

FACTORS INFLUENCING THE DEGREE OF COMPETITION IN THE TELECOM INDUSTRY

The aim of this research is to identify which of Porter's factors used to determine the degree of competition in an industry are also relevant to the sector of telecom. We use data from 30 European telecom markets¹ to find empirical evidence for the validity of the factors that Porter defines in his five forces model² – number and size of competitors, industry growth, degree of product differentiation, market exit barriers, capacity, switching costs, fixed costs, brand loyalty. We propose a better metric for judging the likely degree of competition in any given telecom market.

JEL: L1

Porter's five forces analysis is a framework for industry analysis, analysis of market's attractiveness and business strategy development. The model was established by Michael Porter in 1979 at Harvard Business School. According to this model the competition on profitable markets is a function of five competitive forces: the threat of substitute products or services, the threat of established rivals, and the threat of new entrants; the bargaining power of suppliers and the bargaining power of customers (Porter, 1979).

Porter's theory has attracted a lot of interest and critical reviews throughout the years. For instance Brandenburger and Nalebuff (1997) suggested a sixth force to be added to the model – competitive alliances. Wernerfelt argues that the analysis of one industry cannot be complete without taking into consideration company's recourses (Wernerfelt, 1984). Porter's framework has been challenged by Coyne who has stated that buyers, competitors, and suppliers are not interrelated and do not interact, the source of value is structural advantage (creating barriers to entry), uncertainty is low, allowing participants in a market to plan for and respond to competitive behaviour (Coyne, Subramaniam, 1997).

Since the purpose of this paper is to identify the factors determining the degree of competition in telecom, we examine only one of Porter's five forces i.e. degree of rivalry (competition) in the sector. Below follows an overview of some related to this research scientific work on the subject of competition.

Research done on analyzing market performance of telecoms often describes the means of competition such as product bundles, fixed-mobile offers, low cost brands, increased size of bundles etc. but don't seek to describe the characteristics of the market motivating given competitive behavior. The means (basis) of competition are the most important determinants of customer choice between products and services of different companies but they don't tell us anything about what motivates the level of aggressiveness of the companies deploying them. The test of the

¹ All EU-states (without Cyprus, Malta, Luxemburg) plus Switzerland, Russia, Ukraine, Norway, Turkey.

² We examine only one of Porter's five forces i.e. degree of rivalry (competition).

validity of an economic theory lies in its power to predict the effect of changes in economic conditions. On this test, general industry research has low predictive power as it can't tell us which markets under which conditions will show higher degree of rivalry.

A theoretical research done by Roberts (2002) tries to predict how the competition in an industry will evolve and what the likely outcomes will be. He highlights the role of the marketplace claiming that it accounts for most of the variance between the performance of companies. The characteristics of the served market, of the business itself, and of its competitors constitute about 75% of the reasons for success or failure, and the operating skill or luck of the management constitute about 25%.

General industry research gives a little consideration to the form of the market as a predictor of competitive behavior. Some European telecom markets, such as Italy and Portugal have the characteristics of oligopoly, other resemble more a monopolistic competition. The last is characterized with large number of firms where each has relatively smaller market share, so no individual firm can exercise market power (Krugaman, 2012). On the other hand in oligopoly there is higher interdependence between the few participating companies. The theory of monopolistic competition was introduced by Chamberlin and it sought to analyze the market structure different from monopoly and perfect competition. The essence of his theory is not that much the number of players but their ability to exercise market power.

Porter's famous factors determining degree of rivalry – number and size of market players, degree of product differentiation, fixed costs, industry growth etc. are actually a modification of the theory of monopolistic competition as both theories use similar theoretical constructs. In the traditional economic model, competition among rival firms drives profits to zero. But competition is not perfect and firms are not unsophisticated passive price takers. Rather, firms strive for a competitive advantage over their rivals. According to Porter when a rival acts in a way that elicits a counter-response by other firms, rivalry intensifies. The intensity of rivalry commonly is referred to as being cutthroat, intense, moderate, or weak, based on the firms' aggressiveness in attempting to gain an advantage. The means available to market players to materialize their aggressiveness are prices, product differentiation, distribution, relationship with suppliers (Porter, 1979).

