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Is Draghi report really wrong about telecoms? (An overview of academic papers on telecom market structure and mergers)

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Is Draghi report really wrong about telecoms? (An overview of academic papers on telecom market structure and mergers)

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Working paper

Abstract

The Draghi (2024) Report defines clear policies to restore the competitiveness of the EU through raising investment in innovation. The Report proposes “New EU Telecom Act” to update merger control through considering both static and dynamic effects rather than just static market shares or Herfindahl Index (HHI). Some authors have argued that Draghi’s view on the consolidation’s effects on investment is flawed. This article provides a review of the literature on the impact of mergers and mobile market concentration on price, investment, and quality. It also provides evidence that the evolution of mobile markets during the two last decades have changed the ways that mergers affect competition. It provides policy makers with relevant insights to form their views on the desirability of consolidation in the European wireless markets, in a context where the need for a new approach to mergers in the telecom sector has been outlined in the Draghi’s report.

Key Words: *Competition; Investment; Telecom; Market structure; Mergers*

JEL Classification: D25, D43, K21, L40, L51, L63

*Any opinions expressed here are those of the authors and not those of Orange. All errors are our own.

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1 Introduction

The Draghi Report (Draghi (2024)) defines clear policies to restore the competitiveness of the EU through raising investment and innovation. It covers the telecom industry, where operators are lacking scale and sufficient returns on their investments. A high fragmentation of national markets, which are “above the optimal number of operators” makes it more difficult for operators to fund their current and future investments. Yet their infrastructures are a crucial asset for the European Union.

The Report proposes “New EU Telecom Act” to update merger control through considering innovation and future competition rather than just static market shares. It recommends considering behavioral rather than structural remedies, to avoid transferring critical assets like spectrum and network (mobile sites of fiber outlets), thereby undermining the benefits of consolidation in terms of restored investment capacity.

Moreover, it recommends that, while stressing the importance of protecting consumers and fostering competition, the EU authorities should acknowledge that consolidation can also bring economies of scale, improve operational efficiency, and increase investment in infrastructure. Some authors have argued that Draghi’s view on the consolidation’s effects on investment is flawed ¹

This article examines Draghi’s proposal to update merger control in the telecommunications sector, notably by taking greater account of the dynamic effects which are particularly significant in this sector.

Does the European Union’s telecommunications sector really exceed the optimal number of operators and does it need to be consolidated, as the report claims? Or are these recommendations misguided and dangerous, as the report’s critics claim?

Based on a review of the economic literature on the impact of mergers and market concentration on price, investment and quality, particularly the most recent, and using specific evidences, this article attempts to answer these questions.

This article aims at enabling policymakers to form their view on whether to take full account

¹Duso, T., Motta, M., Peitz, M. & Valletti, T. (17 Sep 2024). Draghi is right on many issues, but he is wrong on telecoms. CEPR.

of the dynamic effects associated to investment as well as on the desirability of consolidation in the European telecom markets, based on peer-reviewed articles rather than non-academic biased opinions and a practice only focused on price effects, henceforth outdated given the evolution of the mobile market.

Although the analysis proposed in the paper addresses more specifically wireless markets, there is apparently no reasons that our conclusions should not apply to the markets for fixed infrastructure, which are part of Draghi's assessment of the European telecom sector shortcomings.

Two main biases distort the debate. The first is the use of the Average revenue per User (ARPU) as a proxy for price. Although in the past, price and ARPU were positively correlated, they are no longer so today, and are even tending to become inversely correlated. The paper shows that as long as markets were driven by voice services, price and ARPU were positively correlated; when data took over, this positive correlation weakened and even turned into a negative correlation.

This reverse effect derives from the fact that voice ARPU is positively correlated with the average price per voice minute call while data ARPU is negatively correlated with the average price per megabyte. Indeed, the price elasticity of voice is low, while that of data is much higher. A decrease in the per-minute price of voice calls only slightly increases demand, leading to a decrease in voice ARPU, while a decrease in the price per megabyte increases traffic even more, leading to an increase in data ARPU.

The shift from voice-driven to data-driven markets has also had implications for investment. The relationship between competition and investment is inverted-U shaped and the level of competition that maximizes investment decreases with technical progress. Hounghonon & Jeanjean (2016) and Jeanjean (2021). The technical progress in applications using data is much faster than in those using only voice. Therefore, the shift from voice-driven markets to data-driven markets increased the technical progress in the sector and thus decreased the level of competition, or equivalently increased the level of concentration that maximizes investment.

The second bias is the misjudgment of the relationship between market concentration and investment. Although the inverted U-shaped relationship between competition and investment

has been clearly established in the mobile markets (Houngbonon & Jeanjean (2016)), some studies have so far continued to ignore it, leading them to draw flawed conclusions on the actual level of competition occurring in the market. These studies looked for a linear relationship between competition and investment, which prevented them from finding the inverted U-shaped relationship. They therefore erroneously conclude that there is no significant impact of market concentration on industry investment. Critics rely in particular on the European-Commission (2024a) report, whose section on mobile phone markets is affected by these two biases, to argue against consolidation in the sector.

Indeed, the report states in the section dealing with the relationship between concentration and price in mobile markets (Section 2.2): *"Our results point to a strong and significant positive relationship between market concentration and prices. In particular, our estimates suggest that one additional MNO is associated with a reduction in average revenues per user (ARPU) by 7%."* This means that the report did not study the relationship between concentration and price as stated, but rather the relationship between concentration and ARPU, which leads to different, and even opposed, conclusions.

