2)y_i - cy_i \tag{22}$$

Each firm sets its quantity in a way that maximizes its profits (in a similar way as a monopolist would do) given the quantity that the other firm sets. This creates reaction functions, which at the optimum creates a Nash-Cournot equilibrium. This equilibrium is derived from the profit maximizing F.O.C's with optimal quantities y_1^*, y_2^*

$$p'(y_1^*, y_2^*)y_1^* + p(y_1^*, y_2^*) - c = 0$$

$$p'(y_1^*, y_2^*)y_2^* + p(y_1^*, y_2^*) - c = 0$$

Adding these two conditions together, market output becomes:

$$p'(y_1^* + y_2^*)\left(\frac{y_1^* + y_1^*}{2}\right) + p(y_1^* + y_2^*) = c \tag{23}$$

Assuming a linear inverse demand curve, $p = a - b(y_1 + y_2)$, as in the monopoly case above, it is possible to compute both firm's outputs and market prices. Both firms set their quantities at the same time and both maximize knowing that the other is maximizing given their knowledge of the other part[2]. This gives price and output:

$$y_1 = \frac{a-c}{3b} \quad \text{and} \quad y_2 = \frac{a-c}{3b} \tag{24}$$

[2]This creates an infinite regress of knowing, see Fudenberg and Tirole (1991) for more on common knowledge.

$$p = \frac{a + 2c}{3} \tag{25}$$

Notice how prices are lower and output is higher with just one more firm in the market. As the number of firms goes to infinity, prices will go towards c which is the same as in a perfect competition setting.

3.2.2 Platform pricing with many firms and differentiated products

The Galeotti and Moraga-González (2009) model is quite complex and therefore this essay will only show the derivation of the equilibrium price. Nonetheless, the resulting price equation is interesting compared to the one derived above for the Cournot model, especially since this is in a multi-firm setting. The model is designed as a game in several phases. First the platform chooses a fixed entry fee, a, to be paid by the firms who join and a fixed subscription fee, s, for the consumers. Then, all firms simultaneously choose whether or not to participate in the platform and also which prices to charge for their product. At the same time, all consumers simultaneously choose whether to participate in the platform or not. The game ends when the transactions between the consumers and the firms are carried out. Those firms and consumers who decided not to join any platform are unable to carry out any transactions. Also, the platform has no cost, neither fixed nor variable.

The firm's decision to join the platform is based on a number of parameters. There exist a number, $N \geq 2$, firms who compete with differentiated goods which they sell for prices p_i. Their goods are produced at a constant returns to scale with no costs. The firms choose whether or not to participate in the platform (remember, there is only one platform), which in strategy form becomes the set, for firm i, $E_i = \{P, NP\}$ with P is the choice to participate and NP is the choice to not participate. The choice to participate can then be viewed as a mixed strategy over a probability function over the set. The reason for viewing the strategies as a probability is due to the fact that there are many firms. With many firms independently choosing the central limit theorem applies and the result for their choices is best viewed as a probability function. Over all the firm; the variable λ_i is the probability that firm i will participate. Given the two choices of prices and participation, the complete strategy set becomes $\sigma_i = \{\lambda_i, p_i\}$ for firm $i = 1, 2....N$. The expected value for the profits is $E\pi_i(\sigma)$

Looking at the consumer side of the game, there is an unspecified number of identical consumers. Their willingness to pay for a good from firm i is measured by $\epsilon_{im} > 0$ for a given consumer m and the maximum demand is one unit per consumer. ϵ_m is a matching factor, randomly distributed on $[0, \bar{\epsilon}]$. ϵ have an uniform cumulative distribution function F

and a probability density function f.[3]

Like the firms, the consumer can choose between subscribing to the platform or not, so the strategy set becomes $R = \{S, NS\}$ where S is subscribing and NS is not subscribing. A mixed strategy for a given consumer is then a probability distribution over the set R, denoted $\mu \in [0,1]$ given the binary choice of subscribing or not. Given the firms, and the other consumers choice's, a given consumer has expected utility $Eu(\mu)$. Given this, one can note that the amount of consumers who will subscribe to the platform is $\mu \in (0,1]$[4]. As with the firms before, the large numbers of consumers each choosing if they want to join or not, makes it possible to view their choices as a probability function.