The role of the market share or market standing is considered one of the most important business objectives also by Ansoff, Drucker and Datta (see Datta, 2009). Achieving market share leadership in a product-market or segment can play a major role in enhancing the long-term competitive advantage of a business. A business with a small market share will ultimately become marginal in the market, and therefore become quite vulnerable. Also the sales volume of a marginal supplier may be too small to provide the level of service customers may expect. Many customers therefore prefer to deal with high-market share businesses because they perceive less risk in dealing with a business that is considered substantial, and whose position in the industry appears to be secure.

In the light of the importance of market share the founder of Boston Consulting Group Bruce Henderson says that a stable competitive market never has more than three significant competitors, the largest of which has no more than four times the market share of the smallest (Henderson, 1973).

The conditions which create this rule are:

- A ratio of 2 to 1 in market share between any two competitors seems to be the equilibrium point at which it is neither practical nor advantageous for either competitor to increase or decrease share. This is an empirical observation.
- Any competitor with less than one quarter the share of the largest competitor cannot be an effective competitor. This too is empirical but is predictable from experience curve relationships.

Characteristically, this should eventually lead to a market share ranking of each competitor one half that of the next larger competitor with the smallest no less than one quarter the largest. Mathematically, it is impossible to meet both conditions with more than three competitors.

Measuring the degree of competition in telecom: data and methodology

The standard approach of antitrust economics is to consider the level of competition as sufficient to prevent an undue exercise of market power by incumbents if those incumbents would find unprofitable to implement a small but significant (typically 5%) and non transitory (typically for one year) increase in price for their services, given the pricing structure of their competitors' products and services (Boone, 2008). Such a move would be profitable if the reaction of consumers to such a price increase for one year were relatively small and limited, that is, if there were no close substitutes to which they can turn to offset the impact of that price increase. The weakness of this approach is that its estimates must be used with extreme care given the empirical difficulties surrounding it (such as defining the relevant market, relevant choice set, relevant competitors).

In the microeconomic theory is implied that competition leads to lower prices. A main notion of this theory is that in the long term economic profit under monopolistic competition is zero because new firms will enter the market if existing ones are making profit (CFA Institut..., 2010). A related measure to this notion is the price-cost margin. The price cost margin (PCM) is widely used as a measure of competition. However, the theoretical foundations of PCM as a competition measure are not robust. Boon (2008) points to researchers present models where more intense competition leads to higher PCM instead of lower margins. Boon suggests an indicator that relies on relative profit differences. His approach is based on the assumption that competition increases efficiency. Thus comparing the relative profits of a company from one industry deemed as efficient with a company from another market deemed as less efficient would give us an indication about the level of competition in these markets. However an empirical study done by Schiersch in German manufacturing enterprises didn't find empirical evidence to support the robustness of the Boon indicator (see Schiersch, Schmidt-Emcke, 2010).

For the purposes of this paper we develop and use two metrics for measuring competition. The first is called *historic value differential* i.e. how much value is getting the customer now in comparison with the years before. Value can be measured through product price, product characteristics or both. A proxy of this measure is the market turnover as a function of price and volume. Higher competition would lead to lower prices and hence lower turnover or to higher volumes at the same prices.³

$$(1) MT = f(P, Perf), \text{ where:}$$

MT is the market turnover;

P – the price;

Perf – the product characteristics.

The second metric we call *relative redistribution of market shares between the main players* over a specified period of time. It is calculated by first calculating the differences between the market shares each of the market players had in a base (beginning) and end period. Second, adding the absolute value of the largest market share loss to the largest market share gain in order to measure the change magnitude.

$$(2) MSR = \max_i (MS_{ij_{t1}} - MS_{ij_{t0}}) + |\min_i (MS_{ij_{t1}} - MS_{ij_{t0}})|, \text{ where:}$$

MSR is the degree of market share redistribution in any give market (country);

$MS_{ij_{t1}}$ – the market share of a company *i* on a market *j* in the end of the analyzed period, $i=(1;9)$; $j = (1;30)$;

$MS_{ij_{t0}}$ – the market share of a company *i* on a market *j* in the beginning of the analyzed period, $i = (1;9)$; $j = (1;30)$.