The relationship between concentration and investment (section 2.3) is specified to look for a linear relationship while in reality it is concave, which is probably why the main results fail to be significant. In the literature review below, many academic papers, avoiding both biases, find very different results.

The remainder of the article is composed as follows. Section 2 is a review of the economic literature, Section 3 shows the shift from voice-dominated to data-dominated markets and derives two consequences: the disqualification of ARPU as a price indicator and the growth of the level of concentration that maximizes investment. Section 4 concludes on the need to take into account dynamic effects in merger review and the desirability of concentrating European markets as proposed in the Draghi's report.

2 Literature review

The impact of a change in market structure on welfare has been largely analyzed in the literature. Recent contributions have brought reliable evidence that increases in market concentration are not always related to a deterioration in welfare that would occur through either higher prices or weaker innovation linked to lower investment. Recent theoretical and empirical results indeed suggest that the static criteria used by competition authorities to assess how shifts in the market structure following entry or mergers will affect welfare might not always be fully accurate.

Indeed, welfare-improving efficiencies occurring when corporate investment in technology leads to quality upgrades, enhanced product differentiation and expanded availability of goods and services are not fully accounted for under a static assessment, which targets only the resulting impact of post-merger price pressures on consumer welfare. A major insight of that stream of literature is that the rate of technical progress shapes the relationship between competition and investment, thus consumer surplus and welfare. Namely, the faster the rate of technical progress, the lower the level of static competition which maximizes the level of investment (e.g., dynamic efficiency gains), thus welfare.

2.1 Assessing only static merger effects might deprive consumer from better quality at lower prices

For example, if assessed under a static standard, a decrease in market concentration through entry would most likely be welfare improving due to lower prices from increased competition. Conversely, an increase in market concentration following a merger most likely deteriorates welfare due to short-term upward pressures on prices. However, when assessed under a dynamic standard, welfare changes in response to a change in market structure can be reversed, because increases in such factors as the differentiation of products, their quality and availability, which are driven by investment, are only accounted for under dynamic standard and not under static standard. A static framework will essentially capture the size of unilateral merger effects, namely the extent to which the merged entity can profitably raise its prices by taking advantage of the lessened competitive constraint induced by the removal of one competitor. Merger simulation

which estimates post-merger price movements or Gross Upward Pricing Pressure Index (GUPPI) calculations from price diversion ratios are not capturing how merger-specific efficiencies will benefit consumer because lower costs from faster innovation and higher investment from greater capacities do turn into upgrades in quality and wider differentiation of products and services.

The importance of dynamic effects has been highlighted by Roberts & Salop (1996), who recalled how mergers could improve consumer welfare, either through competitors' replication of the cost savings achieved by the merged entity or the introduction of competitive innovations. The first effect rests upon the diffusion of merged entity's cost savings to its competitors, which enhances competition as those cost savings are being passed through to consumer prices. The second effect relates to the higher investment which fasten the pace of technological progress thereby decreasing prices and delivering higher quality to consumers. The increase in scale induced by the merger widens the potential for cost savings, access to capital market, and therefore capacity of investment, which in turn will shift the market from competition in prices to competition in quality. Hence assessing the competitive effect of a change in market structure can lead to misleading interpretation based on the assessment criteria.

The literature that addresses these dynamic effects gathers either theoretical models or empirical estimations applied to aggregated or specific industries. Research by Lefouili & Madio (2023) provide a comprehensive literature review on how investment responds to changes in the market structure, outlining the complexity of the relationship, which cannot be reduced to a linear increasing function. Based on their review of theoretical models, they argue that changes in market structure occurring notably through horizontal mergers can have either positive or negative effects on investment. The resulting effect depends on several factors among which the scope of investment (in quality upgrade, new products, or cost reduction), the initial level of competition, the technological state of the market, and the existence of potential competition. The authors suggest that horizontal mergers either between incumbents or entailing the acquisition of innovative entrants can be associated with pro-competitive effects under a defined range of specific conditions. On the empirical side, they highlight that similar merger practices from competition authorities can lead to diverging competitive outcomes according to the industries involved. This suggests that industry-specific parameters such as the rate of innovation should

be accounted for when assessing the competitive effects of horizontal mergers.

Moreover, Jullien & Lefouili (2018) have shown that the effects of horizontal mergers on innovation in the form of a cost-reducing technology is ambiguous and can either be positive or negative depending on the interplay between innovation diversion and innovation spillover effects, and between margin expansion and demand expansion effects, and the net overall impact of a merger on innovation results from the net balance between them. The author recommends that competition authorities avoid any hierarchical bias towards the innovation diversion effects which would lead to block pro-innovation mergers and in the longer term, to reduce the profitability of investment in innovation. As a result, assessing the competitive effects of a merger should include them all, without any unjustified leaning towards a specific effect.

2.2 The impact of market structure on investment depends on the rate of technological progress

The effects of consolidation on welfare relate to a broader scope than the mere competitive effects of a merger. Namely, those competitive effects relate to the effectiveness of the market structure in improving welfare through investment. This shifts the focus from static competition to dynamic competition, hence from competition measured by such parameters as the number of market actors and their margins or the degree of product substitutability towards competition measured by their investment in innovation which improves their cost effectiveness or raise the quality of their products. Jeanjean (2021) outlines that the rate of technical progress is the main variable in shaping the relationship between market structure, investment in innovation, and ultimately consumer welfare. The author shows that, in a theoretical setting where oligopolistic firms compete on differentiated products by investing in a technology which improves their efficiency either by reducing their marginal cost or improving product quality, consumer surplus and welfare are maximized through technical progress. Indeed, the effect of technical progress is to increase the size of innovation (either reducing marginal cost or increasing or the quality of products), thereby reducing the level of competition which maximizes investment, and then consumer surplus and welfare. As a consequence, higher rate of technical progress leads to stronger incentives to improve cost efficiency or product quality, therefore, to raise investment.