To start deriving the equilibrium, assume that a given firm believes that the probability for another firm to join is $\lambda^* \in (0,1]$ and they will charge the price p^*. Then, their expected profit, if they participate in the platform, for the price $p_i \neq p^*$ is:

$$E\pi_i(1, P_i; \lambda^*_{-i}) = \mu p_i (1-\lambda)^{N-1} \Pr[\epsilon_i - p_i \geq 0] \quad +$$
$$\mu p_i \left[\sum_{k=1}^{N-1} \binom{N-1}{k} \lambda^k (1-\lambda)^{N-1-k} \Pr[\epsilon_i - p_i \geq max\{o, z_k - p^*\}] \right] - a \tag{26}$$

This quite massive equation is not as hard to interpret as one might think. σ^*_{-i} is the equilibrium strategies by all firms other than firm i and $z_k = \max\{\epsilon_1, \epsilon_2, ...\epsilon_k\}$ are the different matching factors. In order to interpret (26), one must start by looking at the different cases it describes. If the firm who chooses to interact on the platform is completely alone, then its profits is described by the first part of the equation. The probability for being alone is $(1-\lambda)^{N-1}$. The firms make a profit p_i for every sale it makes and a sale happens whenever $\epsilon_{im} - p_i \geq 0$.

However, if the firm faces two competitors the profit function becomes different. The probability for facing two competitors is $\binom{N-2}{2}\lambda(1-\lambda)^{N-3}$. The competition leads to different probabilities for a sale occurring. Now, for firm i facing a rival j(who charges p^*) a sale occurs when $\epsilon_{im} - p_i \geq \epsilon_{jm} - p^*$ and $\epsilon_{im} - p_i \geq 0$. Given that the firm might face $k = 1, 2...N-1$ different firms, the summation is necessary.

Now, given that a firm faces k number of competitors in the platform, its probability for selling a product is:

[3]The P.D.F is the derivative of the C.D.F. Loosely speaking, the C.D.F measures the probability for a certain value up to a certain point while the P.D.F measures the probability that the value will appear at a given point. See Verbeek (2008) for a more through discussion.

[4]Notice that the set is open at the lower end and closed at the other end.

$$\Pr[\epsilon i - p_i \geq \max\{o, z_k - p^*\}] = \int_{p_i}^{\overline{\epsilon}} F(\epsilon_i + p^* - p_i)^k f(\epsilon_i) d\epsilon_i \tag{27}$$

This expression is derived from, as noted above, that the C.D.F of z_k is $F(\epsilon)^k$. Hence, (10) becomes:

$$E\pi_i(1, P_i; \lambda^*_{-i}) = \mu p_i (1-\lambda)^{N-1}(1 - F(p_i)) +$$
$$\mu p_i \left[\sum_{k=1}^{N-1} \binom{N-1}{k} \lambda^k (1-\lambda)^{N-1-k} \int_{p_i}^{\overline{\epsilon}} F(\epsilon_i + p^* - p_i)^k f(\epsilon_i) d\epsilon_i \right] - a \tag{28}$$

Where equation (27) has been inserted into the square brackets of equation (28). In the first term (the case with no competitors), $\Pr \epsilon_i - p_i \geq 0$ has been replaced with $1 - F(p_i)$ which follows from the definition of the C.D.F.

By using $\binom{N-1}{k}$ with $k = 0$ it is possible to eliminate the $\mu p_i (1-\lambda)^{N-1}(1 - F(p_i))$ section. By using the binomial theorem[5] equation 28 reduces down to:

$$E\pi_i(1, P_i; \lambda^*_{-i}) = \mu p_i \left[\int_{p_i}^{\overline{\epsilon}} \left[1 - \lambda + \lambda F(\epsilon_i + p^* - p_i) \right]^{N-1} f(\epsilon_i) d\epsilon_i \right] - a \tag{29}$$