For example the degree of market share redistribution in Austria is 16.1%:

Country	Player	2004	2012	Change magnitude		Degree of market share redistribution
	$MS_{i1_{t0}}$	$MS_{i1_{t1}}$	$MS_{i1_{t0}} - MS_{(i+1)1_{t0}}$	max	min	$\max+ \min $
A1 Telekom Austria, %	41.9	43.3	1.4	8.6	-7.5	16.1
T-Mobile, %	36.6	29.1	-7.5			
Orange, %	19.3	16.7	-2.5			
Hutchison, %	2.2	10.8	8.6			

³ The question arises here how to establish which portion of the turnover has been increased due to the growth in this sector in the respective country and which portion was reduced as a result of the higher competition intensity. A growth in the sector could be achieved on the account of increasing the number of users of telecom services and/or the average yield of one of them (measured as a price, multiplied by the volume of used services). Taking into consideration the fact, that during the period of the research (the number of clients divided to the inhabitants) of mobile services in each of the investigated countries would be maximum, then the impact of this factor might be avoided. Therefore, a growth in the sector could be due mainly to an increase in the scope of the services used by one customer, without any pro-rata decrease in their prices, or due to the price drop of the used services without any pro-rata drop in the used volume. Consequently, if the mean used scope rises higher than the average price drop, it could be an industry growth. If the average used scope increases more slowly than the decrease in the average price drop, it is called competition effect.

Validation of the Porters' factors determining the intensity of competition: empirical evidence

To validate the factors Porter considers as determinants of the degree of rivalry we conduct an empirical experiment. We use real historic data⁴ from testing 103 operators in the period between 2004-2012 in 30 European telecom markets and analyze with the goal to confirm/refute the validity of Porter's factors if they are applied to telecom markets.

Number and size of competitors

The thinking of Porter presented in his five forces model highlights the number of competitors and their size as factors intensifying the degree of competition in the cases where there are either many competitors in a market or they are equal in size (Porter, 1979). We would like to see if we could find empirical evidence to support this theoretical construct. Our hypothesis would be that the markets where competitors are equal or almost equal in size are more competitive than the markets where the opposite is true. We ignore the number of competitors because in telecom regardless of the market we usually have 3-4 players only.

We will test this hypothesis by using two variables – independent and dependent. Then we measure the correlation between these two.

The role of the independent variable will be played by a metric which we call *size differential* measured as the absolute difference, (or the sum of absolute differences), between the revenue shares of two or more players in a base period, in other words this variable will be calculated as the sum of the market share differences between the first and second player and between the second and third player.

$$(3) SD = [(MSI_{ij_{t1}} - MSC_{ij_{t1}})] + [(MSC_{ij_{t1}} - MSF_{ij_{t1}})], \text{ where:}$$

SD is the size differential for any given market (country),

$MSI_{ij_{t1}}$ – the market share of a company first entrant i on a market j in the beginning of the analyzed period, $i=(1;9)$; $j=(1;30)$.

$MSC_{ij_{t1}}$ – the market share of a company second entrant i on a market j in the beginning of the analyzed period, $i=(1;9)$; $j=(1;30)$.

$MSF_{ij_{t1}}$ – the market share of a company third entrant i on a market j in the beginning of the analyzed period, $i=(1;9)$; $j=(1;30)$.

This indicator has been selected to measure the size differential, as it shows the relative differences between the entrants. In order to select the available power of a company, not only its size should be known, but also its value compared to its competitors.

