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**FIRST COME, FIRST SERVED:
AN ANALYSIS OF PIONEER AND FOLLOWER FIRMS' MARKET AND NON-
MARKET ACTIONS IN THE EUROPEAN MOBILE TELEPHONE INDUSTRY***

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Abstract

This study examines the relationship between erosion of the first-mover's market share and the differences in competitive behaviour of pioneer firms and followers. Particularly, we pay particular attention to market actions related to innovation, pricing and promotion, and to non-market actions related to judicial issues. The empirical study has been carried out with companies that are present in a dynamic context, such as the European mobile telephone industry. Our results show that when followers take more non-market actions than pioneers the negative effect on the first-entrant's advantage is more significant. On the contrary, we have not found a significant impact of innovating and pricing actions.

Keywords: First-mover advantage, non-market actions, legal actions, mobile industry, competitive dynamics.

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1. INTRODUCTION

The dynamic nature of many of today's markets casts doubt on whether it is possible to construct sustainable competitive advantages (D'Aveni, 1994), including the maintenance of 'first-mover advantages'. This fact is reflected by the way the study of competitive dynamics has gained strength (Hoskinsson *et al.*, 1999). Strategies are indeed dynamic, which is why firms must be alert to their competitors' moves and ready to respond.

The interdependent nature of firms' actions can be clearly seen in the relationship between pioneers and followers. Follower firms need to develop competitive behavior that will enable them to erode the pioneer's advantage. Pioneer advantages, however, have been shown to be sustainable over many different industries (Robinson, 1988; Robinson and Fornell, 1985; Urban *et al.*, 1986; Lieberman and Montgomery, 1998), even in fast-changing industries where it is easy to copy competitor's actions (Makadok, 1998). This does not mean, though, that all strategies and actions taken by followers are equally ineffective at reducing the pioneer's advantage. Our objective is to gauge how effective different types of competitive actions are at eroding the pioneer's position.

A firm has a range of alternatives - such as pricing actions, marketing actions, new product actions, capacity actions, and signaling actions - that can be used in the fight against competitors (Ferrier, 2001). These are all market actions, but a firm can also take the battle into the public policy arena with legal, regulatory, legislative and public relations issues (Spulber, 2003). These non-market actions can be used to construct competitive advantages and to offset competitive disadvantages (Baron, 1995, 2002). The inclusion of non-market actions in business strategy is necessary in

industries where many opportunities are controlled by government (Baron, 1995). It is also critical when the business models and technologies are easily copied (De Figueiredo and Spiller, 2000).

This study analyzes the effect of different market and non-market actions on the pioneer firm's advantage in the European mobile telephone industry between 1997 and 2000, the period when competition was introduced and developed in the market. During this period the industry was characterized by its dynamism and growth, measured in number of clients. We pay particular attention to market actions related to innovation, and pricing and promotion, and to non-market actions related to judicial issues.

The paper contributes to the literature in several ways. First, it combines two lines of research on competitive dynamics: pioneer advantage and competitive actions (Ketchen *et al.*, 2004). It also attempts a combined analysis of market and non-market actions, which, excepting Shaffer *et al.* (2000), is not common in empirical research (Hillman *et al.*, 2004).

Second, it considers judicial processes and decisions, and the effects of non-market actions on the performance of firms. Despite increased research into non-market actions over the last two decades (Kein and Baysinger, 1988; Schuler, 1996; Hillman and Hitt, 1999), neither of these areas have received much attention (Hillman *et al.*, 2004).

Third, this study includes all the European Union countries, plus Norway and Switzerland. Most studies on pioneer advantages have been carried out on US industrial firms (Lieberman and Montgomery, 1998). Something similar has happened with non-market strategies (Hillman and Hitt, 1999), which is not surprising considering the institutional differences among countries (Baron, 1997).

Finally, having information available on competitive actions over a four-year period allows us to perform a longitudinal study, one of the research opportunities in the competitive dynamics field (Ketchen *et al.*, 2004).

The paper is set out as follows. In the next section we present the conceptual foundations and put forward our hypotheses on the relationship between differences in pioneer and follower firms' competitive behavior and the erosion of 'first-mover advantages'. The empirical analysis is presented in the subsequent section. We conclude with a discussion of results and a review of implications, limitations and directions for future research.

2. THEORY AND HYPOTHESES

To construct competitive advantages a firm must embark on a series of actions that will always be closely watched – when not directly countered – by competitors. This makes analyzing the dynamic aspects of strategy ever more important. The performance of many firms depends not only on what they do, but also on what their rivals do (Dixit and Nalebuff, 1991). This makes firms interdependent. Competition, then, is a dynamic process in which the participants make series of moves in the market that have significant effects on rivals (Chen and Hambrick, 1995).

These aspects are even more important in dynamic markets, where the difficulty of building sustainable competitive advantages makes it advisable to replace them with a series of successive advantages over time (D'Aveni, 1994; Ferrier *et al.*, 2001; MacMillan, 1988). In fast-changing environments, trying to hang onto an advantage based on specific resources or on static capacities for as long as possible will normally produce unnecessary costs for the firm (Fiol, 2001).

The construction of competitive advantages in fast-changing environments has been studied by the fields of dynamic capabilities (Teece *et al.*, 1997) and competitive dynamics (Smith *et al.*, 1992). Both approaches are rooted in the Austrian School of Economics (Hayek, 1948; Kirzner, 1973), one of whose basic propositions is the constant disequilibrium of the market.

Dynamic capabilities studies the processes by which existing resources are enhanced or new resource configurations to address fast-changing environments are built (Teece *et al.*, 1997; Eisenhardt and Martin, 2000), while competitive dynamics studies the business actions that these processes support. Empirical research on competitive dynamics has attempted to explain both the causes and consequences of actions and responses, especially the performance consequences of these dynamics (Smith *et al.*, 2001).

