ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

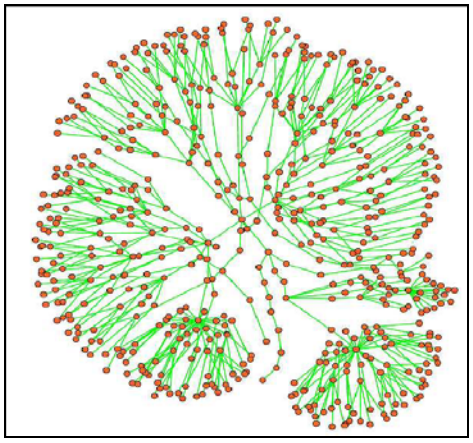
ΣΧΟΛΗ ΚΟΙΝΩΝΙΚΩΝ ΕΠΙΣΤΗΜΩΝ

ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΩΝ ΕΠΙΣΤΗΜΩΝ

ΠΜΣ «ΟΙΚΟΝΟΜΙΚΗ ΘΕΩΡΙΑ ΚΑΙ ΠΟΛΙΤΙΚΗ»

ΘΕΜΑ ΔΙΠΛΩΜΑΤΙΚΗΣ ΕΡΓΑΣΙΑΣ:

«NETWORK ECONOMICS AND THE CREDIT CARD MARKET AS A TWO-SIDED NETWORK»



ΕΠΙΒΛΕΠΟΝΤΕΣ : **ΠΕΤΡΑΚΗΣ ΕΜΜΑΝΟΥΗΛ**
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ΦΟΙΤΗΤΗΣ: **ΚΑΣΤΕΛΙΑΝΟΣ ΜΙΧΑΛΗΣ**

ΡΕΘΥΜΝΟ 2009

UNIVERSITY OF CRETE
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

ΠΕΡΙΛΗΨΗ

Τίτλος Εργασίας	Οικονομικά των δικτύων και η αγορά των πιστωτικών καρτών, ως ένα δίκτυο δυο πλευρών
Του:	Καστελιανού Ε.Μιχαήλ, Οικονομολόγου
Υπό την επίβλεψη των :	1. Δρ. Πετράκη Εμμανουήλ, Καθηγητή Τμήματος Οικονομικών Επιστημών Πανεπιστημίου Κρήτης 2. Δρ. Βλάσση Μηνάς, Αναπληρωτή Καθηγητή Τμήματος Οικονομικών Επιστημών Πανεπιστημίου Κρήτης
Ημερομηνία	Δεκέμβρης 2008

Τα οικονομικά των δικτύων αποτέλεσαν πεδίο ερευνών από μια μεγάλη μερίδα επιστημόνων τα τελευταία είκοσι χρόνια. Η εμφάνιση, η οργάνωση, οι στρατηγικές που ακολουθούνται, οι ενεχόμενοι και η πολυπλοκότητα των δικτύων κατάφερε να κεντρίσει το ενδιαφέρον πολλών ερευνητών από διάφορες επιστήμες, όπως η πληροφορική, τα οικονομικά κ.α.

Η παρούσα μελέτη έχει ως βασικό άξονα τη χρήση των εξωτερικοτήτων των δικτύων για τη βελτίωση της συνολικής ωφέλειας των ενεχομένων στα δίκτυα.

Στο πρώτο μέρος της παρούσας μελέτης, γίνεται μια σύντομη περιγραφή του τρόπου λειτουργίας των δικτύων. Αναλύεται η έννοια της εξωτερικότητας που πηγάζει από την αλληλεπίδραση των ενεχομένων μέσα σε ένα δίκτυο. Τέλος παρουσιάζονται συνοπτικά κάποιες περιπτώσεις δικτύων όπως τα δίκτυα Internet, τα δίκτυα μεταφορών, τα δίκτυα ενέργειας και τέλος τα χρηματοοικονομικά δίκτυα.

Στο δεύτερο μέρος, η ανάλυσή εστιάζεται στα δίκτυα πιστωτικών καρτών. Έγινε μια σύντομη ανασκόπηση της διεθνούς βιβλιογραφίας κυρίως κατά τα τελευταία είκοσι χρόνια. Κατηγοριοποιήθηκε η υφιστάμενη βιβλιογραφία σε πέντε βασικές ενότητες, ανάλογα με τη βασική ιδέα την οποία κάθε πηγή πραγματεύεται. Οι κατηγοριοποίηση έγινε ανάλογα με:

1) Τη συμπεριφορά των συμμετεχόντων (κάτοχοι πιστωτικών καρτών, έμποροι, τράπεζες κ.α.)
2) Τα συναλλακτικά κόστη (interchange fees)
3) Τον ανταγωνισμό από άλλα δίκτυα πληρωμών
4) Τις εξωτερικότητες των δικτύων
5) Τα μοντέλα προσδιορισμού των τιμών.

Στο τελευταίο μέρος αναπτύχθηκε ένα μοντέλο για να εντοπίσουμε εάν η υιοθέτηση διαφήμισης από τους εμπόρους, μπορεί να μεταβάλλει τόσο τα κέρδη τους. Πιο συγκεκριμένα, πως η χρήση του δικτύου πιστωτικών καρτών για διαφήμιση από τους εμπόρους, μπορεί να αυξήσει τα κέρδη τους. Εναλλακτικά, μπορούμε να πούμε ότι η εσωτερικοποίηση των εξωτερικοτητών ενός δικτύου μπορεί να μεταβάλει την κερδοφορία των συμμετεχόντων.

Λέξεις κλειδιά: *Οικονομικά των Δικτύων, Εξωτερικότητες, Κάθετη διαφοροποίηση, Δίκτυα πιστωτικών καρτών, Αγορές δυο μερών.*

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ABSTRACT

Title: Network Economics and the credit card market as a two sided network

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Network economics have become a major field of research by a great number of scientists, during the last two decades. The appearance, the organization, the strategic decisions of the participants, the participants themselves and the complexity of the networks have triggered the interest of many scientists from different fields such as informatics, economics etc.

The current study is based on the use of network externalities (network effects) in order to improve the total benefit of the participants in the networks.

In the first part of this study, a brief description of networks function is provided. We analyze the concept of externalities which stem from the interaction of the participants

within a network. Finally, we describe some Network cases such as Internet Networks, Transportation Networks, Energy Networks and Financial Networks.

The second part of this study focuses on the credit card networks. A brief review of the international literature, mainly during the last twenty years is provided. The existing literature is classified into five main categories depending on each source's main idea. The selected classification depends on the following:

1. The behavior of the participants (cardholders, merchants, financial institutions etc.)
2. The interchange fees
3. The competition with other payment instruments
4. The Network externalities
5. The pricing models

In the last part, a model has been developed, in order to identify whether the adoption of advertising strategies from merchants is capable of amending their revenues. More specifically, the use of credit card Network for advertising, from the merchants could, under certain conditions, increase their revenue. Alternatively, we may say that the internalization of the externalities of a network may alter the profitability of the participants.

Keywords: *Network Economics, Externalities, Vertical Differentiation, Credit Card Networks, Two-sided Markets*

CONTENTS

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NETWORK ECONOMICS AND THE CREDIT CARD MARKET AS A TWO-SIDED NETWORK

Part 1 Network Economics

There is a central difference between the "old: and "new" economies: the old industrial economy was driven by economies of scale; the new information economy is driven by economics of networks.