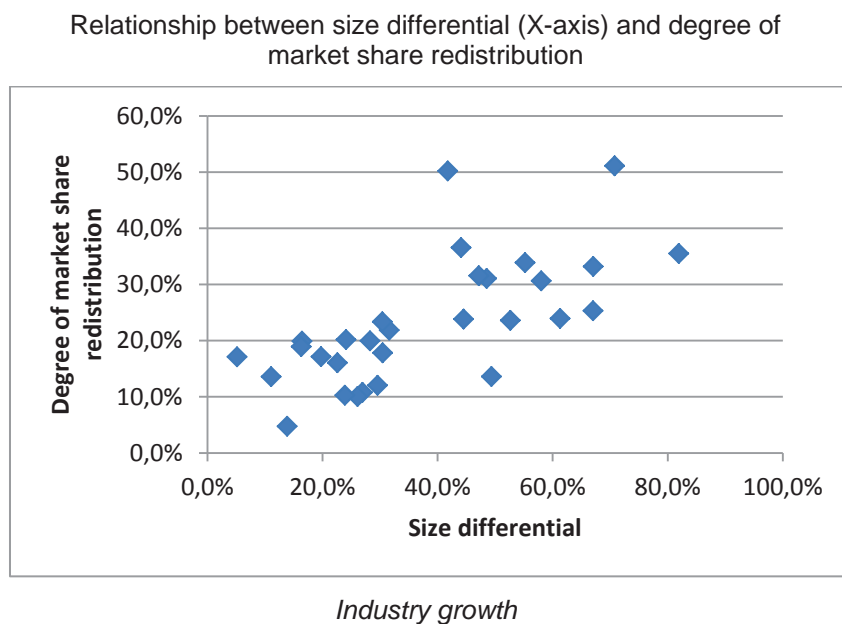
⁴ The data set is produced by the analyst house Analysis Mason, <http://www.analysismason.com/What-we-offer/Research/Regional-markets/Telecoms-Market-Matrix/>

The role of the dependent variable will be taken by the metric specified earlier and called *degree of market share redistribution*. The values of both variables are calculated for 30 European telecom markets, based on historical data for a period of 9 years (2004-2012). The dependent variable is calculated by subtracting the market share each market player in any given market had in the last observation year from the one it had in the first year of observation and then calculate the magnitude of market share redistribution by summing the biggest market share loss (abs. value) and biggest market share gain (the formula can be seen on page 7). As a result thereof the correlation between both variables was measured.

After performing the calculations we get values for the independent variable between 5.2 in Poland and 81.9% in Slovenia (low end – competitors equal on size) and for the dependent variable between 4.7 in Bulgaria and 51.1% in Holland (low end – low competition). Analysis of the data showed a correlation of 0.68 (R2 0.48) and a relationship between the two variables that suggests that intensity of competition is in a linear relationship with the size of the gap between the sizes of the main players (size effect).

Based on this we couldn't find an empirical support of the Porter's construct at least in the case of telecoms.

Figure 1

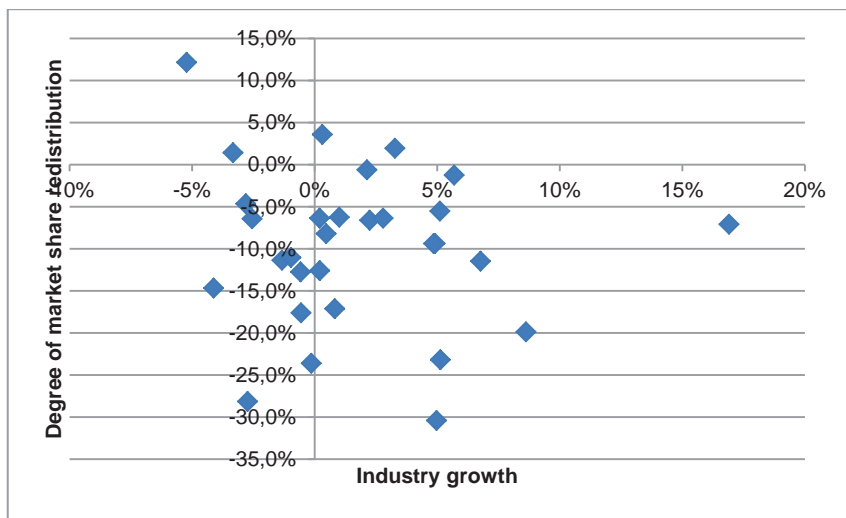


Another factor increasing the intensity of competition is industry growth. The slower the industry is growing the higher is the competition between players

(Porter, 1979). Again, similarly to the previous paragraph, we would like to test if markets with lower growth are more competitive than markets with higher growth. We again use two variables – independent and dependent variable. The dependent remains the same as before i.e. degree of market share redistribution but we change the independent one to the more logical – market growth. The last metric we measure by calculating CAGR (Compounded average growth rate) for the period 2004-2012 for each of the 30 markets. After running the calculations we observe that 5 of the markets don't grow, 10 are shrinking and 15 are growing. However the correlation coefficient we calculated between market growth and intensity of competition was very low - 0.15. Therefore we couldn't find any evidence suggesting that low growth markets are also high competition markets.