Technical progress reinforces dynamic competition (competition occurring through investment) more than it does enhance static competition (competition occurring through the number of market players or the degree of horizontal substitutability). A policy implication derived from the role of technical progress is that industries where the rate of technical progress is higher need a lower degree of competition to maximize investment, thus consumer surplus and welfare.

An empirical proof that a higher rate of technical progress lowers the degree of competition which maximizes investment in technology has been provided by Ciriani & Jeanjean (2020) and Ciriani & Jeanjean (2022). The authors show that the competition level (captured by price mark-ups) which maximizes the growth of hourly labor productivity (which captures the effect of investment on corporate performance) decrease when the rate of technical progress increases. This is due to the strong positive correlation between those optimal markups and the rate of technical progress. The result holds for each sector of the productive system in France over 1978 - 2015 and in a panel of eight euro-zone countries over 1995 - 2018. Persisting non-optimal markups in all sectors is associated to an average 0.4 percent loss in aggregate annual labor productivity growth over both periods. This suggests that competition policies aimed at reducing price markups below their optimal levels risk to harm investment and in particular, to hinder investment in sectors with rapid technical progress, hence undermine their contribution to aggregate productivity growth.

2.3 Implication for merger control in industry with high rate of technical progress

In more recent research, Jeanjean & Ciriani (2025) explain that merger control should account for investment, which is a major driver of competition, in order not to erroneously block operations that would in reality be pro-competitive, especially in industries where the rate of technical progress is high. They show that technical progress induced by dynamic effects (e.g., incentives to invest in technology which reduces marginal costs) is crucial in offsetting the static effects of market concentration such as short-term upward pressures on market prices. The authors build from a theoretical Cournot setting allowing for technical progress and investment, to evidence how post-merger price increases can be offset by dynamic efficiency gains associated

with investment in marginal cost-reducing technology, and that such beneficial effect is increasing with the rate of technical progress. As a result, the likelihood that a merger has pro-competitive effects is even higher when the rate of technical progress is high, meaning that in such innovative industries, limiting the assessment of merger competitive effect to a static standard will likely lead competition authorities to underestimate the dynamic efficiency gains that would have offset the price movements harming consumer in the short run. This would ultimately deprive consumers from the benefits of both lower prices through investment in technology which reduces marginal costs and higher quality products. Empirical studies of mobile market structures discussed in section 3 provide a suitable illustration of how technical progress is shaping the relationship between static competition (the number of firms in the market) and the extent to which firms are willing or are capable to invest in a technology which improves their efficiency by reducing their production costs. These studies all provide evidence that in mobile markets driven by data services, where the rate of technical progress is high and requires sustained investment to be displayed to consumers, overall industry investment will be maximized at lower level of static competition, hence at a higher level of economic margin. An higher market concentration in such competitive framework has an intertemporal effect on price. The transitory price increase is followed by a decrease resulting from the cost savings induced by investment in technology and the costs being spread over higher scale, e.g., output and consumer base.

Houngbonon & Jeanjean (2016) provide empirical proof that there exists a market structure or competition intensity which maximizes the level on investment in the mobile industry. The competition-investment relationship is inverted-U shaped, so that investment ceases to increase with competition beyond a 37 percent margin profit ratio threshold. The authors findings suggest that competition authorities should consider the actual firm-level margin profit ratio before allowing for a change in the market structure, either through entry or merger. Moreover, Jeanjean & Houngbonon (2017) also show that this results holds when competition intensity is captured with the number of mobile operators as a static measure of competition. Houngbonon & Jeanjean (2019) bring theoretical proof and empirical evidence that in the mobile industry, the investment in marginal cost reduction can offset the post-merger increase in profit margin, which implies that investment, and thus consumer welfare, is maximized in markets with three

symmetric operators. Most important, the authors show that the dynamic efficiencies from investment can offset static effects (the increase in margin). Elliott *et al.* (2025) have modeled mobile market competition which captures the engineering characteristics of wireless industry and confirm the inverted-U shaped relationship between the number of operators and consumer surplus or welfare. The optimal market structure is very sensitive to the technical parameters and hypotheses, which leads to a range of different results. For example, the authors find the optimal market structure can either be made of 3 or 4 market players. Notably, the main scenario, which leads to the 4 market players optimum, considers that fixed network costs are fully shared among all operators, which represents a polar case instead of the sector infrastructure-based competition standard.

3 Changes in mobile markets and their impacts on ARPU and investment

This section aims to show three points:

First, the European mobile markets have evolved from voice-driven to data-driven markets. This change has two major consequences. Demand is much more elastic for data than for voice and technical progress is swifter for data than for voice.

The first consequence brings the second point: ARPU is no longer a relevant proxy for prices because the correlation between ARPU and prices shifted from positive to negative over time. Voice prices and voice ARPU (Average Revenue per User) are positively correlated because voice price-elasticity is relatively low, while data prices and data ARPU are negatively correlated because data price-elasticity is sufficiently high.

The second consequence brings the third point: mergers do increase the price per minute of voice calls and decrease the price per megabyte. Indeed, as noted in the previous section, technical progress strengthen dynamic effects. The latter consists of investments in cost reduction. Mergers tend to increase margins (static effects) and to reduce costs (dynamic effects). As a result, for voice, where dynamic effects are moderate, static effects dominate, so that mergers increase the price per minute of voice calls, while for data, where technical progress is very rapid,

dynamic effects dominate, so that mergers decrease the price per megabyte.