Carl Shapiro and Hal R. Varian

Information Rules (1999)

Introduction

1.1 Why are Networks important in economics?

Network economics is a rather new field of Economic Science. As technology evolves new markets appear along with new ways of managing them. New strategies arise in order to fit the continuous changes of the markets structure. Given the importance of the new technological achievements, that have caused these changes, it is not surprising that they have led to a large and growing body of academic research.

* I would like to express my deepest gratitude to Dr Petrakis Emmanouil for his guidance and inspirational lectures through all the years of my undergraduate and postgraduate studies which helped me complete this program. I would also like to express my gratitude to Mr Stamatakis Michail, Manager of National Bank of Greece, Chortatzi Str. Branch for his understanding and support during my postgraduate studies. Furthermore I would like to thank Dr Drydakis Nick, Miss Anagnostaki Adamantia and Miss Konsolaki Georgia for their apt comments and support. I would like to express my appreciation to all the students and teachers of this Postgraduate program. I would like to thank my friends for their understanding and support. Finally, I would like to thank my family for their guidance, support, and because they taught me to chase my dreams.

The tremendous expansion of internet technology, the great development of communications, means of transportation, energy networks and financial networks have triggered the interest of many great scientists around the globe. The formation of networks was a dominant feature even in the earliest step of mankind. The development of communication networks was of great importance for humans; therefore they began to develop several means such as smoke signals, drum beats, even the use of pigeons at the early stages, telegraph, telephone and internet computer networks of nowadays. Besides communication networks, people also tried to develop transportation networks. They built roads and bridges, they used animals as means of transportation and later they developed vehicles, ships and finally airplanes. All these gradual changes intended to bring people closer. This means that the formation of Networks have served as the foundation for connecting humans to one another as well as their activities.

Nowadays network formation plays a major role in economic activity. The computer software market for example could not have been developed to the level we see it today unless it was for the existence of networks. Their major economic role emanates from the fact that the economies have altered and therefore new means have to be used in order to meet the new circumstances. Though formerly, the appearance of networks was a concept closely related to a firm which was vertically developed, that means that network was connected to one owner, network nowadays have become a much more complicated feature.

According to Ranjay Gulati, Nitin Nohria and Akbar Zaheer (Mar., 2000) firms networks have five key areas of strategy research which are:

1) Industry structure,

2) Position within an industry

3) Resources and capabilities which are inimitable

4) Contracting and coordination costs

5) Dynamic network constraints and benefits

The above mentioned key areas of networks may influence the outcome of any strategy within the network. According to Ranjay Gulati, Nitin Nohria, Akbar Zahher (Mar., 2000) industry structure is characterized by the extent of concentration, market power to upstream and downstream industries and the extent of collusion that may appear within an industry that may influence their profitability. Therefore, the entry of

new firms may be impeded by barriers to entry. For instance, dense interfirm ties, or tacit collusion[2] may sustain the profitability of an industry due to the above mentioned barriers to entry.

The homogeneity of an industry is a characteristic of intra-industry structure. Firms within an industry may be divided into several groups depending on the similarities of the product or services they produce, the similarities in technology, or the similarities of the customers they serve. These groups may create alliances with each other in order to increase the profitability of their firms. A representative example is the automobile industry. GM, Ford and Chrysler, the three major U.S. manufacturers formed an alliance which main characteristic was that each of these firms included a major Japanese manufacturer and a major Korean partner. This meant that partners of the group were locked in to cooperate with each other and that excluded (locked out) them from cooperating with others.

Inimitable firm resources are of great importance for the formation of a network. Firms' networks of relationships may be chosen due to the above mentioned resources. This means that if a firm decides to produce a specific product, it may have to enter a network and as a result it accepts all the characteristics of that network including the lock-in or lock-out[3] effect. Contracting and coordination costs are another element of network formation. Network ties within firms can greatly reduce informational asymmetries. Firms that decide to join a network usually avoid opportunistic behaviors since they become more costly due to the reputational effect. Reputational effect is of great importance because an opportunistic behavior within a firm may influence not only that specific firm or alliance but also all the current and potential partners of that network.

Though some networks tend to be quite stable, most of the networks nowadays are more dynamic. There are both exogenous and endogenous forces that may influence the development and evolution of a network. Exogenous forces might be the environmental changes or even some technological advances. Internet technology might be considered as exogenous force for the evolution of a network because it altered the way market used to function. A typical example of a technological advance which triggered the development of a network is the internet technology.

[2] **Tacit collusion** occurs when two firms agree to play a certain strategy *without explicitly saying so*.
[3] **Lock-in effect** occurs when a participant in a network becomes dependent on a good or service and thus excluded from using any alternative (substitute) good or service.

When purchases through internet became possible it triggered even more the development of credit card networks. Endogenous forces may also force a network to evolve. The ties between the firms of a network could be considered as endogenous force. The actions of each member of a network, is able to influence the rest members. These actions could be new alliances that are capable of leading to the expansion of the network.

According to Nicolas Economidis (1996) there are two important classifications of networks in economics. The first type is the one way network. The one way network is one of the simplest forms, a typical example of which is broadcasting or paging. One way networks consist of two main components which are combined to produce a final product. By combining a component of each type, a new composite product appears. This final product is the one that customers demand, usually without being able to discriminate the two distinct components.

The second classification is the two way networks. Two way networks is a more complicated feature. According to Nicolas Economidis and Lawrence J. White (1994) in two-way networks there exists a node which connects each two different components of the final product. An example would be the telephone network. If customer A wants to speak to customer B then he could call B, using the node(n), or B could call A using the node (n) as well. The outcome would be the same, though "AnB" and "BnA" are different. So the main elements of a two-way network are that most of the products are complementary to each other, any two of them could be combined to create the desired composite product (An+Bn=AnB or Bn+An=BnA). Two composite goods that share at least one same component are most likely to be different. Finally there exist network externalities or network effects which are going to be further discussed later in this paper.

1.2. Network externalities- Network Effects

Network Externalities or more accurately Network effects are possibly one of the most important features of network theory. Many scientists have studied and analyzed the importance and power of network effects. According to S.J. Liebowitz and Stephen E. Margolis (1995)[4] "*Network externality (effect) has been defined as a*

[4] Also available on: http://www.utdallas.edu/~liebowit/palgrave/netwark.html

change in the benefit, or surplus, that an agent derives from a good when the number of other agents consuming the same kind of good changes". Joseph Farrell and Paul Klemperer, (2001)[5] have chosen a slightly deferent definition of network effect which was "*A good exhibits network effects if each user's payoff is increasing in the number of other users of that good or of goods compatible with it*". A more general way of explaining network effect could be that it is the effect of any additional user of a good or service to the existing users of that specific good or service within a network.

Several examples have already been analyzed by many economists considering the concept of network effect. The most widely referred is the case of fax machines. In that case, users acquire additional benefit from each customer who joins that network, since all of them will have the opportunity to increase its use. Another, possibly, more illustrative example is the Internet Network. As its users increase so does the range of services that it offers but so does the line congestion, which is a rather negative effect of that Network's usage.