Competitive actions help firms build resource endowments (Young *et al.*, 1996), establish market positions, and react to rivals' moves. Researching pioneer advantages and how to erode them, then, lends itself to a dynamic analysis given the eminently interactive relationship between pioneer and follower firms: followers must take actions designed to erode the advantage of the pioneer, who must in turn react to these actions to conserve the advantage.

Competitive Activity

A priori, it would appear that being active in the market should bring a competitive advantage in a fast-changing environment. An efficient firm, but one that does not make new competitive moves in the market, will soon see its competitive advantages eaten away by its more active rivals and will be unable to maintain its success over time (Schumpeter, 1942). Therefore, firms that continually launch new

competitive moves and react to those of their competitors will obtain competitive advantages (D'Aveni, 1994; Smith *et al.*, 2001). All in all, then, in dynamic industries it is clear that firms that launch more market actions improve their performance and worsen that of their rivals (Smith *et al.*, 1992). Empirical research has found a positive relationship between performance and number of competitive actions in a given period (Young *et al.*, 1996; Chen and MacMillan, 1992; Miller and Chen, 1994; Ferrier *et al.*, 1999). In addition, a significant negative linear relationship between a firm's competitive intensity and its rivals' stock market wealth (Ferrier and Lee, 2002) has been found.

This suggests that if follower firms have a more aggressive competitive behavior and carry out more actions than pioneers, they will make bigger inroads into the pioneer's market share. This leads us to formulate the following hypothesis:

Hypothesis 1: The more competitive actions followers take in relation to pioneers, the bigger the erosion of the pioneer's market share will be.

Types of actions

Although some research has been done on the strategic behavior of pioneers and followers (De Castro and Chrisman, 1995), the behavior patterns that the two conform to are still not clear. They can use different types of actions, or the same actions with different degrees of success. In fact, a fundamental advantage of followers is that they can learn from the pioneer's mistakes (Lieberman and Montgomery, 1988; Kerin *et al.*, 1992).

A firm can use several types of market and non-market actions to implement its strategy. Each of these will have distinct consequences in terms of resources involved and degree of irreversibility. This makes it likely that their ability to erode (in the case

of follower firms) or defend (in the case of pioneer firms) the first-mover advantage will also be distinct, as will the possibilities of putting them into practice. Among market actions Schnaars (1994) highlights the role of innovation, lower prices and marketing to eliminate the pioneer's advantage, while among non-market actions Baumol (1993) calls attention to the use of litigation. We will go on to analyze the relationship between each of these and the maintenance of the pioneer's advantage in the mobile telephone industry.

Innovation

It is well known that innovation brings competitive advantages (Schumpeter, 1934; Bayus *et al.*, 2003). Smith *et al.* (1992) showed that the launch of new products brought greater benefits to firms than other actions such as price cuts or advertising campaigns. A positive and significant relationship has also been detected between the rapid introduction of incremental product innovations and performance measured by stock market wealth (Lee *et al.*, 2000), market share (Banbury and Mitchell, 1995) or sales growth (Ferrier, 2000).

Follower firms can erode pioneer advantages most easily through innovation, especially in technology intensive industries (Golder and Tellis, 1993; Carpenter and Sawhney, 1996). Technology improvements have been empirically proved to be an important source of competitive advantage for followers (Bohlmann *et al.*, 2002). Likewise, Shankar *et al.* (1998) have shown that when new entrants are innovators they create a competitive advantage and grow more rapidly than the pioneer firm. This all leads us to the following hypothesis:

Hypothesis 2: The more innovation actions followers take in relation to pioneers, the bigger the erosion of the pioneer's market share will be.

Pricing and promotion

Price reductions and promotions, both permanent and temporary, affect sales in the short term more than any other marketing action (Tellis, 1988; Sethuraman and Tellis, 1991; Deighton *et al.*, 1994; Nagle and Holden, 2002). This is why they are so commonly used to increase market share, in spite of their negative impact on profitability (Ailawadi *et al.*, 2001). Price reductions and promotions boost demand for a product (Folkes *et al.*, 1993; Ailawadi and Neslin, 1998; Ailawadi *et al.*, 2001). It has been shown that they are a good tool for capturing new clients and increasing the consumption of existing ones (primary demand) (Bell *et al.*, 1999; Van Heerde *et al.*, 2000; Nijs *et al.*, 2001). They also provide a good way of tempting clients away from rival firms (secondary demand) (Gupta, 1988; Bell *et al.*, 1999; Ailawadi and Neslin, 1998).

Follower firms tend to compete by lowering their prices when they are not able to find sources of differentiation (Covin *et al.*, 1999). This makes it likely that follower firms will set rock-bottom prices to increase their market share at the expense of the pioneer (Kotler, 1997; Dutta *et al.*, 2002).

Therefore, if follower firms are more active cutting prices and using marketing campaigns than pioneers, they will be able to take market share from the pioneer – which brings us to our third hypothesis:

Hypothesis 3: The more pricing and promotion actions followers take in relation to pioneers, the bigger the erosion of the pioneer's market share will be.

Non-market strategy

Non-market actions complement –sometimes even replace– more conventional actions designed to implant the competitive strategy (Yoffie and Bergenstein, 1985;

Baron, 1995, 1997). Firms use them to deal with constraints imposed by legal regulations and social concerns (Spulber, 2003). Nowadays, “using legal tools for competitive advantage is a requirement – not an option - in business” (Shell, 2004). Managers need to understand and use them (Keim, 1981) with the same long-term perspective required by the rest of the firm’s strategic decisions (Yoffie, 1988).

In this study we focus on legal actions that involve filing suits to courts or regulatory agencies. These measures may be taken for different purposes, such as protecting rights, handicapping a competitor, or gaining a direct advantage (Baron, 2002). In other words, the decision to take legal action depends more on strategic than legal considerations (Shell, 2004). The use of private anti-monopoly suits has, in fact, delayed competition instead of promoting it (Posner, 1976).