In both cases, mergers tend to increase ARPU, and academic literature on mergers in mobile industry unambiguously shows that mergers increase ARPU Genakos *et al.* (2018), Aimele *et al.* (2021) among others. However, in voice dominated markets this growth in ARPU is due to a growth in prices while in data dominated markets, the growth in ARPU is due to a drop in price and a growth in data traffic.

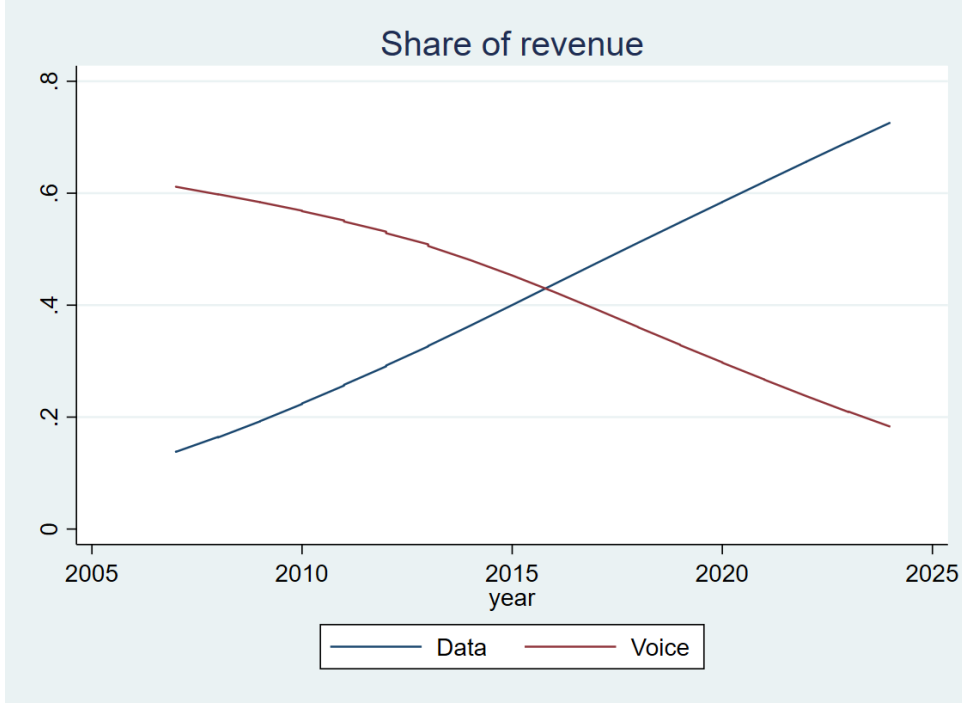
The European Commission's report: European-Commission (2024b) studies the state of competition in the European Union. Chapter II.1 studies the effect of competition or market concentration on prices and explains that market concentration increases prices. Subchapter II.1.2 is devoted to the mobile industry. However, in this section, the authors deliberately choose ARPU as the price. This is a poor and misleading choice because ARPU is not a price but a revenue; ARPU is the product of an average price and an average quantity. An increase in ARPU can therefore indeed correspond to an increase in prices, but it can also correspond to an increase in quantity, which generally reflects a decrease rather than an increase in prices. It turns out that, as seen above, in today's data-dominated mobile markets, ARPU moves in the direction opposed to price. We find again this confusion between price and ARPU in the report European-Commission (2024a) mentioned in the introduction.

3.1 Changes in mobile markets

Mobile markets have radically changed over the two last decades, moving from a predominance of voice to a predominance of data. This has major consequences on the competitive effects of Entry/Mergers and the resulting impact on consumer surplus and welfare.

First, the price elasticity of demand is much higher for data than for voice. This is crucial because price elasticity moderates price increases after a merger. Indeed, the higher the price elasticity, the greater the sales loss following a price increase. Second, technological progress is much faster for data than for voice, which generates stronger dynamic effects leading to higher investment as shown in previous sections. The graph below figure. 1 shows the change in European wireless markets from voice to data dominated markets.

Figure 1: Share of revenues between voice and data in wireless markets



This figure highlights that for 27 European countries, the weight of data in mobile revenue that was on average below 20 % in 2007, increased to more than 70 % on average in 2024. The data are extracted from two datasets from Analysys Mason: European quarterly metrics-Western Europe and European quarterly metrics-Central and Eastern Europe) from 2007 to 2024.

Price elasticity is much higher for data than for voice. To measure and compare the Price elasticity between voice and data, we model the relationship between price and traffic following:

$$T = kP^\varepsilon$$

where P is the price, T the traffic per user of voice or data, k a positive coefficient and ε the price elasticity defined by $\varepsilon = \frac{dT}{dT} \frac{P}{T}$.

Using the previous dataset, we can estimate the price elasticity for voice and data.

We provide an OLS estimation of the following model for voice and for data:

$$\ln(T) = \ln(k) + \varepsilon \ln(P) + \mu$$

where μ is the error term.

The table below, Table.1 provides the estimation of price elasticity.