Now, in order to calculate the first order conditions it is easier to first insert the expressions for $F(x)$ and $f(x)$ which are $x/\overline{\epsilon}$ and $1/\overline{\epsilon}$ respectively and then solve the integral.

$$\mu p_i \left[\int_{p_i}^{\overline{\epsilon}} \left[1 - \lambda + \lambda \frac{\epsilon_i + p^* - p_i}{\overline{\epsilon}} \right]^{N-1} \frac{1}{\overline{\epsilon}} d\epsilon_i \right] - a$$
$$\frac{\mu p_i}{\overline{\epsilon}} \mu p_i \left[\int_{p_i}^{\overline{\epsilon}} \left[1 - \lambda + \lambda \frac{\epsilon_i + p^* - p_i}{\overline{\epsilon}} \right]^{N-1} d\epsilon_i \right] - a \tag{30}$$

Integrating this expression gives:

$$\left[\frac{\overline{\epsilon}}{\lambda N} \left(1 - \lambda + \lambda \frac{\epsilon_i + p^* - p_i}{\overline{\epsilon}} \right)^N \right]_{\epsilon_i = p_i}^{\epsilon_i = \overline{\epsilon}}$$
$$\frac{\overline{\epsilon}}{\lambda N} \left(1 - \lambda + \lambda \frac{\overline{\epsilon} + p^* - p_i}{\overline{\epsilon}} \right)^N - \frac{\overline{\epsilon}}{\lambda N} \left(1 - \lambda + \lambda \frac{p^*}{\overline{\epsilon}} \right)^N \tag{31}$$

Inserting equation 31 into equation 29:

[5]The theorem states that: $(x+y)^n = \sum_{k=0}^{n} \binom{n}{k} x^{n-k} y^k$

$$\frac{\mu p_i \overline{\epsilon}}{\lambda N}\left[\frac{\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{\overline{\epsilon}+p^*-p_i}{\overline{\epsilon}}\right)^N-\frac{\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{p^*}{\overline{\epsilon}}\right)^N\right]-a \tag{32}$$

Now, in order to get the first order condition the equation must be differentiated with respect to p_i. Also, in equilibrium the firms will issue the same price as their competitors, i.e. $p_i = p^*$

$$\frac{\partial \pi}{\partial p_i}\left[\frac{\mu p_i \overline{\epsilon}}{\lambda N}\left[\frac{\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{\overline{\epsilon}+p^*-p_i}{\overline{\epsilon}}\right)^N-\frac{\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{p^*}{\overline{\epsilon}}\right)^N\right]-a\right]=0 \tag{33}$$

$$\frac{\mu\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{\overline{\epsilon}+p^*-p_i}{\overline{\epsilon}}\right)^N-\mu p_i\left(1-\lambda+\lambda\frac{\overline{\epsilon}+p^*-p_i}{\overline{\epsilon}}\right)^{N-1}-\frac{\mu\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{p^*}{\overline{\epsilon}}\right)^N=0$$

In equilibrium the firms will issue the same price as their competitors, i.e. $p_i = p^*$. After some rearranging, this boils down to:

$$\frac{\mu\overline{\epsilon}}{\lambda N}-\mu p^*-\frac{\mu\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{p^*}{\overline{\epsilon}}\right)^N=0$$

$$\frac{\overline{\epsilon}}{\lambda N}-p^*-\frac{\overline{\epsilon}}{\lambda N}\left(1-\lambda+\lambda\frac{p^*}{\overline{\epsilon}}\right)^N=0 \tag{34}$$

and finally:

$$p^*=\frac{\overline{\epsilon}}{\lambda N}\left[1-\left(1-\lambda\left(1-\frac{p^*}{\overline{\epsilon}}\right)\right)^N\right] \tag{35}$$

Notice how the equilibrium price is decreasing in λ, which means that the more competitors that sign up for the platform the lower the price will be even with differentiated products. In the same way as prices where decreasing in the Cournot model when more firms entered (and supply therefore expanded), prices decrease here due to the competition (but not necessarily due to an increased supply of goods per se). However, whereas in the Cournot model it is proven that enough competition will lower prices to marginal costs, here it is not clear that a large increase in firms participating will lead to a socially optimal price. The model presented by Galeotti and Moraga-González (2009) is therefore an interesting example in how complex platform models easily become. Notice that this model only had one platform and choices were binary for both firms and consumers (i.e participate vs not participate). Nonetheless, the model nicely illustrates the complexities for platforms who want to capture a large number of both consumers and firms. It also illustrates how plat-

forms can be used for helping trade of differentiated products, an example of this might be Ebay where lots of different sellers sell all kinds of goods to a large number of different consumers via a single platform.