Figure 2

Relationship between industry growth (X-axis) and degree of market share redistribution



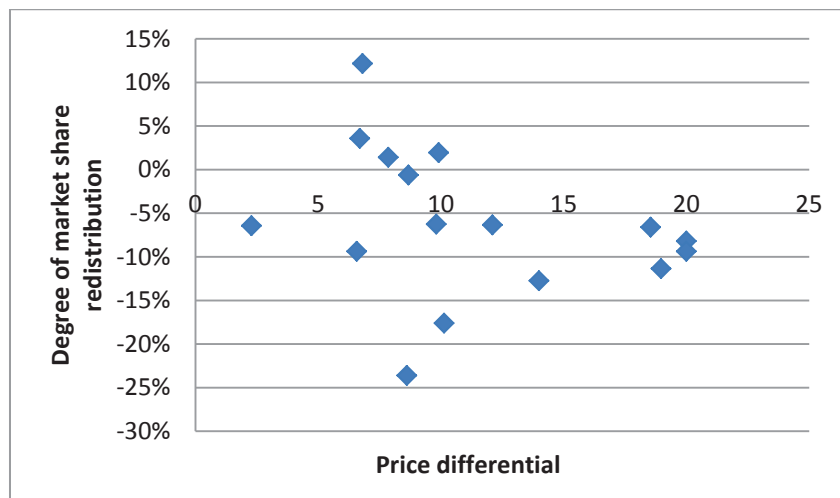
Product differentiation & diverse strategies

Porter's model lists degree of product differentiation as a factor decreasing competition in the case where its value is high (Porter, 1979). The more differentiated is the product the easier for competitors is to avoid price wars. Logically, our hypothesis should be that markets with high product differentiation also show lower degree of competition. We will again use the same dependent variable. Selecting a proper independent variable is a bit challenging here because measuring product differentiation in a market where the product is seen often as commodity is difficult. However a good proxy of product differentiation can be the price differential, intrinsic to a given market and measured as the difference between the highest

and lowest ARPU (average revenue per user) on the market. The highest is the differential the higher the differentiation. We use data from 16 European markets and calculate the correlation coefficient. The values we calculated for the independent variable fell in the range 2-20. The correlation coefficient didn't show any strong relationship – 0.29.

Figure 3

Relationship between price differential (in EUR) (X-axis) and degree of market share redistribution



Exit barriers

If barriers to exit the industry are high then companies will compete more fiercely to be able to stay in the market, according to Porter's thinking. Although it seems that exit barriers in telecoms are high due to heavy investments in network assets and spectrum in fact we assert that actually they are low due to the large M&A market for telecom assets in Europe. Based on McKinsey data the telecom industry has spent USD 1.5 trillion on M&A in the last decade with the bulk in Europe and US (Lebraud, Karlstroemer, 2011). Therefore we can't consider exit barriers in telecoms as a factor increasing competition.

Capacity

Porter describes a linear relationship between capacity and degree of competition. The higher the free capacity the higher would be the intensity of competition. A study done by Arthur D Little shows that capacity utilization of 3G networks in Europe has been below 100% (60% in 2013, 25% in 2012). At the same time they report in the same research rapid growth of traffic (product volume) with decreasing price per unit (price per 1 Gb) (Pradayrol, Didier, 2013). These

observations suggest that in fact the availability of free capacity is driving competition.

Switching costs

Switching costs is the costs that a customer incurs when switching products or suppliers. If the costs are high than the competition will be also lower because customers will stick with the same products and companies (Porter, 1979). In telecom a rise to switching costs is given by long term contracts, smartphone subsidies, loyalty programs, bundled offers etc. Telecom markets in Western Europe historically are more advanced than their eastern European counterparts and therefore we would expect to see that western European markets show lower level of market share redistribution than eastern counterparts. In our data set from 30 markets, 16 are in Western Europe and 14 in Eastern. On average the degree of market share redistribution is 19.6% and Eastern Europe 27.5%. This indicated that switching costs might matter to degree of competition.

