

Is there a number of MNOs that best suits consumers in wireless European markets?

Abstract: European consumers are currently, in average, better off in 3 players markets than in 4 or 5 players markets. It was not necessarily the case in the past, about 15 or 20 years ago. The optimal number of MNOs tends to decrease over time. This is due to the fact that the share of data revenues in wireless markets regularly increases. The technical progress rate is much higher for data than for voice and technical progress tends to reduce the number of firms, that maximizes market performances.

Jeanjean, F. (2020). Impact of Technical Progress on the relationship between Competition and Investment. *Journal of Industry, Competition and Trade*, 1-21. <https://www.econstor.eu/bitstream/10419/184948/1/Jeanjean.pdf>;

Ciriani, S., & Jeanjean, F. (2020). Competition, technological change and productivity gains: a sectoral analysis. *Intereconomics*, 55, 192-198.

<https://link.springer.com/content/pdf/10.1007/s10272-020-0899-8.pdf>

The tradeoff between margin and marginal costs

The optimal number of MNO on wireless markets is a long lasting debate, and the recent wave of concentration in European markets has given it a new lease of life. Operators generally claim for more benevolence in the regulation of mergers while competition authorities worry about weakened competition following mergers.

On the one hand, more concentrated markets tend to increase market power which may have an increasing impact on prices, but on the other hand, more concentrated market may also increase investment in coverage, in quality improvement or in marginal cost reduction which has a decreasing impact on prices.

Jeanjean, F., & Hounghonon, G. V. (2017). Market structure and investment in the mobile industry. *Information Economics and Policy*, 38, 12-22.

https://hal.archives-ouvertes.fr/hal-01653812/file/iep_full.pdf

These two effects act in an opposite way on prices and on consumer surplus. A merger increases market power but, in the same time, it may also increase investment, provided technical progress is high enough.

There is an inverted-U relationship between competition and investment in wireless markets. It is estimated that the optimal level for wireless markets is achieved around 38% margin rate in average. This means that a certain level of market power is essential to allow for an optimal investment level. Market structure, and in particular the number of MNOs matters to reach the optimal investment. Less MNOs means higher margin but also more investment and, therefore, lower marginal costs. The higher the technical progress, the greater the impact on cost reduction. If technical progress is high enough,

the decreasing impact on cost dominates the increasing impact of margin on prices and eventually prices decrease.

Houngbonon, G. V., & Jeanjean, F. (2016). What level of competition intensity maximises investment in the wireless industry?. *Telecommunications Policy*, 40(8), 774-790.

<https://hal.archives-ouvertes.fr/hal-01653797/document>

Houngbonon, G. V., & Jeanjean, F. (2019). Investment and market power in mobile mergers. *Journal of Industrial and Business Economics*, 46(1), 65-81. <https://link.springer.com/article/10.1007/s40812-019-00110-4>).

There is a tradeoff between the rise in margin and the decrease in costs which result in the optimal number of MNOs. The higher the degree of technical progress, the lower this number (cf Jeanjean 2018, Ciriani & Jeanjean 2020)

Consequences on prices in wireless markets

The level of technical progress is much higher for data than for voice. Voice services are regularly improved and the cost of one minute of vocal communication regularly decreases, however, this progress is without comparison with what is happening with data. The number of data services (video streaming, social network, real time services, geolocalization, ...) exploded. Each new generation 3G, 4G and now 5G increases the network capacity tenfold and data traffic increases exponentially. In the same time, the share of data in operators' revenues increases sharply. In 2011, data revenues represented in average about 30% of total revenues in Europe when they represent now more than 60%. The 50% was reached on average in 2016, sometimes earlier or later depending on the country. UK reached it in 2012, Denmark, Norway, Sweden and Switzerland in 2013, France in 2015, Austria and Croatia in 2018, Hungary and Romania should reach it soon. The increasing dominance of data in wireless markets increases the general level of technical progress of the wireless industry and thereby decreases the optimal number of MNOs.

From the consumer's prospective, the optimal number of MNOs can be estimated based on the price levels observed in different European countries. If we only retain this measure, on a panel of 21 European wireless markets we estimate that consumers are, in average, better off in 3 players markets than in 4 players markets. The optimal number of MNOs tends to decrease as the share of data revenues increases. In the past, when the share of data was very low, it could be possible that 4 players markets best suited consumers but nowadays, in Europe, the share of data dramatically increased and therefore 3 players markets generally best suit. We observe that, in average, the fall in the data prices is faster in the markets with 3 MNOs while the fall in voice prices is more rapid in the markets with 4 MNOs.

The graphs below represent the average decrease in data and voice prices according to the number of MNOs.