4 The importance of platforms in the current economy

In this section there will be a brief discussion of a number of economic platforms that are currently operating in the world economy. Most of these firms are large and multinational, which of course is the reason why so many people know about them. The interesting part of them is that, while they all are considered economic platforms, they have quite different methods of raising revenue and operate in different markets. Both a list of big and fast growing firms will be presented, as well as a number of very brief case studies. The point of these small case studies is to show how large the differences are in which markets that platforms operate in and how they derive their revenue. However, all the firms are genuine platforms and apply a non-neutral pricing strategy which very often involves subsidizing one part. All numbers are taken from the companies's annual reports[6] unless stated otherwise.

4.1 Large and fast growing platforms

In order to see how important platforms are and to see if platforms might become increasingly important, the platforms listed on the Forbes 2000 global list of the biggest publicly traded firms and the Fortune 100 fastest growing firms will be presented in the tables below. These two lists represent both firms that are currently very large and those which might become large in the future. While the number of firms is not very large, nonetheless there exist several very large economic platforms and several new platforms that are growing very rapidly.

The Forbes placement is derived by them ranking each firm in the different categories (sales, profits and so on) and then merging the results, giving each part equal weight. The Fortune 100's list is on firms traded in the US stock market, which have a revenue of at least $ 50 million and net income of at least $ 10 million. The rankings are based, with equal weight on the increase in revenue and the growth rate in earnings per stock along with a three year annualized total return.

[6]Which publicly traded firms must release in order for the stockholders to have access to the relevant information.

Table 1: Platforms on the Forbes Global 2000 list

Firm name	Rank	Country	Sales	Profit's	Asset's	Market value
Apple	47	USA	\$76.3B	\$ 16.6B	\$ 86.7B	\$ 324.3B
Microsoft	50	USA	\$ 66.7B	\$20.6B	\$92.3B	\$215.8B
American Express	114	USA	\$30.2B	\$4.1B	\$ 147B	\$53.2B
Google	120	USA	\$29.3B	\$\$8.5B	\$57.9B	\$185.8B
VISA	318	USA	\$8.3B	\$ 3.1B	\$34B	\$60.4B
Nintendo	331	Japan	\$15.3B	\$2.4B	\$18.5B	\$ 39.8B
Ebay	408	USA	\$9.2B	\$1.8B	\$22B	\$ 40.1B
Mastercard	670	USA	\$5.5B	\$ 1.8B	\$8.8B	\$ 32.4B
NSYE Euronext	966	USA	\$4.4B	\$577M	\$13.4B	\$9.2B
Nasdaq OMX Group	1448	USA	\$3.2B	\$ 935M	\$16.2B	\$4.8B
Alibaba.com	1995	China	\$843M	\$22.9M	\$1.9B	\$9.3B

Table 2: Platforms on the Fortune 100 fastest growing companies list

Firm name	Rank	Earnings growth	Revenue growth	Total return
Baidu	4	78%	65%	65%
Priceline.com	12	59%	28%	64%
MercardoLibre	15	72%	33%	32%
Ebix	19	48%	42%	30%
Apple	21	57%	37%	26 %
Netflix	24	48%	23 %	116%
Netease	58	25 %	39%	27%
Sohu.com	89	33%	38%	1%

4.2 Credit cards

There are three large credit cards which capture most of the market in the western world: MasterCard, VISA and American Express. MasterCard and VISA are not firms, they are large non-profit organizations owned by more than 6000 banks (Rochet and Tirole, 2003). American Express is instead a more traditional firm which seeks to make a profit. All firms issue a non-surcharge rule, which means that firms which have allowed trade with these cards are not allowed to charge the consumers for using their card. This rule is outlawed in Britain, Australia and some US states and therefore merchants there are allowed to charge consumers. The main reason for the merchants to accept the deal offered by the credit card organizations/firms is that credit cards make it easier for consumers to trade with the merchant. Without being able to use their credit cards, the merchants would lose consumers who could then only pay in cash.