Considering those referred above, there are two different categories of Network Effects positive and negative. *Positive Network Effects* occurs when the use of a good or service within a network creates positive externalities for all the users of that network. In the debit card market, as the size of the A.T.M. (Automatic Teller Machines) network increases then the use of the debit card acquires additional value. This is obvious since people spend less time in order to find an A.T.M. and use its services. On the other hand, *negative network effect* could be considered as the negative externality which arises from the use of a good or service within a network. An example from recent networks could be the production of biofuel. In order to produce biofuel it is necessary to use wood or other specific agricultural crops (corn, sugar cane, soya and other edible crops) which could result in an important increase in price of these products as well as a decrease in the remaining forest areas. Additionally, intensive cultivation for producing beofuel will decrease the production of goods for consumption which will also increase their price. All these externalities could be considered as negative network effects.

Another distinction of network effects is between direct and indirect effects. *Direct network effect* is the most obvious form of network effects. It is the direct

[5] Available on http://www.sciencedirect.com/science/article/B7P5S-4PKFGN7-9/2/2bb2fa448f28f107771b2d62342aad79

physical effect of the number of consumers of the specific good or service on its value. The communication network, for example, is capable of creating direct network effect since the increase of its users increases the value to all the existing users of that network. On the other hand, *indirect network effect* is a more complex feature. According to Amiya Basu, Tridib Mazumdar and S. P. Raj (2003) indirect network effect exists when the utility of a product increases with the greater availability of compatible complementary products. So in the software market, Windows and Linux are two of the most widely accepted operating systems. They could be considered as two competitive firms even though their competition is not so obvious to their users, as it is to the software developers. Nicholas Economides and Evangelos Katsamakas (2005) have clearly pointed out that the pricing strategy of a platform firm must take under consideration both the direct users of that platform as well as the firms offering applications that are complementary to these platforms. In their research, they have offered an explanation why industries based on a proprietary platform (such as Windows) are more likely to dominate over open source platform industries (such as linux) in terms of market share and profitability.

1.3. Network cases

i. Internet networks

Internet Networks are probably the most complicated form of networks. They appeared during the last two decades and have evolved since then, to the extention we know them today. Amazon, Google, E-Bay and Facebook are the four most famous Internet networks that exist today. All four of them offer different services to their customers. They all appeared as typical web-sites and gradually evolved as four of the greatest networks that exist today. Their existence, though, required a common factor in order to succeed. This factor was the wide-spread of internet and computer technology. In order to purchase products or services through these networks someone should have access to a computer, an internet connection and even further a mean in order to make the transactions possible (to pay for the good or service he desired). This mean would most likely be a credit card. Hence a whole branch of networks had to cooperate so that a single, seemingly simple, transaction to be processed.

Their success was based on an innovation that each of them had used in order to reach internet users. Initially, Amazon's friendly feature, like one click check-out, as well as customers delight connected with a wide range of associates program to increase links to Amazon have greatly contributed to its success. On the other hand, E-Bay used new features such as the buyers-sellers feedback rating system, the bids and the so called "organic word of mouth" which occurred due to customer's satisfaction. All the above were the main issues of its success.

Google's heart of search technology is Pigeon Rank™ [6], a system for ranking web pages developed by Google founders Larry Page and Sergey Brin, resulted in the amazing increase of speed and accuracy of its search. Moreover its simple interface along with the perfection of nature of targeted ads[7], has made the value of its brand almost twice as much as the coca-cola's brand, over the last few years.

Facebook emerged during the last five years. It is a community network which was created on 2004. Initially, only students of Harvard University could gain access to that network. Later, it began to expand to other US and Canadian colleges then to European and Asian colleges and finally on 2006 it became available for any email address around the globe. Connected users have the opportunity to invite their friends in order to interact with each other. So not only does the Facebook network attract users through the quality of services that it offers, but it possesses a huge database which can be used to attract advertisements to specific target groups. The use of Facebook requires a process of signing in where the users have to give specific personal data along with an existing e-mail address. After this the user is suggested to join specific groups within the Facebook network that match his needs. So what do we have? A perfect whole branch of target groups which can be used by associates of Facebook Network for advertising purposes. That was the great innovation that Facebook network managed to introduce.

[6] For further information see: http://www.google.com/technology/pigeonrank.html

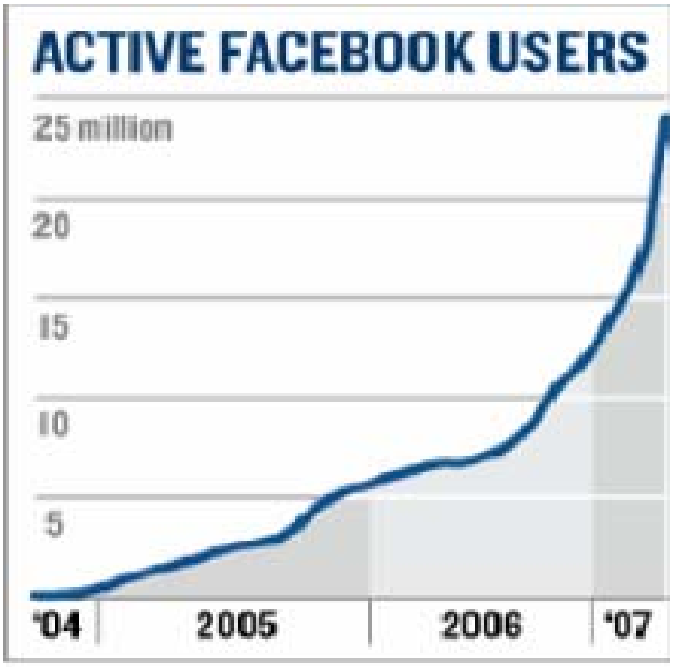
[7] Targeted ads are advertisements that target on a specific group of people. What Google managed was to use the searching terms and project the relevant ads next to the results. (See Appendix Figure1)

TABLE 1

Worldwide Growth for Facebook.com June 2008 vs. June 2007 Total Worldwide Audience, Age 15+ Home and Work Locations Source: comScore World Metrix			
	Total Unique Visitors (000)		
	Jun-2007	Jun-2008	% Change
FACEBOOK.COM	**52,167**	**132,105**	**153%**
North America	35,698	49,248	38%
Europe	8,751	35,263	303%
Asia Pacific	3,712	20,712	458%
Middle East – Africa	2,974	14,951	403%
Latin America	1,033	11,931	1055%

Source: comScore World Metrix

CHART 1



Source: comScore World Metrix

ii. Energy networks

Energy networks are another fundamental classification of the existing networks. The uniqueness of this form of networks stems from the fact that economic

policy regulators face the challenge to provide the appropriate incentives to energy producers, while they protect the interest of the consumers. On the other hand, they have to be able to keep prices as high as necessary in order to appropriately reflect the scarcity of the essential resources.

The continuous development of technology has increased dramatically the demand for energy nowadays. Many researchers, during the last decades, have tried to identify new ways of producing energy. They turned to the so called "Renewable Resources". Renewable resources consist of different networks depending on the method and form of energy they produce. The most illustrative example of renewable energy network is the production of Biofuel. Networks are being created between the firms which produce biofuel[8], the agriculturalists that produce the necessary resources and the final receiver of that energy form. The development of renewable resources became one of the most important features nowadays because other forms of energy create externalities which are devastating for the environment.