Entangling firms in lawsuits, with the accompanying publicity they bring, negatively affects the defendant’s reputation (sham litigation). Measures of this type can be more effective than conventional actions like advertising campaigns (Keim, 1981). First, a lawsuit for abuse of a dominant position can turn public opinion against the incumbent firm and cause its sales to drop. Second, legal action can distract the attention of the managers of the firm taken to court (Salop and White, 1986). Litigation is a useful strategy even if it is ultimately unsuccessful, as it is guaranteed to distract, delay, and bring costs to rivals (Baumol, 1993; De Figueiredo and Spiller, 2000). This is true even if the legal case is built on weak arguments (Shell, 2004). Third, in fast-changing markets surprising the competition is vital (D’Aveni, 1998). Legal actions are probably more unexpected and imaginative than competitive actions, a factor that may increase their effectiveness. In fact, it has been shown that litigation between firms causes the defendant significant losses of wealth (Bhagat *et al.*, 1998; Bizjak and Coles,

1995). In addition, the possibility of having restrictions placed on competitive behavior is more damaging than the threat of fines (Bizjak and Coles, 1995).

Therefore, if follower companies are more active than pioneers in taking legal action, we expect the following hypothesis to be correct:

Hypothesis 4: The more legal actions followers take in relation to pioneers, the bigger the erosion of the pioneer's market share will be.

To sum up, followers have a series of market and non-market actions at their disposal that can significantly erode the pioneer's advantage. The model we put forward is illustrated in Figure 2.1.

[INSERT FIGURE 2.1]

3. RESEARCH METHODOLOGY

Empirical setting

The empirical setting for our study is the European mobile telephone industry. We specifically focus on companies that are present in the EU, Norway and Switzerland¹ with digital technology (GSM-1800, DCS-1800), also known as second generation systems.

Providing mobile telephone services depends on gaining access to a scarce resource: the frequency spectrum. Any company wishing to operate in this industry needs to obtain a license from the regulatory body of the country in which it wants to work². These licenses limit the geographical market where you can work, so companies compete in national markets.

¹ Norway and Switzerland are included because the characteristics of their mobile telephone industries are similar to those of the other countries in the sample and because of the high level of penetration of this service.

² We focus on companies that develop their own mobile telephone network with the idea of later exploiting it. We do not consider 'virtual operators' whose only goal is to exploit networks that third parties have developed.

The mobile telephone industry has gone through three stages, each clearly defined by the technology used. The first began in the 1980s with the commercialization of analog, or first-generation, systems³. As the analog networks of the different operators were incompatible with each other, it was impossible to connect networks either within or between countries. The monopolies that operated in the conventional wireline telephone industry obtained licenses to work with this technology⁴.

Digital, or second-generation, systems began to be offered in some EU countries at the beginning of 1993, first GSM-900 and then DCS-1800⁵. These systems had the advantage of offering compatibility to operators in the EU, Norway and Switzerland: a call could start in one operator's network and end in another's. With the arrival of this technology governments decided to open their markets to competition, though not at the same time. In Sweden, Germany, Denmark and Portugal licenses were immediately granted⁶, thereby eliminating the monopoly that had existed with analog technology. In Switzerland and Luxembourg, however, the regulatory bodies took more than four years to grant a second license. In Finland, the company that was working with analog technology received its license to work with digital technology almost a year later than the first mover.

Licenses for third generation systems (UMTS) were granted to companies in 2001. This technology uses a wider bandwidth, which opens the door to services such as

³ These systems could operate in a bandwidth of 450 or 900 Megahertz (MHz).

⁴ The United Kingdom was the only country to grant a license to operate with analog technology to a company (*Vodafone*) that was not working in the fixed telephone market. Greece and Luxembourg are the two countries where no companies worked with analog technology.

⁵ These systems could operate in a bandwidth of 900 or 1800 MHz respectively.

⁶ One of these licenses was, however, for a company that was already operating with analog technology. Although most of the companies operating with analog technology were monopolies, they were not discouraged from working with digital technology. For example, in Austria, Belgium and Ireland (among others), digital licenses were only granted to the analog operators, who wasted no time in starting operations.

downloading MP3 sound files and MP4 video files, along with high-speed Internet access. This network will be compatible worldwide.

There are, then, two types of technological change in the mobile telephone industry (Figure 3.1):

1. *Radical*

When going from one technological generation to another: This change obliges the operator to upgrade parts of the existing network such as base stations⁷. The new technology offers better voice and data transmission.

2. *Incremental or continuous*

a) When introducing small improvements to the technology: For example, going from TMA 450 to TMA 900 in an analog system or from GSM 900 to DCS 1800 in a digital system.

b) When introducing new services with the same technology: For example, the GSM system allows data transmission (up to 9,600 bits/sec), short message services, e-mail and Internet access, etc. It also allows additional services such as redirecting calls, three-way calls, holding calls and restrictions on in-coming and out-going calls.

[INSERT FIGURE 3.1]

The mobile telephone industry has a number of features that make it particularly well suited to a study of the sustainability of pioneer advantages in a fast-changing environment.

First, it is a regulated industry where the license constitutes the main resource and is a prerequisite to enter the market. Once in the market, the pioneer would not

⁷ These are the fixed installations with antennas, transceivers, power, etc necessary for communication among the mobile telephone users in the base station's area of coverage.

appear to enjoy significant advantages. The technology is accessible to all the competitors. The cost of changing from one operator to another is the only restraining factor, specifically the lack of telephone number portability until 2000⁸ and the fact that network economies permit better conditions to be offered to the network's own members. On the other hand, incumbent operators have been forced to allow competitors to use their base stations during an agreed time.