Table 1: Price Elasticity for voice and data				
Variable	coefficient	std.err (robust)	95%	conf.interval
$ln(T)_{voice}$				
ε_{voice}	-0.2523	0.0070	-0.2659	-0.2387
$ln(k)_{voice}$	5.2702	0.0242	5.2226	5.3178
Observations	1890			
R-square	0.4595			
$ln(T)_{data}$				
ε_{data}	-1.0903	0.0063	-1.1027	-1.0779
$ln(k)_{data}$	3.0302	0.0180	2.9949	3.0655
Observations	1842			
R-square	0.9229			

Table 1 shows that demand is much more elastic for data than for voice. Data elasticity, ε_{data} is estimated on average at -1.09 while voice elasticity, ε_{voice} is estimated on average at -0.26 which is far below in absolute value. A more detailed estimate specifying the different elasticity values in each country is available in the appendix. The result that data is much more elastic than voice holds at the level of each country $\varepsilon_{data} < -1$. This means that a decrease in price by 10% entails an increase in data consumption by more than 10%.

3.2 Impacts on ARPU

Changes in mobile markets have altered the effects of the merger on ARPU (Average Revenue Per User). The academic literature unambiguously shows that, in mobile markets, mergers tend to increase ARPU. However, this does not necessarily imply that mergers increase prices. In this section, we show that when markets are voice-driven, mergers increase prices, while the opposite occurs when markets are data-driven. Indeed, ARPU and prices are positively correlated when markets are voice-driven and negatively correlated when markets are data-driven.

The transition from voice dominated markets to data dominated markets has increased the price elasticity and when price elasticity is below -1 (above 1 in absolute value), a decrease in price entails an increase rather than a decrease in ARPU. Considering $ARPU = TP$, the product of traffic per user T and unit price P . Remember $T = kP^\varepsilon$, therefore, $ARPU = kP^{(\varepsilon+1)}$

and $\frac{dARPU}{dP} = k(\varepsilon + 1)P^\varepsilon$

The sign of this expression is positive if $\varepsilon > -1$ and negative if $\varepsilon < -1$. As a result, if price elasticity is below -1 then a decrease in price entails an increase in ARPU. As data price elasticity is below -1 , a decrease in data price entails an increase in data ARPU and as voice price elasticity is above -1 , a decrease in voice price entails a decrease in voice ARPU.

This explains why voice ARPU and voice price (the average price of one minute call) are positively correlated while data ARPU and data price (the average price of the megabyte) are negatively correlated.

The graph below figure 2 shows the positive correlation between voice ARPU and voice prices and figure 3 shows the negative correlation between data ARPU and data prices.

Figure 2: Relationship between voice ARPU and voice price

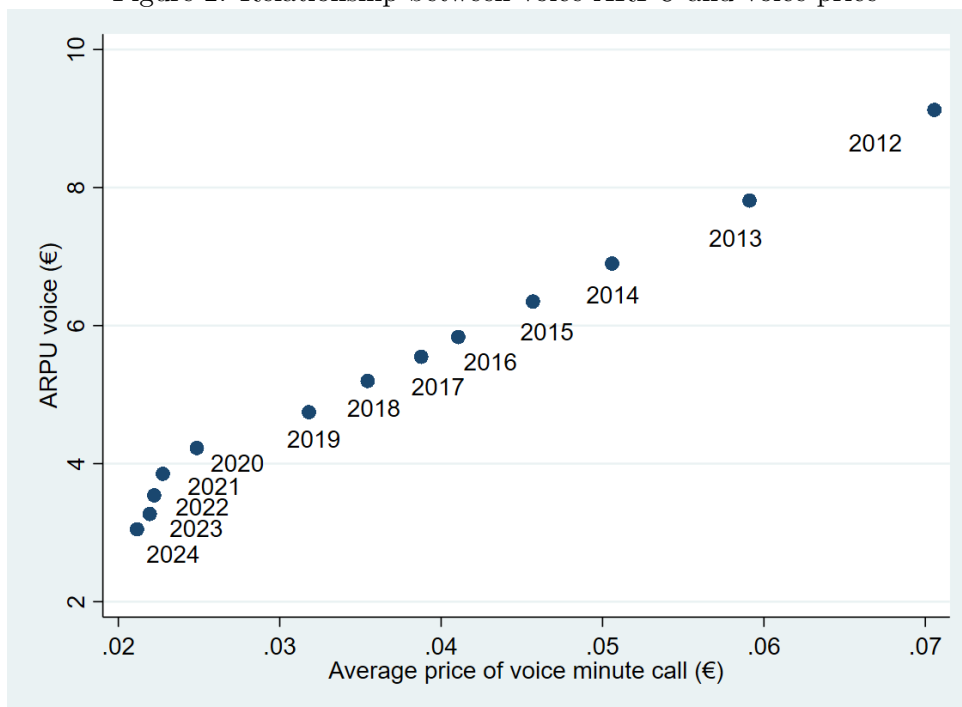
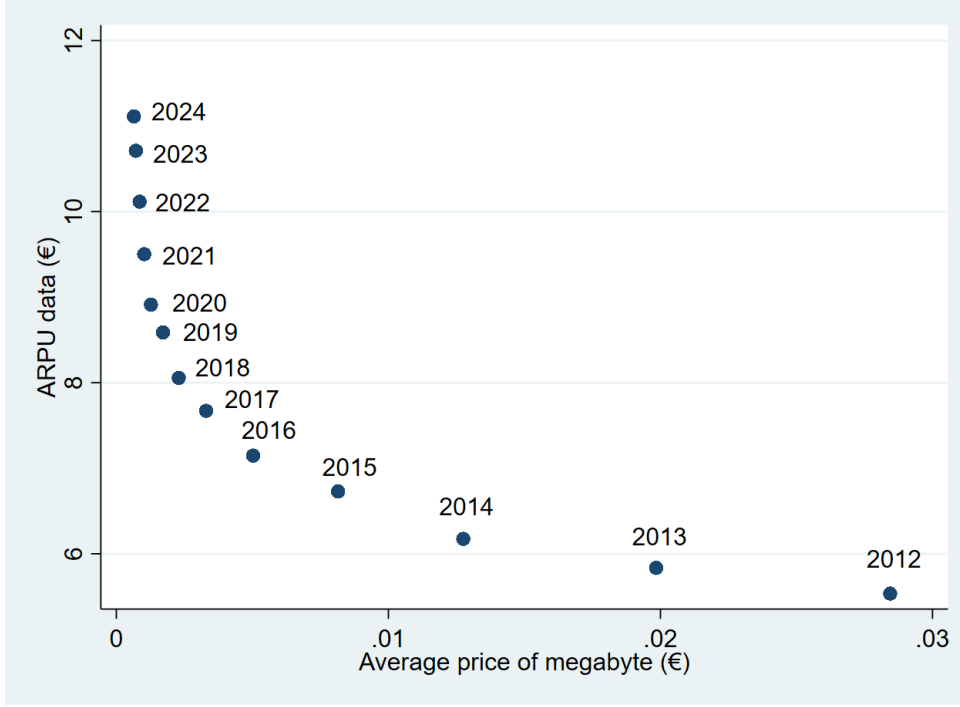