Pollution that derives ether from the production of energy or its consumption has raised its cost to extremely high levels. A wide variety of legislative regulations have been proposed and gradually used to prevent the overproduction and the overconsumption of energy.

iii. Transportation networks

Transportation networks could be considered as the system that consists of transportation infrastructure, transportation vehicles and the group of services that are necessary in order to perform a function of moving people and freight from one place to another. People's necessity to interact with each other and to exchange commodities has triggered the evolution of these networks, in order to perform the above actions using the less possible amount of time and money.

Taking traditional microeconomic theory under consideration, there are three important conditions that should be satisfied for the markets. Firstly, goods and services have to be homogenous. Secondly there must exist one, few or many consumers and one, few or many producers of a specific good or service. Finally the

[8] For further information about biofuel networks see http://esteast.unep.ch/default.asp?community=est-east&page_id=4C0A748A-4B56-45AA-93C0-8780C299B257

third condition is the private ownership of goods and services. One important characteristic of transportation networks is that usually, parts of this network are publicly owned. Therefore analyzing the transportation networks, someone must take under consideration the violation (at least partly) of the ownership rule.

An illustrative example of the transportation network is the urban road network. Users of that network (drivers, passengers, pedestrians) try to find a way to travel with the less possible disutility associated with transportation. They try to find the root with the shortest travel time. But in areas with dense traffic usually end up with traffic congestion which is a negative network effect of transportation networks.

iv. Financial networks

Another network category of critical importance is the financial network. Nowadays, financial networks have become very popular since they cooperate with other networks in order to be able to offer a wide spectrum of services to the people. There are several categories of networks concerning the financial field. The most complex ones are those that are related to the option market. Options are financial products or to put differently they are contracts between a seller and a buyer, that convey the latter the right — but not the obligation — to buy (in the case of a *call* option) or to sell (in the case of a *put* option) a particular asset, such as a piece of property, or shares of stock, biofuel production or even the weather. To generalize, subject of options might be anything that contains risk. So, usually, financial institutions offer options to buyers and sellers. Option networks are so complex due to the wide range of subjects (subjects could even be other networks) which can be used as the core element of these contracts.

Besides options, there are other financial networks which are more popular. The most widely accepted are the A.T.M. (Automatic Teller Machines) network, the P.O.S (Points of Sale) network, the B.F.C. (Business Fast Credit) network and the credit card network.

A.T.M. networks are the computerized telecommunications device that provides the customers of a financial institution with access to financial transactions in a public space without the need for a human clerk or bank teller[9]. The appearance

[9] For more technical details see http://en.wikipedia.org/wiki/Automated_teller_machine

of A.T.M. networks has caused a series of changes in the markets since it was possible to make a transaction any time and from any place. Several companies have emerged during the last two decades, which main purpose was to create networks within the financial institutions. These companies served as the link between the financial institutions so that the customer of each financial institution could use the network of A.T.M. of another financial institution. The most famous companies are MAESTRO and CIRRUS which both connect more than one million A.T.M. machines around the world.

P.O.S. networks are also computerized devices which financial institutions provide to merchants in order to complete transactions using credit cards. So if a merchant has a P.O.S. device then customers will be able to use their credit or debit cards (if they are compatible) to complete their transactions. The P.O.S. network for those who wish to buy a good using their card is an alternative network to the A.T.M. network. Their difference is that using P.O.S. it is not necessary to keep physical money since after any transaction its cost is directly deducted from the customer's account.

The B.F.C network is another classification of financial networks. B.F.C. is a program installed by financial institutions to merchants, through which merchants are capable of providing loans to their customers through the banks. This means that customers of merchants are able to buy products through this network without having to pay directly but by getting a form of a loan from the bank. In this case it is not necessary for the customers to have physical presence in the financial institution; instead the settlements are concluded by the merchandiser. All the above networks intend to offer better and faster services to its users and on the other hand to increase sales for both financial institutions and merchants.

Considering the credit card network, it will be discussed in detail in the second part of this paper.

Part 2 CREDIT CARD NETWORK

During the last two decades, credit card networks have attracted a big number of researchers. This matter has been applied by a wide spectrum of aspects, and has been the main feature of a great number of papers. The idea of these papers is that credit cards may provide benefits[10] to consumers, merchants and financial institutions in a way that no other payment instrument is capable. That, at least partly explains their explosive growth nowadays. Several theoretical models have been constructed which focused to a variety of issues such as participants behavior, pricing models, interchange fees, network competition, competition from other payment instruments, network externalities and network strategies.

2.1 Participants

The participants of the credit card networks may vary, but they could generally be classified in five main categories. Firstly we have the *cardholders* or those who possess credit cards and use them as payment instrument. Secondly, there are the *merchants* who accept credit cards as an alternative payment method. Thirdly, *financial institutions* are those who issue the cards and cooperate with merchants who decide to accept cards as a payment method. Fourthly, there are the *interbank networks* (Maestro, Cirrus, Plus) which main purpose is to connect the financial institutions. Customers may use their cards to complete a transaction from a different bank than the one that issued the card, and they may even use their card in a different country through these interbank networks. The final participants of these networks are the *brand name firms* (VISA, MASTERCARD). Their main target is process payments between bank of merchants and banks of the cardholders which use their cards. They gain their revenues from two main sources. Firstly they charge a fee to financial institutions that use their brand name and network in order to be able to issue cards. Secondly they receive a small percentage of total revenues, which derive from the use of these cards, from financial institutions.

[10] See Appendix Table 1

i) Cardholders

Chakravorti (1997) studied the behavior of consumers and the reasons that led them to choose between alternative payment methods. He analyzed the alternative payment methods and presented the frequency of usage of each of these methods in USA from 1991 to 1995. He also emphasized to the consumers preference on payment instruments that are convenient, safe and secure, inexpensive to use and widely accepted.

Paul S. Calem and Loretta J. Mester (1995), analyzing data from a 1989 survey of consumer finances, found that credit card borrowing is inversely correlated to the willingness of households to compare shops for loans and deposits. In addition these households are more likely to be rejected or to be granted with lower credit limit that they desire and therefore it becomes even more difficult to switch between alternative credit cards. So despite credit card industry's competitive structure, there are other forces which keep interest rates quite high.

Frank M. David (2001) developed a model which determined the probability that consumers would switch their credit cards. He studied the reasons why consumers are likely to change their credit cards to other credit cards. The main reasons that appeared in this research were the interest rates and the credit balance that the cards offered to the consumers. There exist other reasons that support the decision to switch or not which are the ease of entry, the network size, the switching costs and even the lack of information of the cardholders.

Ausubel (1991), Brito and Hartley (1995), Stavins (1996) and McGeehan (2004) all converged to the idea of the long term credits of credit cards. They all have applied empirical studies to examine consumer's behavior and their decisions to use long term credit components. Consumers (cardholders) who use the long term credit in their credit cards are known as "*revolvers*". Revolvers are those who roll their balances over from month to month, and never paying in full. On the other hand there is a classification of cardholders who do not avail their payments, commonly referred as convenience users. In these papers, it is referred that convenience users in USA range from 30 to 40 percent of all cardholders, whereas about 85 million Americans tent to delay their payments.

Min Qi and Sha Yang (2003) tried to find a way to accurately predict consumer's credit card adoption behavior. They compared the consumer's utility function obtained from neural models and that from logit models. The main result of this survey was that the utility function of consumers' credit card adoption obtained from neural models significantly outperformed the logit in predicting consumers' card adoption decisions.

ii) Merchants

Credit card networks may provide significant benefits to merchants even though accepting credit cards is considered to be one of the most expensive payment methods. Chakravorti (2000) provided a model which explained the merchants' decision to accept credit cards as a payment instrument. They develop the idea that merchants prefer secure guaranteed sales today than hoping for uncertain sales in the future.