Second, it is a highly concentrated industry (a maximum of five operators in each national market). This structure makes it more likely that companies will be mutually dependent, which in turn makes it easier to spot the competitive actions of all the companies operating in the countries under study. Most research up to now – in an attempt to guarantee the existence of competitive actions - has focused only on non-diversified US companies with high levels of sales (Miller and Chen, 1994, 1996; Young *et al.*, 1996; Ferrier *et al.*, 1999).

Finally, the number of users of digital mobile telephone services has increased greatly in a short time – something that makes analysis possible in highly dynamic environments (D'Aveni, 1994). Graph 3.1 shows the service penetration at the beginning and end of the sample under study.

[INSERT GRAPH 3.1]

Sample Selection

As we stated in the previous section, the sample for this study comes from companies that operate in the digital mobile telephone industry with GSM 900 or/and DCS 1800 networks⁹. The sample for this study consists of 52 European mobile telephone companies – 22 market pioneers and 30 follower firms - that operate in the

⁸ Only the United Kingdom brought forward the portability of numbers to 1999.

different countries of the European Union, Norway and Switzerland¹⁰. We define a market pioneer firm as one that was the first to commercialize mobile telephone services in a specific geographical market. In all other cases we define the firms as followers¹¹.

We constructed a database containing competitive activity information between pioneer and follower firms from 1997 to 2000¹². We have taken 1997 as the first year of the sample because at this time there were at least two firms competing in the digital technology market in all of the countries. It is, then, possible to study a group of pioneer firms (those that were able to reap the potential benefits of entering the digital technology market first) as well as the followers. Our cut-off point was 2000 because in 2001 third generation (UMTS) licenses began to be granted¹³. No firms in this industry have disappeared, thus avoiding the problems of survival bias pointed out by VanderWerf and Mahon (1997).

The study uses the number and characteristics of competitive moves to measure competitive behavior. We have used structured content analysis (Jauch *et al.*, 1980), a technique employed in many other studies of dynamic strategy (overviews are found in Grimm and Smith (1997) and Ferrier *et al.* (2001)), to identify the competitive moves of all the companies under study. Although most research on competitive dynamics has used an annual aggregate (Chen, 1996; Ferrier, 1995), in this study we use six-month

⁹ From now on, all companies referred to in the study will have and commercialize GSM 900 and/or DCS 1800 networks.

¹⁰ Sweden has been excluded from the sample because the three operators here started up at the same time.

¹¹ In this study we do not take into account Golder and Tellis's (1993) concept of 'pioneer product', because infrastructure suppliers and operators develop the new technologies in the mobile telephone industry together.

¹² As some of the companies began their commercial activity after 1997, we have included information from the time that they began to operate in the industry until the end of 2000.

periods because it enables us to collect more information on the dynamics of the competitive process.

The data on operators' competitive actions were obtained by electronically searching the main general and business newspapers in the countries where they were working, along with several European trade journals from the telecommunications industry - all included in the Reuters database¹⁴.

We collected our data in the following way. First, the authors, with the help of several Strategic Management professors and professionals working in the industry, identified the most common types of actions in the European digital mobile telephone industry and sorted them into categories such as innovation, pricing and promotions, and legal (see Table 3.1). Second, we searched for all news items - by company and year – published in the newspapers and trade journals where the operator was working. Third, the coders¹⁵ read all the new items obtained in the previous stage and entered the articles they felt contained information on a competitive move in a database¹⁶. Out of a total of 22,391 articles selected in the second stage, 1,776 were coded as competitive actions.

[INSERT TABLE 3.1]

Intercoder reliability is needed in content analysis because it measures how far the different judges tend to assign exactly the same rating to items (Tinsley and Weiss, 2000). To verify the level of 'intercoder agreement' among coders we had them go over

¹³ This innovation is interesting in the competitive process of the companies, but because no company commercialized the technology until after 2004 – plus the press speculation about the granting of licenses in 2001 – we decided to exclude data from the sample after 2000.

¹⁴ This electronic database is useful because it gives us a summary in English of all the news items published on the telecommunications industry in the main general and business newspapers of the countries under study. We decided to omit Luxembourg due to lack of information.

¹⁵ One of the authors and two strategic management students who had been specially trained for the task were the coders.

¹⁶ To avoid repeating news stories only the earliest chronological appearance of a news item was retained.

10% of the news items from the sample together. The three coders agreed on the identification and classification in 97% of the actions¹⁷. The Cohen's Kappa (Cohen 1960, 1968) average was 0.942¹⁸. Both coefficients indicate a high degree of intercoder reliability (Neuendorf, 2002), which is important because it allows the researcher to divide the coding work among many different coders (Neuendorf, 2002). In this case, 90% of the remaining news items were coded by just one person.

Measurement of variables

Independent variable

We have used four variables of competitive activity. For each one we have calculated a difference score by subtracting the follower's value from that of the pioneer (Ferrier *et al.*, 1999; Ferrier *et al.*, 2002).

Competitive intensity. The total number of competitive actions taken by the follower firm 'j' in a specific period and market minus those taken by the pioneer firm 'i'.

Innovation actions. The total number of innovation actions taken by the follower firm 'j' in a specific period and market minus those taken by the pioneer firm 'i'.

Pricing and Promotion actions. The total number of price cutting or promotional actions taken by the follower firm 'j' in a specific period and market minus those taken by the pioneer firm 'i'.

Legal actions. The total number of legal actions taken by the follower firm 'j' in a specific period and market minus those taken by the pioneer firm 'i'.

¹⁷ Percent agreement (PA)_{1,2}=0.964; PA_{1,3}=0.964; PA_{2,3}=0.982.

¹⁸ Cohen's Kappa (CK)_{1,2}=0.931; CK_{1,3}=0.930; CK_{2,3}=0.965.