Credit card organizations make money in two ways: first by charging the merchants a percentage of the trade being made via the credit card. This is the reason why some

merchants do not allow the usage of credit cards when one buys for less than a certain amount; the marginals on small purchases become too small when the merchant must also pay for the the credit card usage cost. Credit cards also often charge the consumers using them. This charge is in the form of a monthly or yearly usage fee which varies heavily depending on what other services they also provide. These services could be in the form of credit or access to, for example, exclusive tickets at the opera. Traditionally, American Express has been the most expensive card, which also offers the most expensive services (such as access to shows at Broadway or West End), with higher charges for both consumers and merchants. The reason why merchants have still accepted the card is due to it being related to a valuable group of consumer i.e. wealthy people (Rochet and Tirole, 2003).

During 2010, MasterCard had a revenue of $5.5 billion. The volume of transfers and purchases was $2.7 trillion. The same year, VISA:s revenue was $8.1 billion and their total volume of transfers and purchases was $5.0 trillion. In comparison, the GDP of USA in 2010 was $ 14.6 trillion. Also in 2010, the revenue of American Express was a massive $27.8 billion, giving them a net income of $4.1 billion! Given that one might think that economic platforms are firms which do not have a large amount of personnel, its worth noting that American Express has 60500 employees.

4.3 Video game consoles

There are three big video game console suppliers: Sony, Microsoft and Nintendo. Their latest consoles are Playstation 3, Xbox 360 and Wii, respectively. Although they are all meant to be plugged into a TV in order to play games, they have different characteristics. Playstation (released in 2006) is the most expensive and graphically advanced. Wii (released in 2006) have less advanced graphics, but (at the time of the release) had a unique control where the gamer moved in order to make the game character perform a similar movement. Xbox 360 (released in 2005) is somewhere in the middle especially with its release of Kinect (in 2010) which is a similar control system to Wii where the player interacts with the console.

The consoles business model is based on selling the console for a low price and receiving royalties from the creators of new games. In addition, all three firms produces some games of their own which give a business model similar to tie-in sales[7].

4.3.1 Sony Playstation

Sony has sold more than 35.7 millions of Playstation 3. The Playstation 3, along with its handheld smaller version Playstation Portable, can be connected to the Internet via a service

[7]For a general discussion of tie-in sales, see Pepall et al. (2008)

that Sony provides. More than 47 million accounts have been registered. While connection itself is free, connection to the network allows Sony to sell add-ons and similar services. Sony does not release revenues for separate sales, but during 2010 their gaming section raised ¥870 billion (around $11 billion given exchange rates at time of writing). Given that the other parts of their gaming section where from sales of the older console Playstation 2 and their smaller consoles; the entire figure is revenue raised from economic platforms.

4.3.2 Microsoft Xbox

Microsoft Xbox uses a similar business model as Playstation. The console is subsidized and royalties are taken from the independent producers of games. Microsoft also produces games of their own and gains revenue from these. It is a bit hard to determine the revenues that Microsoft derive from the Xbox since they bundle them together in the annual report. Microsoft also has a lot of different activities in their entertainment section. Total revenue for their entertainment sector was $ 8 billion and although all of this is not from the Xbox 360, the Xbox and surrounding items make up a large part according to the report. In 2010, Microsoft shipped 10 million units, in 2009 they sold 11 million. In Sweden, a Xbox 360 costs between 1400-3700 SEK depending on the size of the hard drive and other add-ons.

4.3.3 Nintendo

Finally, Nintendo is the third major developer of video game consoles. At the time of its release in 2006 it did not have as good hardware as it competitors. It did however have a completely unique control, the so-called nunchuk, which the user moved in order to move the character. This lead to a large media attention and large sales of, especially, sporting games. In 2010, they achieved a total revenue of ¥1.4 trillion, ($ 15 billion according to the annual report) and sold almost 21 million consoles which means that almost 71 million Wii's have been sold in total.