Figure 3: Relationship between data ARPU and data price

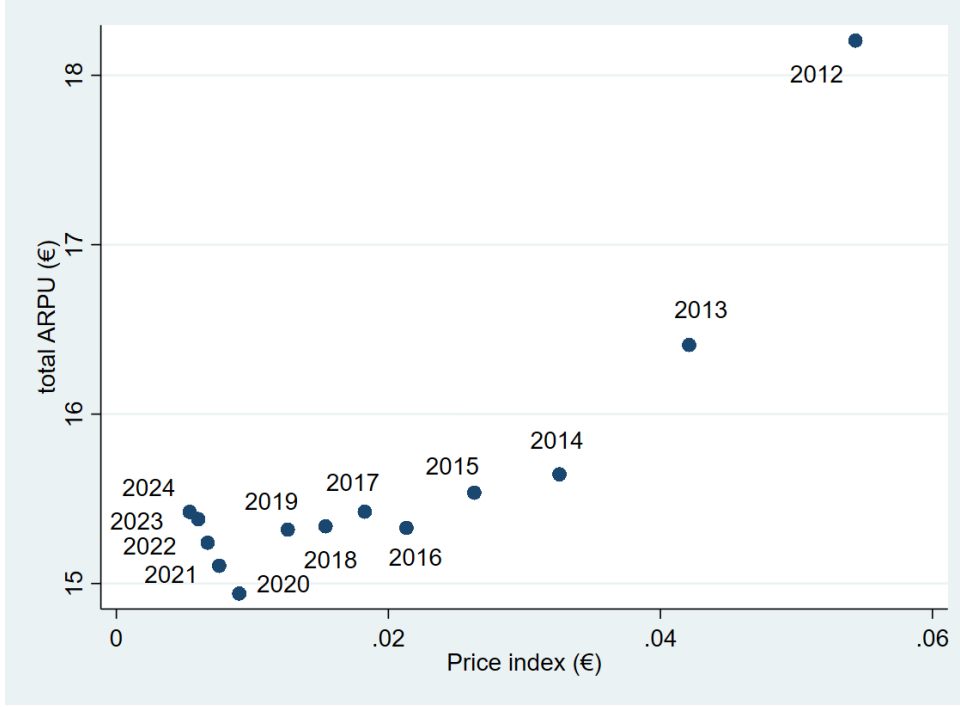


To have a general relationship between prices and ARPU, we compute a price index defined as the average price between voice and data weighted by the share of the revenues. More specifically, the price index is: $P_{index} = \frac{P_d R_d + P_v R_v}{R_d + R_v}$ for the 27 countries on an annual basis, where P_d is the average price of a megabyte, R_d the revenue of data, P_v the price of the minute of call and R_v the revenues of voice. The total ARPU is the sum of voice ARPU, data ARPU and wholesale ARPU ². The relationship between the price index and the average total ARPU is given in the graph below, figure 4 ³

²Wholesale ARPU, being mainly based on mobile call terminations, follows a downward trend comparable to that of voice ARPU.

³Figures 2,3 and 4 start in 2012 to be more readable, however from 2007 to 2012, markets behave, as expected, like voice dominated markets. A graph in the appendix show the complete sequence from 2007.

Figure 4: Relationship between total ARPU and the price index



Before 2015, the 27 markets are predominantly voice-driven, therefore, price index and total ARPU are positively correlated. Between 2015 and 2019, voice and data are more balanced, therefore, price index and total ARPU are no longer significantly correlated. Since 2020 ⁴, the markets are predominantly data-driven, therefore, price index and total ARPU are negatively correlated. As a robustness check, Figure 10 in the appendix provides an alternative measure of price to compare with ARPU. We compute the average price per megabyte including voice, where voice traffic in minutes is converted into data traffic in megabyte. This alternative measure provides similar results.

This shows that ARPU is not a valid choice for comparing prices between a three or four operators market configuration. This was the case in the past, but it is no longer the case today: since 2020, an increase in ARPU is no longer a sign of a price increase, but even, on the contrary, a sign of a price decrease. In the current data-driven market environment, merger-induced ARPU growth is driven by data traffic growth following the fall in data prices.