Dependent variable

We have used a measurement of how far the follower firm ‘j’ eroded the market share of the pioneer firm ‘i’ as the variable dependent (Ferrier *et al.*, 1999; Ferrier, 2001)¹⁹; this is a commonly used relative performance variable in this field.

$$\text{Erosion}_{ijtm} = (\text{Gap}_{ij(t-1)m} - \text{Gap}_{ijtm}), \quad \text{where}$$

$\text{Gap}_{ijtm} = \ln(\text{CM}_{imt}) - \ln(\text{CM}_{jtm}),$
 $i = 1, 2, \dots, I$ pioneer firms
 $j = 1, 2, \dots, J$ follower firms
 $t = 1, 2, \dots, T$ periods
 $m = 1, 2, \dots, M$ countries
 $\text{CM} =$ market share

We obtained the information on each firm’s market share and geographical market from the trade journal *Mobile Communications*²⁰.

Control variables

We included five variables in the analysis to control for the potential effects in the erosion of the pioneer’s market share. The exact definitions of the control variables are given in Table 3.2.

[INSERT TABLE 3.2]

It has been shown that being the first entrant in the market is less important than being alone in the market for a long period of time (Huff and Robinson, 1994; Brown and Latín, 1994). The reason for this is that the pioneer company can exploit the advantages of being first for longer (Lieberman and Montgomery, 1998; Carpenter and Nakamoto, 1989; Robinson *et al.*, 1992). In addition, many studies have proved that there is a strong relation between order of entry and performance (Lee *et al.*, 2000; Makadok, 1998; Green *et al.*, 1995; Kalyanaram and Wittink, 1994). It has been empirically shown how in some cases, however, an early second entrant has obtained

¹⁹ It is possible for more than one company to enter a new geographical market at the same time. In this case, these companies are classified as pioneers, even though they have not been operating in a monopoly situation.

²⁰ We are grateful to *Telefónica Móviles* for giving us access to this source of information.

better performance than the pioneer company (Conner, 1988; Smith *et al.*, 1992), thus negating the first entrant's potential advantage. All of this led us to include the variables 'months in monopoly', which reflects the time that governments took to open their markets to competition, and 'order of entry', which indicates which follower firm began to compete in the industry first.

Another factor that is relevant to the level of competition and the performance of the firms is industry life cycle (Porter, 1980). This approach includes the variables 'penetration' and 'growth' as proxies for the stage of the life cycle of the mobile telephone service in each geographical market analyzed. Several studies have shown the importance of these structural variables in firms' performance (Deephouse, 1999; Lieberman and Montgomery, 1998; Pan *et al.*, 1999)²¹.

Finally, we have included a variable that measures the market share that the pioneer company had in the period previous to the study. This is important as the bigger a company's market share, the easier it is to take away (Ferrier *et al.*, 1999; Caves *et al.*, 1984; Davies and Geroski, 1997).

Model Specification

To test the hypotheses, we performed multiple regression analyses using ordinary least squares (OLS) appropriate for processing panel data. The following equation tests Hypothesis 1, concerning 'competitive intensity'²²:

$$Erosion_{ijm} = \beta_0 + \beta_1 * Competitive\ Intensity_{ijm} + \beta_2 * Months\ in\ monopoly_m + \beta_3 * Market\ Growth_{tm} + \beta_4 * Service\ Penetration_{tm} + \beta_5 * Order_j + \beta_6 * Pioneer's\ market\ share_{i(t-1)m} + \varepsilon_{ijm} \quad (1)$$

²¹ The variable 'concentration' has been used in previous studies. We have not included it in this model because of its high correlation with 'pioneer's market share' in the previous period (0.84) and with 'months in monopoly' (0.58).

²² As 'erosion' takes account of the effect at the end and beginning of period 't', we have not backdated the dependent variables for any period.

Hypotheses 2, 3, and 4 address the effect of the type of action on the erosion of the first entrant's advantage. We test these hypotheses with a second model similar to that specified in equation (1). We remove the independent variable 'competitive intensity' and add three other independent variables: 'innovation', 'pricing and promotion', and 'legal actions'.

The analysis of longitudinal data with ordinary least squares is subject to violations of the conventional suppositions, mainly homocedasticity and auto-correlation. Not taking account of these problems could cause the estimations to be biased, resulting in an inflated statistical F value (Bergh and Holbein, 1997).

In our case, with information on firms from different countries, it is highly likely that we have a problem of heterocedasticity. The Cook-Weisberg statistic indicates the presence of heterocedasticity when using models of ordinary least squares. To get around this problem, we used generalized least squares – specifying that the error structure was heterocedastic – to ensure that the standard errors were robust.

To study the possible presence of serial correlation we performed the Wooldridge test, which confirmed the existence of an auto-correlation problem in the data. To account for the panel structure of the data, we used a generalized least squares estimator for the linear regression that corrects for the error term auto-correlation within the time-series panels.

Table 3.3 gives the descriptive statistics of the dependent, independent, and control variables, including mean and standard deviations. The multicollinearity between the dependent and independent variables could present difficulties as some Pearson correlation coefficients are statistically high. Variance inflation factors (VIF) reflect the impact of multicollinearity on each independent variable in the model. After

calculating the VIF for all the variables, we found that none of them was higher than 2 (see Table 3.4). As the rule forbids these values to be higher than 10 (Nester *et al.*, 1985; Chatterjee and Price, 1991), we can conclude that multicollinearity is not a problem in this study²³.

[INSERT TABLE 3.3]

[INSERT TABLE 3.4]

3. RESULTS

Table 3.5 reports the regression results for the models that examine the relationship between erosion of the first-mover's market share and the differences in competitive behavior of pioneer firms and followers. The regression linear 1 model shows the effect of competitive intensity on the erosion of the first entrant's market share. Model 2 shows the differences in the type of actions that pioneer and follower firms use. Both models are significant (chi-square for covariates significant at $p=0.001$).

Hypothesis 1 predicts that differences in level of competitive intensity should affect the erosion of the first entrant's market share. This hypothesis is not supported (model 1). The fact that a follower firm carries out more competitive actions than the pioneer is unrelated to market share erosion.