Summing up, the video games industry is not a marginal phenomenon. Millions of consoles have been sold all over the world, revenues for the three big firms are measured in billions of dollar and there are hundreds of different titles of games. The business idea of subsidizing the consumer (gamer) over the game developer is in line with what theory suggests, given that the gamers have a higher elasticity than the developers. The method of claiming royalties from the developer is most likely due to the fact that games do not sell equally well. Indeed, some games sell very few copies whereas other sells in very large amounts. One of the most popular games for Xbox 360, Halo 3, sold 4.2 million copies on

the day it was released in 2007. One should not underestimate the importance for Xbox 360 to have such a title, for people who like Halo the choice of a platform becomes obvious. Similar titles exist for Playstation and Wii.

4.4 Internet dependent platforms

The Internet is host to a large amount of economic platforms. Indeed, the rapid availability of information via the Internet makes it almost ideal for the platforms business model. In this section, a number of Internet based platforms will be analyzed, covering areas as different as music, communications, mobile phone applications and love/matchmaking.

4.4.1 iTunes and Spotify

Given the enormous increase in bandwidth[8] during the last decade the possibility to deliver music via the Internet has exploded. Much of this has been illegal downloading. However, there also exist a large market for legal music transfers either via downloading or via streaming. In this section there will be a quick description of two actors on the music market; Apples iTunes and the upcoming Swedish firm Spotify.

iTunes is a software distributed by Apple.inc. It is used to play media files such as MP3(music) or xvid (movies) but also to buy tracks from the Internet site iTunes.com, also called iTune's store. All tracks are sold for an identical price, $ 0.99 per song. Hagiu (2007) claims that this unilateral pricing structure, which is completely Apple's decision, makes iTunes more of a merchant than a platform. However, in this essay they will be regarded as a platform, nevertheless one with a large degree of control over their pricing. iTunes gathers music form several different recording labels and is therefore able to have a very large catalogue of tracks available covering many different styles. This is reflected in the fact that there are around 14 million different songs available. Total revenue from the iTune's store was $ 4 million during 2010. It is important to notice that when a consumer buys a song from the iTune's store, the consumer owns the song. They download it from the site and are then free to load it on their computer, burn it on a CD or put it in their portable player. Also worth noting is that the software iTune's syncs very nicely with Apple's other products such as their computers, iPhone and iPods. It can however be quite a pain to buy from iTune's and not use the relevant Apple soft- and hardware, depending on technical knowledge.

[8]The transfer speed of computer communications, usually measured in bit's per second. One byte of data is made up of 8bits

The Swedish software Spotify takes a quite different approach. Although it is now possible to buy and download songs using their program, the main usage of Spotify comes from streaming the music, i.e. playing it online without having the song stored on your computer or smartphone. Spotify's uses a membership based fee but also has an advertising based version. The advertised financed model is also restricted to ten hours each month and the user may only listen to a track four times in total. For a Swedish consumer, one could then upgrade and pay a monthly fee of either 49 SEK or 99 SEK a month. For 49 SEK there is no restriction of only ten hours a month and on the number of times one can play a particular song. For 99 SEK a month one get's access to offline mode, i.e. one can store songs and play them without an Internet connection. Also, one gets access to better sound quality and the possibility of having Spotify in one's smartphone. The usage of a club fee rather than paying for the numbers of hours listed is in line with with theory as presented in Rochet and Tirole (2003, 2006) and Armstrong (2006). Spotify's method of doing business is not without controversy however. Quite recently, the record label Century Media[9] decided to remove all of their tracks from Spotiy. The reason for this, according to their press release, was: "Physical sales are dropping drastically in all countries where Spotify is active. Artists are depending on their income from selling music... Spotify is a problem for them." In their response, Spotify declared that: "...since our launch just three years ago, we have paid over $100 million to labels and publishers. Spotify is now also the second single largest source of digital music revenue for labels in Europe." Since Spotify is not publicly traded, they do not release their annual revenue, but the figure quoted above suggest that they earn substantial amounts. Given that they just recently have gained access to the U.S market this will most likely increase in the near future. It remains to be seen however if more labels will react the way Century Media did when or if, sales of (the more profitable) physical music continues to decrease.