Figure.1a represents the fall in voice prices and Figure.1b the fall in data price.

The y axis represents the difference in unit price (price of one minute of vocal communication for voice or one megabyte for data) between a quarter and the first quarter of 2011. The curves represent the smoothed average results for 21 European countries. Figure.1a shows that the drop in the price of a minute of voice communication is greater in the markets with 4 or 5 MNOs than in the markets with 3 MNOs while Figure.1b, on the contrary, shows that the price of a megabyte fell more in the markets with 3 MNOs than in the markets with 4 MNOs and even more than in the markets with 5 MNOs.

However, voice and data are sold jointly and thus what is the optimal number of MNOs in the whole market, 3 or 4?

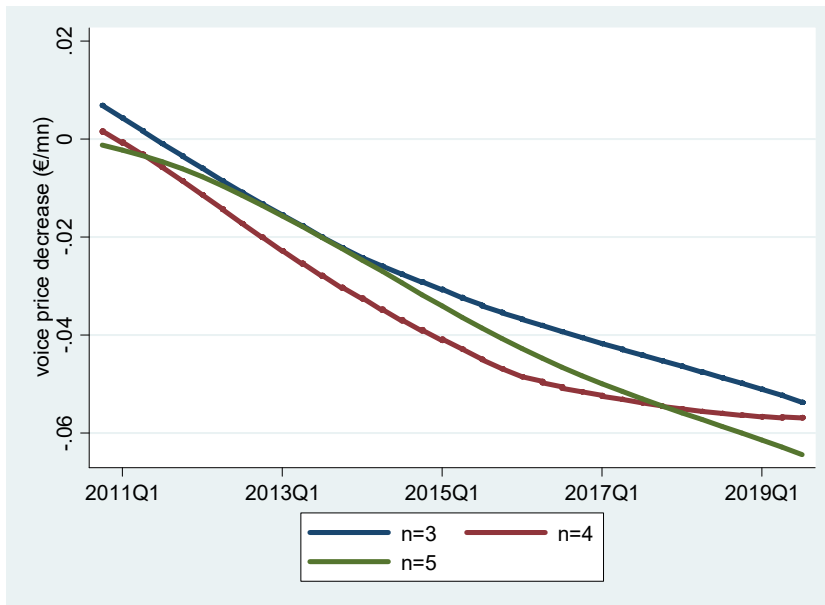


Figure.1a: fall in voice prices according to the number of MNOs

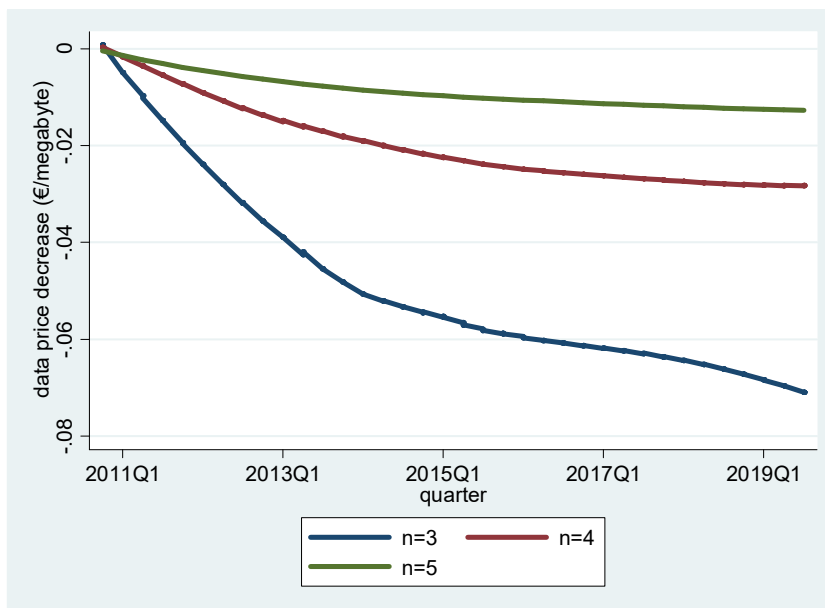


Figure.1b: fall in data prices according to the number of MNOs

Price elasticity:

One consequence of the difference in technical progress between voice and data is the price elasticity. Data is hyper elastic while voice is not. Unit price elasticity is in average estimated at $\epsilon_d = -1.19$ for

data and $\varepsilon_v = -0.255$ for voice. Hyper elasticity means that price elasticity is lower than -1. In other words a 10% decrease in price entails an increase in traffic higher than 10% such that revenues increase. A 10% decrease in megabyte price entails in average a 11.9% increase in data traffic and a 1.9% increase in data revenues. A 10% decrease in voice minute entails a 2.55% increase in traffic and a 7.45% decrease in voice revenues.