We make the argument, however, that in theory not all competitive actions would have the same effect on the erosion of the first entrant's market share. For this reason, in model 2 we distinguish between different types of competitive actions such as innovation, pricing and promotion, and legal.

Hypothesis 2 explores whether the differences in launching innovation actions between follower firms and pioneers affect the first entrant's advantage. We hypothesized

²³ We have also removed variables like 'concentration' because the correlation with the variable CM_{1d} was 0.81.

that when new entrants take more innovation actions than pioneer companies the erosion of the first entrant's market share will be positively affected. The variable 'innovation actions' in model 2 turned out to be insignificant.

The coefficient for the 'pricing and promotion' variable was insignificant. Hypothesis 3 (which postulated that as differences in pricing and promotion activities between follower and pioneer firms increase so will the erosion of market share), then, was not confirmed in our model 2. It appears that lowering prices more times and launching more promotional campaigns does not enable followers to take market share away from pioneers.

There was support for hypothesis 4 - the more legal actions followers take in relation to pioneers, the greater the erosion in the first entrant's market share ($b=0.0453$, $p<0.01$). As predicted, when followers take more non-market actions than pioneers such as filing lawsuits against their rivals or hauling them before fair trading bodies, the negative effect on the first entrant's advantage is greater.

As for the control variables, the coefficient associated with pioneer market share in the previous period is positive and significant ($b=0.6409$, $p<0.001$). This means that the more clients a pioneer firm has, the greater will be the erosion in its market share. In addition, the coefficient 'order entry' is also positive and significant ($b=0.1791$, $p<0.001$). Follower firms that enter at a later stage are able to prize more clients from pioneers than those competitors that entered at an earlier stage. The variable 'months in monopoly' is negative and significant (-0.0056 , $p<0.001$). This means the longer pioneer firms were in monopoly, the more difficult it was to take market share from them. Finally, the variables related with industry life cycle, service penetration, and market growth turned out to be insignificant for the pioneer's market share erosion.

[INSERT TABLE 3.5]

4. DISCUSSION AND CONCLUSIONS

The study of competitive strategy behooves us to improve our knowledge of which actions and responses are most effective at obtaining a competitive advantage. This analysis is even more important in fast-changing industries, where it is better to be constantly on the lookout for competitive advantages in the short run rather than trying to build a position of sustainable competitive advantage. Firms' strategies are dynamic, which explains why their actions have repercussions on their competitors' behavior.

This interdependent characteristic of competition is even more evident in the antagonistic relationship between pioneers and followers. Up to now empirical research has verified the existence of sustainable competitive advantages for the pioneer, even in fast changing industries (Makadok, 1998). We do not know, however, if the competitive behavior of the follower can have some impact on the erosion of this competitive advantage. To resolve this question, this paper has studied the difference in the pattern of competitive behavior of pioneers and followers in the European mobile telephone industry between 1997 and 2000. This is a dynamic industry where service penetration grew more than 600% in the four years under study - an average annual increase of more than 150%. Moreover, it is an industry where any change initiated by the competition is easy to imitate, something that presumably favors greater competitive activity and reduces the likelihood of the pioneer holding onto the competitive advantage of entering the market first.

Despite this, we have not been able to confirm that greater competitive activity by followers results in eroding the market share of the pioneer. Taking more competitive actions than the pioneer does not help to significantly reduce its first-mover

advantage. Being a competitively active follower in a fast-changing industry does not lessen the pioneer's advantage. This could be because not all competitive actions are equally effective, which is why we distinguished between market and non-market actions. Among the former, we studied innovation actions and pricing and promotion, obtaining a similar result for both. We did not find a significant relationship between erosion of the pioneer's market share and relative innovative activity, or between competitive activity and price and promotion.

Follower firms can learn from the pioneer's mistakes by introducing technological improvements. They should also benefit from the reduced commercial risk (Lieberman and Montgomery, 1988) and from being able to act as a free-rider on the pioneer's investments (Kalyanaram *et al.*, 1995). On the other hand, the unsuccessful nature of the follower's market actions could be due to higher than anticipated switching costs. Apart from the issue of number portability, it could be that clients were reluctant to change companies while the product was working (Schmalensee, 1982, Kalyanaram *et al.*, 1995, Bohlmann *et al.*, 2002). Finally, although pioneers cannot stop new firms moving into recently liberalized industries²⁴, they can try to restrict competition by making life difficult for follower firms. Pioneers can do this by not giving full access to their own assets, one example being base stations, which they were legally obliged to cede for a limited period (Laffont *et al.*, 1997).

Even if market actions do not work, however, new entrants still have another line of attack: non-market actions such as lawsuits brought before courts and regulatory bodies (Baumol, 1993; Yao, 1997). Our empirical research confirms that these actions are ways of attacking competitors. We found that they are the only actions capable of significantly

eroding the pioneer's market share. Non-market actions are presumably more difficult to react to than either tactical or even strategic market actions. They are one-off actions that are capable of disorienting competitors, which is why they seem to be so threatening to the pioneer's competitive advantage.

Not all non-market actions, of course, are the same. Shaffer *et al.* (2000) studied actions that a priori seem to have a more direct effect on sales and market share²⁵. Our study, meanwhile, analyzes the effects of the plaintiff's announcement of impending legal action, not the elimination of restrictions on competition that results from a lawsuit. We found a positive and significant relationship between such announcements and the erosion of the pioneer's market share. It is paradoxical that none of the actions that theoretically should have some immediate effect on market share are effective, while legal actions that have no direct influence on sales are the only ones capable of significantly eroding the pioneer's market share.

To sum up, it appears that Makadok's (1998) findings still hold true: being first is an advantage in a fast changing industry where any competitive action can be copied or improved on easily. Only 'atypical' non-market measures like legal action seem to cause any significant erosion of the pioneer's market share.