On the other hand, Rochet and Tirole (2002) have developed a model of competition between merchants willing to accept credit cards and those who accept only payments in cash. They showed that in many occasions, merchants use strategies such as accepting credit cards in order to improve the services that they provide to the customers as well as to attract customers who are willing to pay through credit cards, from rivals that do not accept cards. This could partly explain the low resistance of merchants on accepting credit cards.

The benefits, acquired from the acceptance of credit cards from the merchants, are not without cost. Financial institutions charge a specific fee, which is a percentage of the total sales of merchants. This percentage varies not only from one financial institution to another but also from one type of card to another. There exist several types of credit cards, the most widely accepted of which, are MasterCard, Visa[11], American Express, and Discovery. American Express and Discovery are considered more expensive for merchants though they provide several benefits to cardholders

[11] MasterCard, Visa are (brand name) companies that do not directly issue credit cards but cooperate with financial institutions which are authorized to issue the credit cards.

such as membership rewards system[12]. On the other hand MasterCard and Visa are less expensive for merchants and have a wider network worldwide.

iii) Financial Institutions

Financial institutions earn their revenues in credit card market both from consumers and merchants. Their role is very complicated since they must find a way to create a pricing structure that is going to maximize their benefits. Many researchers have applied the financial institutions' side of credit card market.

According to Chakravorti Sujit (2003) financial institutions earn their profits (concerning credit card market) from consumers by charging them annual fees, interest and other fees such as over-the-limit fees. They compete on cardholders on interchange fees, annual fees and using various strategies such as frequent usage awards. On the other hand financial institutions earn their profits from merchants (acquirers) by charging them interchange fees[13]. These fees are set at the Network level. This means there could be some important differences from one network to another. For example, Visa and Mastercard charge an average of 1-2% per transaction to merchants, whereas American Express and Discovery an average of 3 % per transaction.

iv) Interbank Networks

Interbank Networks[14] are computer networks that connect A.T.M. (Automatic Teller machines) of different banks and thereby transactions between accounts or cards of different issuers are permitted. They earn their revenues by charging fees to every transaction which is processed by A.T.M. of different bank than the one that issued the card used. Through these networks, cardholders are able to complete simple transactions such as withdrawals or balance inquires. Though these networks partially unify the A.T.M. networks of different financial institutions, they are rather expensive

[12] Membership Reward project is a point system where cardholders with every use a specific card are rewarded with some points. These points may be converted into checks which can be used only on specific associate firms.
[13] In Greece, interchange fees that merchants have to pay to issuers varies from 1% to 4% of total transactions made using the terminals that issuers have provided to the merchants.
[14] A list of the most widely accepted interbank networks is illustrated in Table 3 in the Appendix

for the cardholders. Interbank Networks have not been thoroughly studied and therefore consist a rather new field of research.

v) Brand name Firms

The final participant of the credit card network is the brand name firms. There are two different cases of brand name firms. The first case consists of MasterCard Worldwide and Visa Inc. which are Brand name firms that do not issue credit cards. Their main concern is to develop and expand their networks, to increase the security of the transactions and to provide new services in order to satisfy the requirements of cardholders, merchants and issuers/financial institutions. They earn their revenues primary from fees paid by financial institutions. Those fees depend on the transactions volume that each financial institution processes and the related services that are provided. The second case consists of the other brand name firms such as American Express, Discovery etc. which issue cards. There is limited literature on brand name firms and especially to those that do not issue cards since this is a new feature[15].

2.2 Pricing Models

A wide literature has been developed concerning the pricing strategies in credit card network. The first steps in credit card industry even from the early 1980s, was the strategy of merchants to charge higher prices for those who used credit cards and lower for those who paid in cash. Though such strategies are not common today, there still exist a small proportion of merchants that impose additional interchange fees for those who pay with credit cards. A study from the Netherlands (Vis and Toth, 2000), showed that only a 10 per cent of merchants charged different prices for credit card users. This study also found that 60 per cent of the firms that didn't charge different prices stated that their policy was based on the strategy of the firm to provide better services to their customers, one of which was to accept credit cards as an alternative means of payment. Therefore, charging different prices was considered "customer -unfriendly" for the firm. A similar study from Sweden (IMA Market

[15] Mastercard Worldwide stopped issuing credit cards after 2006

Development AB, 2000) has pointed out that only an amount of about 5 percent of merchants imposed additional surcharges to cardholders.

Wright (2003) has also studied the pricing policies in the credit card network. In his research he presented a model analyzing one price policies. He found that one price policy for monopolist merchants, improve the welfare. If this policy is absent, monopolist merchants tent to charge such a price that will extract the consumers surplus. This will result in lowering the revenues of card issuers, since the combination of annual fees (for card issuers) and absence of one price policy (for monopolist merchants) will make the use of credit cards so expensive that consumers will have no incentive to hold cards in the first place.

For competitive merchants, Wright finds that one price policies does not affect welfare. When one price policies are not present, merchants will choose to sell their goods at the level of their cost, increased by the payment's instrument cost, used by consumers and decreased by any additional benefit that the acceptance of a payment instrument may produce. On the other hand, if one price policies are present, merchants will be divided into two categories, those who accept only cash and those who accept card-only payments. So the total welfare will be defined by the level of competition among these two types.

Chakravorti and Emmons (2005) discriminated two separate categories of credit card users, the convenience users and the revolvers. They constructed a model to study the effects of subsidizing the convenience users in order to prevent them from turning to merchants that do not accept credit cards. To finance this subsidy they consider that charging higher interest rates on borrowings could be the suitable means to motivate convenience users to make use of their cards.

2.3. Network Externalities and Network Strategies

Network externalities have been one of the most important features of Network economics. A few researchers have focused their analysis on the impact of Network externalities in credit card market. According to Adrian Masters* and Luis Raúl Rodríguez-Reyes (2005) when merchants make their decision with respect to the credit card acceptance, they do not take into account the impact of their decision on

the other sellers. This decision though, may create additional externalities which could lead to multiple equilibria.

Furthermore, Mingchun and Edison (2007) in their research showed that the interaction among two distinct groups of agents (in our case merchants and cardholders) via a common platform (credit card network) creates additional value to the users of that platform. This positive network externality is able to create the exact opposite problem to both sides of the network. This problem usually referred as the "chicken-and-egg problem" because without sufficient number of merchants accepting the particular platform (card network) few consumers are willing to apply for that specific card and vice versa, if the number of consumers that possess a specific card is limited, merchants have no incentive to accept that card. In their analysis they construct a model in order to introduce ways of overcoming the above mentioned problem. Such strategies include mergers and acquisitions, forming strategic alliances, adjusting product and pricing strategies, etc. An illustrative example which is provided in the above mentioned study is that if most of the consumers carry Visa credit card, merchants accepting Visa card will be able to accomplish higher sales volume from these cardholders.