In the past, when the European wireless industry was voice-based, an increase in revenues reflected an increase in prices and therefore was detrimental to consumers. By contrast, now, in a data-dominated European industry, higher revenues mean lower prices and thus benefit consumers.

Consequences on consumer surplus

Benefits for consumers depend both on price and quality. However, MNOs sold very substitutable products voice minutes and megabytes, therefore differences in quality are mainly captured by the traffic which is driven by price. Some differences in quality without price may come from coverage, density of coverage or result in differences in upload and download speeds or latencies. A consumer surplus based on price, thus reflects most of the benefits for consumers, however, it is a conservative approach, insofar as coverage, download/upload speed and latencies are better in average in 3MNOs countries than in 4 MNO countries, according to GSMA:

https://www.gsma.com/publicpolicy/wp-content/uploads/2020/01/GSMA-Mobile-Market-Structure-and-Performance-in-Europe_February20.pdf

Consumer surplus based on unit prices, may be express as a linear combination of voice and data revenues (see annexes). The graph below, Figure.2 represents the evolution of consumer surplus according to the number of MNO between 2011 and 2019.

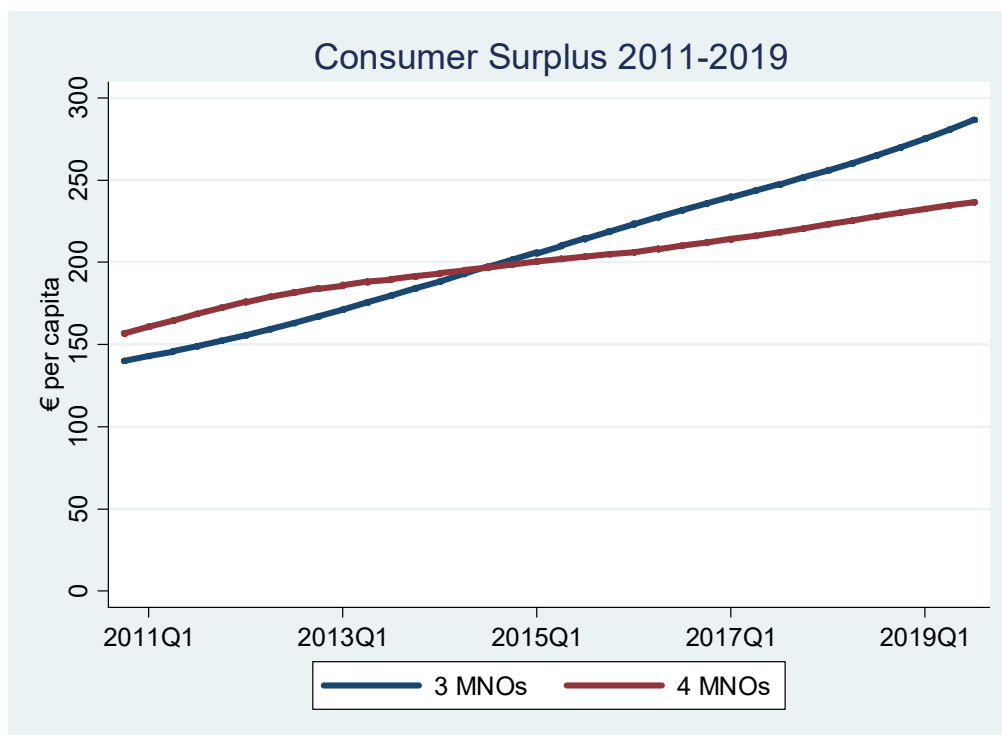


Figure 2. Evolution of consumer surplus

The four-player markets start on average with a higher consumer surplus in 2011, but the consumer surplus of the three-player markets is growing faster and exceeds that of the four-player markets around 2014 on average. The growth of consumer surplus can be estimated between 2011 and 2019.

Figure.3 below, shows the average impact of the number of MNOs on the growth of consumer surplus according to voice and data.

Data consumer surplus increases faster in 3-players markets while voice consumer surplus increases faster in 4-players markets. Furthermore, data consumer surplus increases faster than voice consumer surplus, thereby, the figure.3 shows that the growth in consumer surplus of the whole market (voice + data) is higher in three-player markets than in four-player markets.

In the voice side where technical progress is moderate, consumers are better off with four MNOs than with three and in the data side where technical progress is higher, consumers are better off with 3 MNOs.