This work is not free from limitations. We use the market share variable to measure the erosion of competitive advantage, something that has been criticized as this method of gauging performance has been shown to increase the probability of finding pioneer advantages (VanderWerf and Mahon, 1997). Using measurements of financial performance for a cross-country study like this one, however, would have been difficult

²⁴ Despite this, it has been shown empirically that at the beginning of the 1980s *British Telecom's* non-market strategy was specifically designed to hamper the deregulation process in its domestic market (Bonardi, 1999).

as accounting practices differ from country to country. In the period under study the mobile telephone businesses were not independently quoted, so we were also unable to use stock market wealth as a measurement.

Apart from the actions studied in this research, firms make other types of competitive moves that in many cases are sequenced (Ferrier, 2001). This would have made it desirable to have had fuller information on the firms' competitive behavior. Finally, the measurement of firms' resource endowments is not highly accurate. Obtaining better information on each of the competitor's resources is one of our objectives for the future. We would also like to do further research on the relationship between the appearance of legal action and the erosion of competitive advantage.

This study's practical recommendations are clear. Litigation is expensive for the firms involved²⁵ (Schuler, 1996; Salop and White, 1986) and the economic system (Baumol, 1993). We need to analyze, therefore, how to improve the effectiveness of market actions so that follower firms are not forced to fall back on litigation as their only efficient competitive weapon. We have also found that the erosion of the pioneer's competitive advantage depends on two factors: length of time in monopoly and legal actions. Governments, then, should open the market and remove all restrictions on competition as soon as possible. These measures should be more effective than the competitive actions that firms take. They would also reduce the temptation to resort to courts and regulatory agencies.

²⁵ They included public relations activities, testimony before Congress, testimony before administrative agencies, filing administrative petitions, and lobbying.

²⁶ In Spain, *Telefónica* has been fined many times by the Spanish Office of Fair Trading (OFT). At the end of 2004 it had received ten fines totaling more than 75 million euros from the OFT. (Information obtained from the Spanish OFT's web site www.tdcompetencia.es/). *Telefónica* has also been fined several times (the largest was 18 million euros in July 2002) by the Comisión del Mercado de las Telecomunicaciones (Spain's telecommunications regulatory authority).

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Figure 2.1
Relationship between competitive actions and the erosion of first-mover advantage

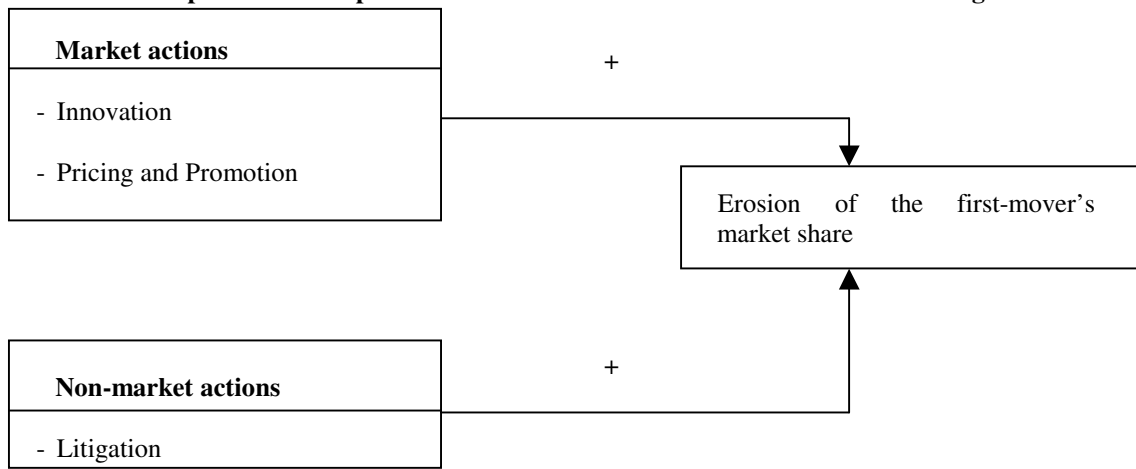
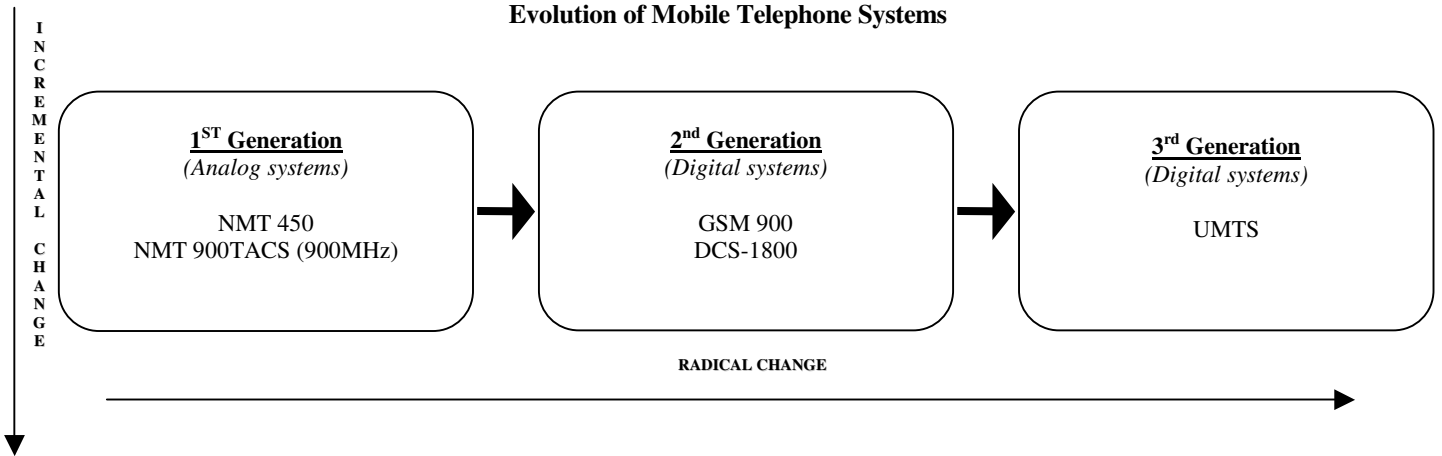