⁴after a decline likely due to Covid-19 pandemic, with a peak of voice traffic in 2020

The decline in data prices is driven by rapid technological progress, which encourages investment in network infrastructure and reduces the average cost of producing a megabyte. This price decline offsets the increase in margins that is due to increased market power. Dynamic effects dominate static effects, allowing mergers to lower their prices at the benefit of consumers. This impact of dynamic effects driven by technical progress is developed in the following subsection.

3.3 Impacts on investments and on the dynamic effects of mergers

The three figures above show that voice and data prices are decreasing over time, primarily due to lower production costs. This decline in production costs is the result of technological progress incorporated into the market through investment. From 2007 to 2024, for the 27 countries, the price of voice was divided by approximately 7 and that of data by more than 1200. At the same time, voice traffic increased by 69% while data traffic increased more than 3,000-fold. This significant transformation shows that the driving force behind market development is the increase in network capacity, driven by investments that allow increases in traffic and reduce costs, and therefore prices. As shown by Jeanjean (2015), the decline in the price per megabyte is mainly due to Investment (dynamic effects) rather than market power or margin changes (static effects).

We see that data prices are falling much faster than voice prices. This shows that technical progress is happening much faster for data than for voice. As seen in section 2, technical progress generates investments in network infrastructure that decreases costs.

Market structure drives both market power and investment. A merger strengthens competition and tends to decrease market power. The impact of a merger on investment depends on the pre-merger level of competition. Since the relationship between market structure and investment is inverted U-shaped, a merger increases investment if the pre-merger level of competition is below the peak of the U-shaped curve and decreases it if it is above. Section 2 also shows that the competition level which maximizes investment is lower when the rate of technical progress is higher. As a result, a data-driven market maximizes investment for a lower level of competition than does a voice-driven market. An increase in investment tends to reduce costs. As pointed out by Hounghonon & Jeanjean (2019), if this cost reduction (dynamic effect) is higher than

the growth of margin due to market power (static effect), a price decrease occurs.

It turns out that, as highlighted by Aimene *et al.* (2021), recent 4 to 3 mergers have decreased data prices, increased the price of voice and the ARPU. In a context of data-driven markets, the impact on data price dominates. Moreover, Čihák (2025) found that the entry of the fourth operator in the Slovak Republic in 2015 led to an increase in data price, a decrease in voice price and a fall in ARPU. The entry of a fourth operator had therefore an opposite effect on prices and ARPU compared with the effects associated with the 4-3 mergers. These results support an optimal mobile market structure with 3 players, at least in Europe.

The 4-3 mergers have increased investment, which has led to lower costs. Technological progress for data is so fast that declining costs have outpaced margin growth driven by increased market power. This has resulted in lower data prices, leading to higher ARPU. Weaker technological progress for voice has not been sufficient to offset margin growth, leading to higher voice prices. However, the dominance of data is such that the overall result has been beneficial to consumers.

Conversely, the entry of a fourth operator has reduced investments and led to an increase in the cost of data, which exceeded the decline in margins. Data price therefore increased, leading to a decline in ARPU. The drop in voice prices in a data-driven market could not prevent an overall negative impact on consumers.

These results are consistent with Bahia & Castells (2023) that highlighted that 3 player markets perform better than 4 player markets in terms of investment, data traffic, download/upload speed and latencies.

4 Conclusion

This paper has discussed the lines of argumentation opposed to Draghi's Report recommendation to foster consolidation in the European national telecom markets, and argue that these criticisms are not built upon sufficiently robust evidence. Two main bias which affect the public debate on the need to promote more concentrated telecom market structure for the sake of investment and consumer welfare in Europe.

The first bias relates to the flawed assessment of the competitive effect of merger on prices, due to the fact that many studies consider that ARPU is a reliable proxy for price. However, due to the evolution of wireless markets from voice to data ecosystems of services, the initial positive correlation between ARPU and price has been reversed, so that today, in markets largely driven by data services, the relationship is reversed.

The second bias arises from the fact that current merger control procedures fail to account for the dynamic effects specific to mergers, which are particularly significant in the telecom industry, even more so in data-driven markets. The merger simulations and upward price pressure tests performed by competition authorities are limited to the static effects. They miss the dynamic effects associated to investment, which are a crucial parameter of efficiency gains in the telecom market. Competition for technology stimulates investment and allows cost savings thus lower prices.

The policy implications of our analysis, based on the reviewed literature and the assessment of the relationship between ARPU and price, suggest that Draghi's Report recommendation for consolidation in European telecom markets is relevant and conforms with the most recent results from academic research. Such evolution in merger control would improve the overall efficiency of the industry and consumer welfare alike.