4.4.2 Google

The firm Google can perhaps be viewed as the mother of all platforms. The firm has grown rapidly since its start in 1998 and its revenue for 2010 was $2.9 billion. Google's main product is the search engine from which the firm's name is derived. The fact that the word googling now is a verb for using it does in some way show the complete dominance that Google has established in the search engine market. While competitors do exist, such as Bing or Yahoo, Google controls the majority of the market in the western world.

Google's revenues are almost completely drawn from advertisement. Given the huge amount of data they are able to collect form their users previous search history they are able

[9]Famous bands under this label include Arch Enemy, Dark Tranquility and Iced Earth.

to tailor the advertisement to what they believe the user is interested in. Google's other services such as email (Gmail), video streaming (YouTube) and social contacts (Google+) also increase the amount of data gathered by specific users on many parts of their lives. When this data is processed, Google are able to derive information of the users (probable) gender, location, interests and much much more. Of course, it will never be perfect but it still allows for much more directed advertising than for example television.

There are two economic reasons why Google does not charge their users any fees for using their services. First, it is in line with the models discussed above; the users are clearly the more elastic segment. Although Google's search engine probably is superior to its competitors, it would be a matter of seconds for the users to switch. Secondly, the sheer amount of searches being done via Google, and the marginal cost of doing so, would imply that the price would be very low and that the transaction costs would be higher. Hence, the advertisement finance method is superior.

Also Google have produced their own mobile phone operating system, Android. An important part of this operating system is the online market for applications, Android Market. In this market, developers may sell their home-developed applications for any price they want. They must however pay a transaction cost to Google for every copy they sell. In this way, the Android market becomes a platform between the developer and the user of the application.

4.4.3 Matchmaking

Since many more people have been connected to the Internet, there has been an increase in how many people find their future love via the Internet. Today, matchmaking is an organized industry and the biggest sites have millions of users. There is a multitude of dating sites and hence it is impossible to list them all. To make things more complicated it is very hard to determine which is the biggest site. As an example, the international site Match.com made $ 400 million in revenue during 2010. The money was not from advertising but from 1.6 million paying subscribers.

Several dating sites seek to find users with special requirements such as faith, whether it be Judaism, Muslim or Objectivism[10]. The highly controversial site VictoriaMilan.com is suited for persons who are married or in a relationship but seeking to have an affair. Other sites are for Star Trek fans, convicted criminals and so on.

The site Edarling.com, owned by German firm Affinitas GmbH, seeks to connect wealthy and highly educated singles. The site, which according to themselves has more than 8

[10]Objectivism is the philosophy of Russian-American philosopher Ayn Rand, the corresponding dating site is theatlasphere.com.

million users in several different European countries offers a complex and, according to them, scientific test where one can find a suitable match[11]. Their prices are significantly higher than their competitors, 399 SEK for one month compared to Match.com's 299 SEK for one month. This is probably related to the theory of costly signaling. Costly signaling is a theory first presented by Spence (1973) which tries to explain why individuals perform investment that at first might not seem to have any benefits for them, but which send out useful signals. Spence's example is education which does not raise one's productivity but sends out useful signals about one's intelligence or ambition for a future employer. Other examples can be found in Fudenberg and Tirole (1991) or Smith and Bird (2000). In the case of Edarling.com, paying an extra 100 SEK is a way of proving that one really has a high income (and therefore probably is highly educated) and is not bluffing in order to become more attractive.

Dating sites is a form of platform that seems to be steadily increasing in members and revenue. The sites often combine the insights from platform theory with the older insights from signaling and price discrimination in order to provide sites that maximize the probability for a successful match. In some respects, the dating sites are the most genuine platforms studied in this essay since they are about information and nothing else. Since you cannot buy love or affection, the sites only convey the possibility of a meeting but people are still willing to pay for this information. The sites of course have no control whatsoever over what their users choose to do with their membership which is completely in line with the separation of platforms and merchants.