Figure 3.1
Evolution of Mobile Telephone Systems



Graph 3.1
Penetration of digital mobile telephone services in Europe (in %)

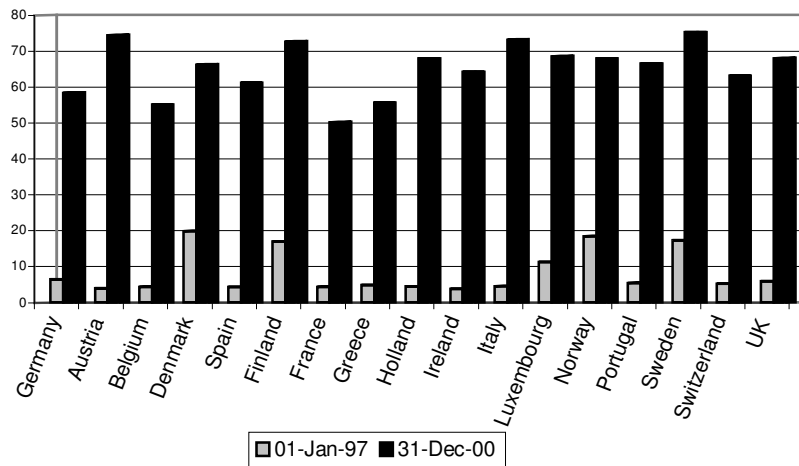


Table 3.1
Types of competitive actions

TYPE OF ACTION	DEFINITION	EXAMPLE
INNOVATION	Actions that involve product launches, improved services or investments to improve the technology.	<i>Movistar</i> launches new SIM cards with enhanced services.
PRICING AND PROMOTION	Actions designed to cut the cost of a service or product or to persuade clients to buy or continue buying.	<i>Bouyès</i> lowers its prices for corporate clients.
LEGAL	Legal action taken by the companies under study against their competitors. Apart from lawsuits, public statements are also included (e.g., in press conferences, newspapers, etc.).	<i>T-mobil</i> sues Mannesman over its publicity campaign.

Table 3.2
Definition of Control Variables used in the study

Months in monopoly_m	Number of months the government of the country 'm' took to grant a second license to a firm to operate with digital technology.
Penetration_{tm}	Percentage of potential users in the country 'm' who already have mobile digital telephone service in the period 't'.
Growth_{tm}	Change in number of clients in two consecutive time periods in the country 'm'.
Order of entry_{jm} ²⁷	Position in which the follower firm 'j' entered the geographical market 'm'.
Pioneer market share_{i(t-1)m}	Percentage of clients of company 'i' in the period 't-1' in the geographical market 'm'.

²⁷ 'Order of entry' is considered as a proxy for the variables 'size' and 'age' – data on which are not available.

Table 3.3
Descriptive statistics and Pearson correlation coefficients^a

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Market share erosion	0.293	0.496											
2. Competitive intensity ^a	-3.525	7.996	-0.04										
3. Innovation actions ^a	-2.172	4.621	0.01	0.83									
4. Pricing and promotion ^a	-0.495	2.592	-0.15	0.61	0.35								
5. Legal actions ^a	0.217	0.779	0.10	0.13	0.06	-0.12							
6. Months in monopoly	10.676	15.872	-0.06	0.09	0.12	-0.01	0.13	-0.12					
7. Market growth	33.818	16.127	0.01	0.07	0.14	-0.02	0.05	-0.01	0.19				
8. Service's penetration	33.939	19.736	-0.02	-0.13	-0.20	-0.05	-0.03	0.01	-0.06	-0.39			
9. Order entry	2.382	0.596	0.12	-0.27	-0.21	-0.05	-0.14	0.09	0.10	0.16	-0.09		
10. Pioneer's market share _{t-1}	0.534	0.150	0.06	0.27	0.18	0.12	0.19	-0.05	0.59	0.31	-0.24	-0.02	

^a These variables are pioneer-follower difference scores representing relative competitive activity

Table 3.4
VIF

Model 1	
Variable	VIF
Pioneer's market share _{t-1}	1.5
Market growth	1.37
Months in monopoly	1.36
Service's penetration	1.32
Order entry	1.18
Competitive intensity	1.09

Model 2	
Variable	VIF
Pioneer's market share _{t-1}	1.53
Months in monopoly	1.39
Market growth	1.38
Service's penetration	1.32
Innovation	1.25
Order entry	1.21
Pricing and promotion	1.18
Legal	1.08

Table 3.5
Regression results^{a,b}

Variable	Model 1		Model 2	
	<i>B</i>	<i>s.e.</i>	<i>b</i>	<i>s.e.</i>
Competitive intensity ^c	0.0012	0.0027		
Innovation actions ^c			0.0044	0.0039
Pricing and promotion actions ^c			-0.0119	0.0072
Legal actions ^c			0.0453	0.0174**
Months in monopoly	-0.0028	0.0009**	-0.0029	0.0007***
Market growth	0.0027	0.0011*	0.0017	0.0010
Service's penetration	-0.0002	0.0011	0.0004	0.0009
Order entry	0.1412	0.0486**	0.1791	0.0449***
Pioneer's market share _{t-1}	0.7793	0.2066***	0.6409	0.1657***
Constant	-0.5096	0.1473***	-0.5868	0.1507***
Rho	0.4622		0.3812	
Log likelihood	-0.6422		-10.3218	
χ^2 (d.f.)	34.14(6)***		63.81(8)***	

^a N=183 in all models

^b *p<0.05; **p<0.01; ***p<0.001

^c These variables are pioneer-follower difference scores representing relative competitive activity