Fixed costs

Fixed costs according to Porter are a factor that can force companies to decrease prices in the situation when they are high (Porter, 1979). We would ignore this factor in determining the degree of rivalry in telecom because margins in this industry are high enough (reaching 50% with 30-40% being the norm) not to be a factor leading to price cuts.

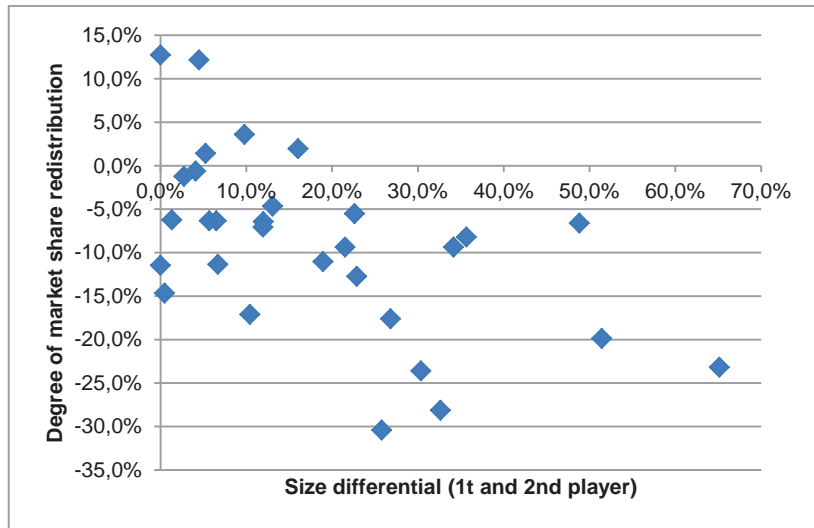
Brand loyalty (modified to incumbent advantage for the purposes of this research)

If the customer is loyal to the brands he does his buying from, then he would be less reluctant to change players. Thus high brand loyalty hampers competition. Measuring brand loyalty is difficult. For the purposes of this research we will assume that the first player on the market enjoys the higher loyalty due to its incumbent advantage and mere fact that it was the first to enter the market. To test our hypothesis we calculate the correlation between the size differentials of the market players (incumbent and closest competitors only) and the degree of market share redistribution (market share of the largest player in the final period less its share in the initial period). The results show less than perfect correlation of 0.55. (much lower value than 1).

However a closer examination of the scatter plot suggests that the incumbent is more likely than not to lose market share and the bigger it is the more likely is that it will lose. In the case when the incumbent is not radically bigger than its closest competitor than it loses less. This might be explained with the lacking ability of misusing market power. Although with our experiment we were not able to prove or disapprove the role of brand loyalty we were able to demonstrate the validity of Henderson's hypothesis that the market leader with the passing of time tends to lose market share.

Figure 4

Relationship between size differential (X-axis) between the first and the second player and degree of market share redistribution



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By using real historical data we tested the empirical validity in the telecom industry of Porter's factors determining the degree of competition. We found enough evidence to refute Porter's claim that competition intensifies if competitors are equal in size. Our analysis found exactly the opposite i.e. the bigger the differences in size the more severe will be the competition. Thus if we compare two markets - one where the first and second market players have almost equal market shares to a market, where the market shares gap between the first and second players is large then we would expect to see a higher competition in the last case. This finding has high practical significance as it allows better gauging the profit potential of a telecom market just by considering the relative market share differences of the players presented.

We were also not able to find a convincingly strong relationship between industry growth and intensity of competition. May be the reason is to be found in the desire of market players to avoid increasing market share on the expense of the overall market profitability. Industry can be shrinking and competition lessening at the same time because it is better to have 1% of something than 100% of nothing.

We couldn't also find enough support for the thesis that higher product differentiation leads to lower competition. This can be explained by the fact that high differentiation costs money and if a player has invested in this he would expect to recover the investment by it through charging higher prices or fighting for market share.

We found that exit barriers and fixed cost are not factors with profound effect on degree of rivalry in telecom.

All being said, we do found evidence in support of the linear relationship between free capacity and degree of competition. The same is valid about switching costs.

Lastly, we found an empirical evidence to back up the thesis of Henderson that a stable competitive market never has more than three significant competitors, the largest of which has no more than four times the market share of the smallest.

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10.III.2014