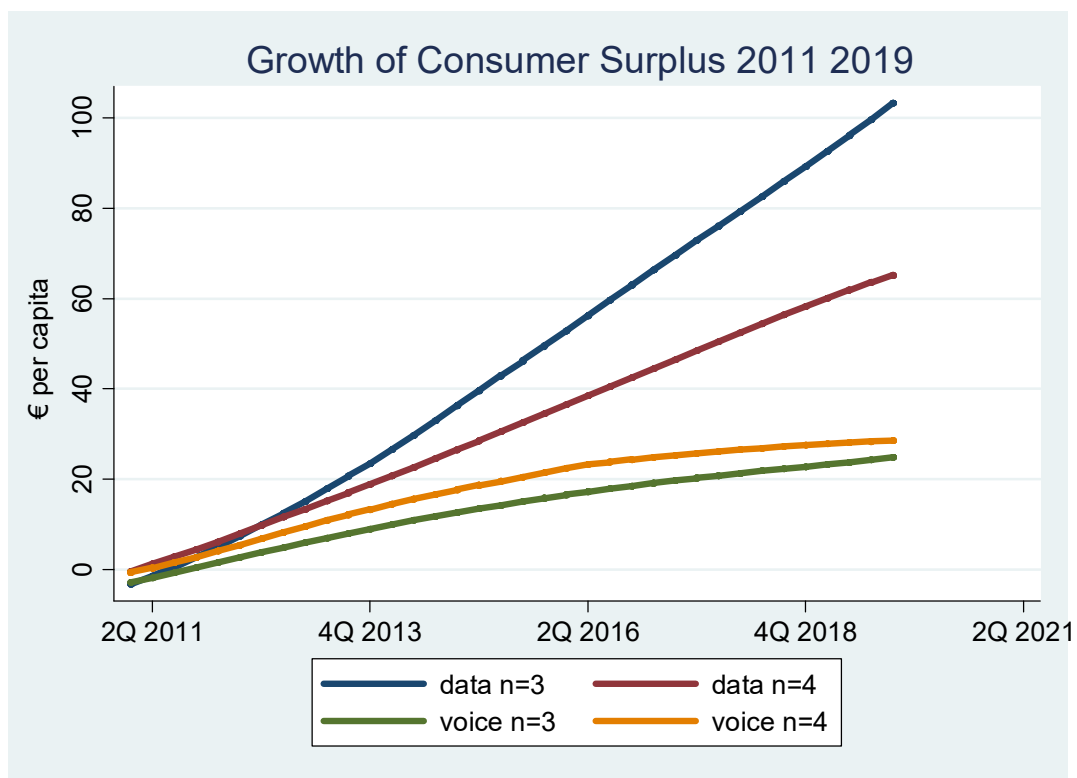


Figure.3: Growth of consumer surplus according to 3 or 4 MNOs

Conclusion

European consumers are currently, in average, better off in 3 players markets than in 4 players markets. The optimal number of MNOs tends to decrease with the growing share of data in the revenues. This is due to the difference in technical progress rate between voice and data. Indeed, technical progress tends to reduce the level of competition, and hence the number of firms, that maximizes market performances. The rise of 5G should amplify the growth of data revenue share.

The views expressed in the paper are those of the author and do not necessarily reflect those of Orange.

Annexes

Calculation of consumer surplus

Unit price for voice or data are following a constant elasticity function such that:

$$P = KT^{(1/\varepsilon)}$$

Where P is the unit price, T the traffic, $\varepsilon < 0$ the price elasticity and K a constant. (The demand function holds only if investment is sufficient to increase network capacities.)

Consumer surplus for wireless market can thus be written:

$$CS = \delta + \frac{\varepsilon_v K_v}{1 + \varepsilon_v} T_v^{\frac{1+\varepsilon_v}{\varepsilon_v}} + \frac{\varepsilon_d K_d}{1 + \varepsilon_d} T_d^{\frac{1+\varepsilon_d}{\varepsilon_d}} - P_v T_v - P_d T_d$$
$$CS = \delta - \left(\frac{1}{1 + \varepsilon_v} \right) R_v - \left(\frac{1}{1 + \varepsilon_d} \right) R_d$$

With index v for voice and d for data. R_v is the voice revenues, R_d the data revenues and δ a constant. Using $\varepsilon_v = -0.255$ and $\varepsilon_d = -1.19$. The value of δ is estimated at 125.41 such that when there is no traffic, $CS = 0$. (Those values are averaged on 21 countries, price elasticities and δ can be estimated precisely for each country.)

this equation can be rewritten:

$$CS = 125.41 - 1.34 R_v + 5.26 R_d$$

This means that an increase in data revenues increases consumer surplus and an increase in voice revenues decreases consumer surplus. Notice that a decrease in data unit price entails an increase in data revenues and therefore in consumer surplus. A decrease in voice unit price entails a decrease in voice revenues and therefore, also an increase in consumer surplus.