2.4. Interchange fees

Interchange fees have been a subject of great research and controversy during the last two decades. Baxter (1983) was one of the first who studied the importance of interchange fees. In his study he concluded that interchange fees are necessary in order to balance the demand of consumers and merchants for credit card services and the cost among financial institutions. Furthermore he supported the idea that it is less costly if interchange fees are centrally determined, since thereby the cost of negotiation among the participants of credit card network is negated.

Furthermore, Schmalensee (2002) tried to extend Baxter's analysis by introducing the concept of market power among financial institutions (issuers and acquirers). He concluded that the profit maximizing interchange fees (in terms of issuers and acquirers) is also socially optimal.

A study from Australia (Howard Chang et. al, 2005), examined the impact of the decision of the Reserve Bank of Australia to reduce interchange fees on credit

cards almost at half. They found that, though this reduction benefited merchants, it is still questionable whether it has passed to consumers at all. They showed that the per-transaction price at the POS has not changed significantly and so has the volume of card transactions. The financial institutions managed to recover a percentage of 30% to 40% of the loss of that reduction in the short run. The conclusion of that research was that the goal of reducing the credit card usage, by making it more expensive, was not achieved.

2.5. Competition from other payment instruments

Farrell J. (2006) developed the idea of competitive bias which arises when a payment instrument with high merchant fee is used. Merchants tend to internalize consumers benefit by altering prices. He therefore suggests that a policy benchmark should be used to counterbalance the cost of different payment instruments. In other words, to avoid increase in prices, due to different costs of payment instruments, a policy which counterbalances the cost should be invented to prevent merchants from internalizing consumers benefit.

Scholnick, B. et all (2008) have presented a paper on the main alternative means of payment. They have analyzed the importance of each payment method. The main methods which developed were the credit cards, the debit cards, the A.T.M. and P.O.S. They constructed a model to identify the elements that influence the consumer's choice for each alternative means of payment. They showed that due to the complexity of the credit card pricing area which includes adverse selection, switching costs, search costs, rational consumers, time inconsistency, tacit collusion etc. it is not feasible at present to provide a clear answer as to why consumers choose among alternative payment methods. The lack of useful data confines the ability to provide new evidence on the area.

Part 3

According to Jean-Charles Rochet and Jean Tirole (2002), consumers (cardholders) value their credit cards mainly to the level that they are accepted from the merchants they use to shop, while on the other hand merchants are benefited from the diffusion of cards among consumers. To generalize, most markets that illustrate network externalities are characterized by the presence of two distinct sides (two-sided markets) whose main benefit stems from their interaction which is based on a common platform. Platform owners, or in our case credit card issuers, have to determine a price structure and not only a price level, which means that issuers have to allocate prices between both sides of the market. To put it more clearly, in order to attract a group of users in a network, the sponsor (in our case the issuer) may have to subsidize the other group of users in the network. There are many historical examples, the most illustrative of which is the Adobe case. The Adobe Company could not have succeeded, if it had not priced Adobe reader (pdf) at zero and gradually increased the sales of Adobe writer.

In recent years, many credit card issuing financial institutions have adopted advertising strategies. The advertisement in credit card markets is an emerging strategy which provides firms (merchants) the opportunity to attract new customers. In other words it allows merchants, who decide to adopt credit card acceptance as a payment method, to earn revenues from the cardholders. The collaboration between credit card issuers and merchants is multidimensional.

For issuers, this collaboration is capable of increasing their revenues, since it provides cardholders additional incentives to make use of their cards, so cardholders' valuation of their credit cards increase. Moreover, if the network size is above a minimum, it may be used by merchants for advertising purposes to increase their revenues by attracting a new group of customers who prefer to pay using their cards.

We will examine the monopoly case of credit card market. We assume that Financial Institution will make an advertising revenue, "a" per user of its network (cardholder). So "a" will be referred as the per user advertising rate. Consequently, we can consider "a" to be the per user advertising price that the financial institution sells its exclusive advertising rights. "a" will be high when we have a well targeted

advertising, based on users' preferences/ profile. Since financial institution has a detailed profile of each user (cardholder), the per user advertising price "a" is expected to be quite high.

Analyzing the case where credit card market is free of advertising, we assume that cardholder place a valuation "b" on their credit card. But if advertisements are provided, we expect that users' valuation will decrease from "b" to "b-c", where c could be considered as the distaste or intolerance for advertisements of the cardholders. The valuation of "b" and "c" may vary from one cardholder to another. This means that cardholders are heterogeneous in terms of b and c.

We normalize b to be b ~ uniform [0,1] and assume that c distributes independently of b or else c ~ uniform [0,λ], where λ>0. The assumption of independence is reasonable, since a high valuation of credit cards (b) does not necessarily mean that the cardholders have to illustrate high or law distaste of advertisements. Additionally, we will normalize that the total network size is 1. We finally consider that cardholders may use only one kind of credit card in order to complete their transaction and that if they do not use any credit card they acquire zero utility. Let's suppose that a monopolist merchant decides not to make use of advertisement. In this case, his profits will be $\Pi_0 = (1-P_0)* P_0 =>$

Following the first order conditions we have:

$$\frac{\partial \Pi_0}{\partial P_0} = 0 \Rightarrow$$

$$1 - 2P_0 = 0 \Rightarrow$$

$$\bar{P}_0 = \frac{1}{2}$$

Substituting $\bar{P}_0$ into Π_0 we have:

$$\bar{\Pi}_0 = \left(1 - \frac{1}{2}\right) \times \frac{1}{2} = \frac{1}{4}$$

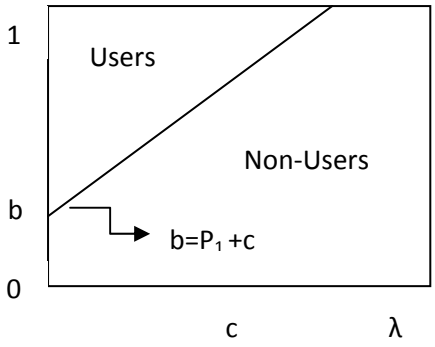
So in the case where monopolist merchant decides not to make use of advertisement through credit card network, the price which is going to maximize his profits is $P_0=1/2$ and the maximum profits are $\Pi_0=1/4$.

Let's consider the case where the monopolist merchant decides to use advertisement as a strategy, through the credit card network. In this case things become a little more complicated.

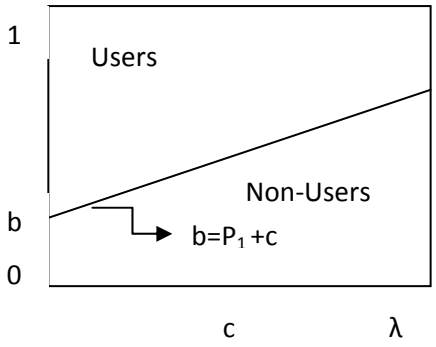
A cardholder of type (b,c) will use his card if and only if the utility that he derives is positive. Or else, if

$$_1(\ ,\ _1) \geq 0$$
$$- _1 - \geq 0$$
$$\geq _1 +$$

We present the following two cases:



Where $P_1 \geq 1-\lambda$,



Where $P_1 < 1-\lambda$

The above figures illustrate which cardholders are going to use their credit cards depending on the different prices of P_1 and λ. Above the line $b=P_1 +c$, cardholders will derive positive utility and thus they will be willing to make use of their cards.