4.5 Stock markets

Stock markets are a much older platform than the others noted in this section. The New York Stock Exchange was established in 1817 and is today the world's biggest stock exchange. The market capitalization for the stocks traded there is a massive $ 13 trillion. It is of course possible to trade stocks without the usage of a stock market, so called over-the-counter deals. However, the public listing of stocks on a stock market helps to lower the transaction costs for everyone involved. Hence, stock markets are a very good example of an economic platform. The worlds second biggest stock exchange, and also listed above in table 1, is NASDAQ which also owns the Swedish stock exchange OMX. NASDAQ was established in 1971 and has since had a tradition of having more technology oriented firms traded there.

The fact that stock markets are economic platforms is interesting in several ways. At

[11] While the author cannot comment of the test scientific value, it takes more then 20 minutes to complete and involves about 100 questions

the time of writing, there is much attention about imposing a tax on financial transactions, a so called Tobin-tax named after the Nobel laureate James Tobin. Given that platforms have a non-neutral price structure, it is not given how prices will be affected and which side will bear the cost of the tax. More research is therefore needed in order to understand how a Tobin tax would affect prices on financial assets. Also, the stock markets function in decreasing transaction costs might be reduced. The consequences of a tax on financial transactions might therefore differ significantly from an ordinary tax on consumer goods.

5 Conclusions

This essay has had two major aims: first to show how platform pricing differs from normal pricing in the brick-and-mortar business world. Secondly, to point out a few examples of existing platforms and show that they operate in very different environments and that they make substantial revenue. Economic platforms are not only interesting in theory, they are important in practice too. That the literature on platforms is growing does coincide with the importance of platforms in daily economic activity. Many individuals today would have a hard time to cope without access to their credit cards or without using search engines such as Google. It does not seem to be any decline in the number of areas where platform models might be used and the importance of platform will most likely increase.

However, the increase of platform importance raises a couple of questions that must be answered in the near future. First, how much does platform pricing differ from traditional pricing methods? The models studied above have shown quite substantial differences. This is not only important in order for firms to be able to maximize profits, it also plays an important role for government regulation. Without knowledge of pricing theory, it will be very hard for competition agencies to find out what constitutes a monopoly price and so on. Furthermore, given that many platforms exhibit network externalities it is not obvious that a lack of competition is negative for consumers. Platform competition might be frustrating for consumers when there are large transaction costs and problems with transferring information. For example, a couple of years ago a text file written on a Macintosh computer was very hard to read and edit on a PC. Although this particular problem has disappeared due to changes in technology, similar problems might exist in other sectors today. It is therefore not obvious that governments should try to avoid monopolies from occurring or break up existing ones.

Secondly, what is the connection between traditional economics of information, signaling, discrimination and platforms? Dating sites, credit cards and similar platforms not only sell services, they also help to solve information problems that might otherwise lead to no transactions being performed and help in lowering transaction costs. As Akerlof (1970) noted, if information problems are too severe then there is not only less trade but there might not be any trade at all. Later research in information theory and signaling showed how different market institutions can reduce these problems in certain circumstances (Stiglitz, 2000). Are economic platforms a new method for solving these problems? Given the expansion and, according to themselves, success of matchmaking sites they do seem to help to solve the problem of finding enough information when looking for a partner. Will economic platforms solve problems with adverse information that has previous hindered transactions? If so,

then the expansion of economic platforms might lead to an increase in trade which will be a very positive development. Here, more research connected to previous investigations about quality, prices and asymmetric information, such as Levin (2001) and Milgrom and Roberts (1986) is needed.

Platforms will most likely become more and more important given the huge increase in information technology in the world. More and more people are connected to the Internet, have access to smartphones which require applications and so on. The importance of research in this area is therefore profound, not only in order for firms to be able to set correct prices and maximize the amount of trade being done. It is also need in order for governments all over the world to avoid making decisions based on older theories about prices and market structure which are inadequate for economic platforms. Given the potentially large positive impact of platforms in the economy it would be quite problematic if bad regulation or taxation leads to a decrease in platform activity.

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