Let's suppose that prices are non negative and that if prices are larger than 1, no consumer will use his credit card as a means of payment. We interpret this as $_1 \in [0,1]$, which could be defined as the price interval of practical interest.

Three main cases could be analyzed considering the price of λ.

Case 1: $\in [\ ,\infty]$

The monopolist's profits are given by the function:

$$_1 = \frac{(1 - _1)^2 \times (\ _1 + \ )}{2}$$

From F.O.C. we have:

$$\frac{\partial \pi_1}{\partial p_1} = 0$$

$$-2(1 - p_1) \times (p_1 + \alpha) + (1 - p_1)^2 = 0$$

$$(1 - p_1) \times (-2p_1 - 2\alpha + 1 - p_1) = 0 \quad (1)$$

From (1) we obtain 2 solutions.

$$p_1 = 1 \qquad -3p_1 - 2\alpha + 1 = 0$$

$$p_1 = 1 \qquad p_1 = \frac{1 - 2\alpha}{3}$$

$p_1 = 1$ is clearly not optimal since $\pi_1(p_1 = 1) = 0$

We have to determine the values of "α" for which $p_1 = \frac{1 - 2\alpha}{3}$ is valid, concerning our initial hypothesis ($p_1 \in [0,1]$).

$$p_1 \geq 0$$

$$\frac{1 - 2\alpha}{3} \geq 0$$

$$1 - 2\alpha \geq 0$$

$$\alpha \leq \frac{1}{2}$$

and

$$p_1 \leq 1$$

$$\frac{1 - 2\alpha}{3} \leq 1$$

$$1 - 2\alpha \leq 3$$

$\alpha \geq -1$, but since "α" is a price it can only take positive prices, so $\alpha \geq 0$.

Consequently, if $\alpha \in \left(0, \frac{1}{2}\right]$ then $p_1 = \frac{1 - 2\alpha}{3}$ is valid and the monopolist's profits are

$$\pi\left(p_1=\frac{1-2}{3}\right)=\frac{2\times(1+\ )^2}{27}$$

If $\geq\frac{1}{2}$ the optimal price is $\bar{p}=0$ and the optimal profits are

$$\pi_1(\bar{p}=0)=\frac{(1-0)^2\times(0+\ )}{2}=\frac{}{2}$$

Case 2: $\in(\ ,\ ]$

In this case, the revenues of the monopolist merchant depend on the price level. Therefore, the profit function can be expressed using two distinct forms as follows:

$$\pi_1=\begin{cases}\dfrac{(2-\ -2\ _1)\times(\ _1+\ )}{2}, & \ _1\in[0,1-\ ]\\ \dfrac{(1-\ _1)^2\times(\ _1+\ )}{2}, & \ _1\in[1-\ ,1]\end{cases}$$

From F.O.C. we find three solutions:

1) $\ _1=\frac{1-2}{3}$ (in order to be valid, $\ _1$ has to be on the interval $[1-\ ,1]$)

2) $\ _1=1$ (not optimal as shown above)

3) $\ _1=\frac{2-\ -2}{4}$ (in order to be valid, $\ _1$ has to be in the interval)

To determine the monopolist optimal price and profit we will have to compare the profits at valid critical points and at the boundaries

$$(\ _1=0,\ [\ ]\ _1=1-\qquad\ _1=1)$$

We have already shown that $_1 = 1$ is not optimal so it is rejected.

In order to be able to analyze the remaining points we will have to discuss different prices of λ within the interval of our initial case (case 2).

If $\in \left(, - \right]$, we could easily show that $_1 = \frac{1 - 2}{3}$ is not a valid critical point since it is not within the interval $[1 - , 1]$, for every price of $\in \left(0, \frac{1}{2}\right]$.

If $\in \left(0, \frac{2 -}{2}\right]$, the optimal price is $_i = \frac{2 - - 2}{4}$ and substituting in the profit function we have

$$_i\left(_i = \frac{2 - - 2}{4} \right) = \frac{\left(2 - - 2 * \frac{2 - - 2}{4}\right) \times \left(\frac{2 - - 2}{4} + \right)}{2} = \frac{(2 - - 2)^2}{16}$$

And if $\in ((2 -)/2, \infty], +$ then the optimal price is $_i = 0$ and the optimal profits are

$$_i(_i = 0) = \frac{(2 - - 2 * 0) \times (0 +)}{2} = \frac{(2 -) *}{2}$$

If $\in [-,]$, and if $> \frac{2 -}{2}$, then neither of the potential prices are valid critical points. So the optimal price is $_i = 0$ yielding to optimal profits

$$_i(_i = 0) = \frac{(2 -) *}{2}$$

If $\leq \frac{3 - 2}{3}$, then $_1 = \frac{1 - 2}{3}$ is a critical point and the optimal profits are:

$$_i\left(_i = \frac{1 - 2}{3} \right) = \frac{\left(1 - \frac{1 - 2}{3}\right)^2 \times \left(\frac{1 - 2}{3} + \right)}{2} = \frac{2 \times (1 +)^3}{27}$$

Finally if $\in \left[\frac{3 - 2}{3}, \frac{2 -}{2}\right]$, the optimal price is $_i = \frac{2 - - 2}{4}$ and the responding optimal profits are:

$$_i\left(_i = \frac{2 - - 2}{4} \right) = \frac{\left(2 - - 2 * \frac{2 - - 2}{4}\right) \times \left(\frac{2 - - 2}{4} + \right)}{2} = \frac{(2 - - 2)^2}{16}$$

Comparing the profits of the two initial cases, considering merchant's decision to adapt or not advertising strategies through the credit card Networks, we will find the conditions under which each case is more profitable.

The profits if merchant decides not to make use of advertisement, as shown above, are:

$$\pi = \frac{1}{4}$$

So if $\pi = \pi = \frac{1}{4}$, the merchant will be indifferent between them.

Solving the above problem we see that in all cases, $= \frac{}{2}$

To summarize, the monopolist's decision to adapt advertising strategies through the credit card network, depends on the market structure. If $> \frac{}{2}$, the monopolist will prefer to use advertisement through the credit card network as a means to increase his profits. On the other hand, if $< \frac{}{2}$, monopolist will prefer not to use advertisement through the credit card network, since such a strategy will make his profits diminish.

The main point is that if financial institutions are capable of influencing the prices of «α» and/or «λ», which means that if financial institutions are able to provide visually pleasing and well-targeted advertisement to cardholders, we expect to have relatively low λ and relatively high α.

Since cardholders are well-targeted groups[16], financial institutions could use targeted ads, instead of making advertisements that may increase the cardholders distaste or intolerance to them. Targeted ads would result in an increase of α (per user advertising rate) and a decrease on λ (distaste or intolerance of advertisement). Targeted ads could lead in an increase of financial institutions' profits from advertisement, since more merchants would prefer using credit card network in order to be advertised.

[16] Financial institutions are keeping records on personal data of their customers (cardholders)

CONCLUSION AND FUTURE RESEARCH AGENDA

The main point of this study was to show whether the internalization of externalities of credit card network could result in an increase of participants' benefit. We have found that under certain conditions, merchants' decision to use credit card network for advertisement could result in a significant increase of their profits.

Financial institutions could be able to influence the effectiveness of advertisement through credit card networks by providing targeted ads to the cardholders. The availability of the personal data of the cardholders, by the issuers could be used to improve the effectiveness of advertisement.

Here arises a new ethical and legal dimension of the issue stated above. Should, financial institutions, be able to use the personal data of their customers for advertising purposes? Additionally, which personal data could be considered "sensitive" and thus should not be accessible by affiliates of financial institutions for advertising purposes.

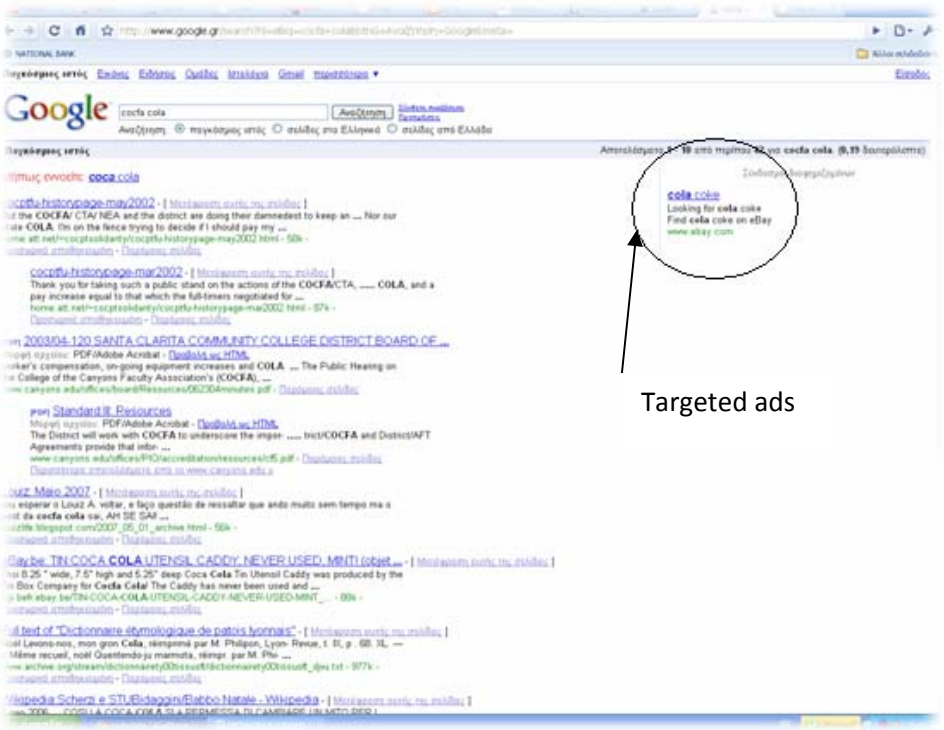
There appear to be some limitations considering the study of the credit card network and therefore further studies should be made. The main constraints for additional research are that there are no sufficient data available considering the credit card network and thus, it is difficult to verify the consistency of the models available. Furthermore, the complexity of the credit card networks, since at least five participants have already been identified, makes it difficult to study. The interaction between the members of that network may differentiate the outcome of the theoretical approaches.

Finally, the perpetual technological development and the simultaneous increase of the services available through the credit card networks, require continual

research. Internet technology could also be used as a rather new area of advertising through credit card networks or, to be more general, new advertising methods should be studied and applied to credit card networks in order to fit the new circumstances.

APPENDIX

FIGURE 1



(Source: http://www.google.com)

TABLE 1

Characteristics of Credit Card Network's Participants			
Type of Participant	**Function**	**Benefits**	**Costs**
Cardholder	• Purchases goods and services	• Convenience of making purchases without carrying cash • Ability to time payments to match cash flows • Access to credit • Access to float • Use of bonus features	• Interest rates and fees • Difficulty managing credit
Merchants	• Sells goods and services	• Access to large number of consumers • Ability to sell to consumer needing credit without carrying credit risk • Guaranty of payment	• Need to pay interchange fees on sales to cardholders • Loss of private credit accounts (customer loyalty, marketing information, interest income)
Issuing Bank	• Collects payments from cardholders • Extends credit to cardholders • Distributes cards • Finances receivables • Authorizes transactions • Ability to collect on interest rate spreads	• Ability to collect fees from cardholders • Ability to share in interchange fees from merchants • Ability to cross-sell to consumers	• Operational costs • Fraud risk • Credit risk
Acquiring Bank	• Issues payments to merchant • Routes information enabling authorization, billing, and payment to merchant	• Shares in interchange fees from merchants	• Operational costs • Some fraud risk
Card Association	• Promotes the brand • Establishes rules,	• Collects transaction fees	• Marketing costs • Cost of fraud reduction

	standards, and protocols governing participation in network • Sets interchange fee structure	• Collects assessment fees	programs • Operational costs of maintaining network
Source: Federal Deposit Insurance Corporation.			

TABLE 2

2007 global market share of general-purpose cards (purchase volume)		
	BRAND NAMES	***GLOBAL MARKET SHARE***
1	Visa	60 percent
2	MasterCard	28 percent
3	American Express	10.5 percent
4	JCB	0.9 percent
5	Diners Club	0.5 percent

(Source: Nilson Report, May 2008)

TABLE 3

Interbank networks by region	
Multiregional	Cirrus - Maestro - PLUS
Africa	CashNet - CMI - Interswitch - SASWITCH
Asia Pacific	1LINK - ACS - ALTO - Artajasa - atm[5] - ATM BCA - ATM Bersama - ATM BII (Superkasa) -ATM Pool - BancNet - BANCS - Bankline - Cashnet - CashTree - Dutch-Bangla Bank nexus - ENS - ETC - Expressnet - FISC - Himbara - JETCO - EPS - Link - MICS - MEPS - MegaLink - MITR - MNET - NFS - Nationlink - Omnibus - UnionPay - Yucho
Caribbean	ATH - Caricard - CarIFS - InfoLink Services Limited - Midas - Unired
Europe	4B - Altın Nokta - BamCard - BankAxept - Banklink - Bankomat - BKM - CB - DIAS - Equens - Eufiserv - Euronet - Euro 6000 - girocard (Cash Group, CashPool) - LINK - Multibanco - Ortak Nokta - Otto. - Sbercard - ServiRed - StarNet - Zolotaya Korona
Middle East	123 - BANCS - Bankernet - CSC - JoNet - NAPS - OmanSwitch - Shetab - SPAN - UAE Switch
North America	Abby - ACCEL/Exchange - Access 24 - Advantage - AFFN - Alaska Option - Alert - Allpoint - Annie - ARN - Award - BankMate - BOH - Cash Station - Checkokard - CO-OP - Credit Union 24 - Credomatic - Discover Network - Easy Answer - Express - Express Teller - Fastbank - Gulfnet - HandiBank - Handy 24 - Honor - Instant Cash - Instant Teller - Interlink - Interac - Jeanie - KETS - LYNX - MAC - Magic Line - Member Access Pacific - Minibank - Money Belt - Money Network - MoneyMaker - Money Station - MOST - MPact - Networks - NYCE - Peak - Presto! - Pulse - Quest - RED - Red Total - SC 24 - Service Card System - SHAZAM - STAR - SUM - The Exchange - Transact - Transfund - TX Network - Tyme - Universal Money Center - Via - X-PRESS 24 - Yankee 24

South America	Banelco - Banred - Conexus - GlobalNet - Link - Redbanc - Suiche 7B - Telebanco - Unicard

(Source: http://en.wikipedia.org/wiki/Interbank_networks)

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