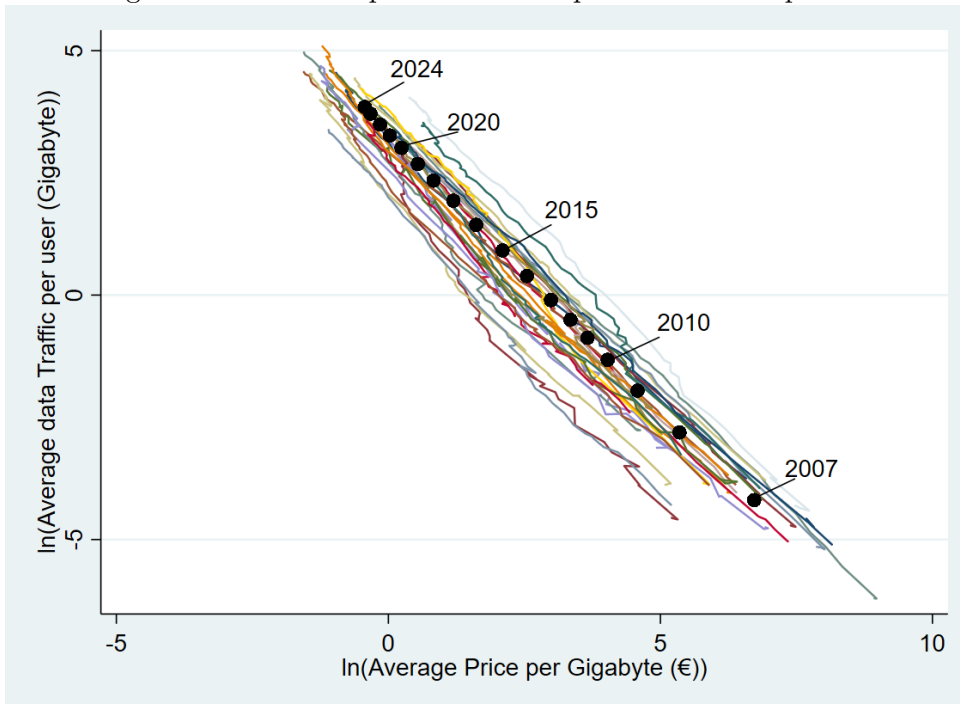
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5 Appendix

Figure 5: Relationship between data price and traffic per user



In the figure above, figure 5, each curve represents the evolution of the relationship between average data price and data traffic. The black scatter plot represents the average evolution for the 27 countries.

The curve described by each country is very close to a straight line whose slope represents price elasticity.

The average price elasticity for the 27 country is estimated in Table 1 and the price elasticity for each country is estimated in the table below, Table 2.

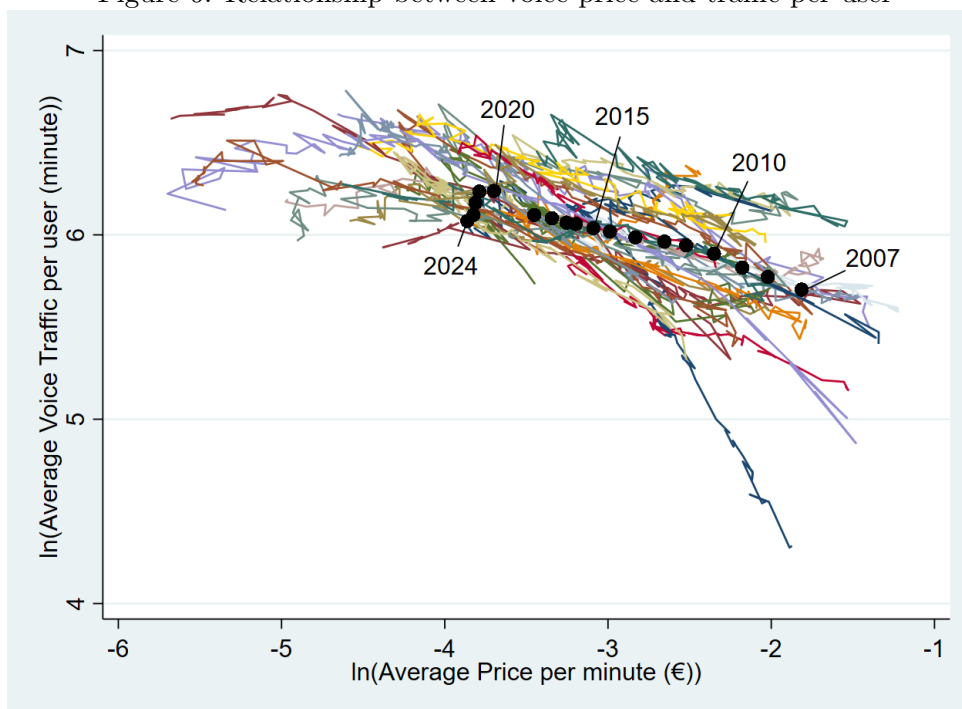
For all countries, price elasticity is lower than -1 which means that a 10% decrease in price increases traffic by more than 10%. Slopes of the straight lines are very steady over time and therefore estimates are very precise and significant.

Table 2: Data Price Elasticity by country

Variable	coefficient	std.err (robust)	95%	conf.interval
<i>ln(T)_{data}</i>				
<i>ε_{data}</i>				
Austria	-1.0938	0.0092	-1.1118	-1.0757
Belgium	-1.1485	0.0049	-1.1581	-1.1388
Denmark	-1.1155	0.0030	-1.1214	-1.1096
Finland	-1.2370	0.0197	-1.2756	-1.1983
France	-1.0844	0.0040	-1.0923	-1.0765
Germany	-1.1838	0.0102	-1.2038	-1.1638
Greece	-1.1855	0.0213	-1.2273	-1.1437
Ireland	-1.0981	0.0044	-1.1068	-1.0895
Italy	-1.0599	0.0026	-1.0651	-1.0546
Netherlands	-1.0654	0.0035	-1.0722	-1.0586
Norway	-1.2064	0.0107	-1.2274	-1.1854
Portugal	-1.1668	0.0161	-1.1984	-1.1351
Spain	-1.1861	0.0069	-1.1996	-1.1726
Sweden	-1.3367	0.0179	-1.3717	-1.3017
Switzerland	-1.1655	0.0043	-1.1740	-1.1570
UK	-1.0723	0.0069	-1.0859	-1.0587
Bulgaria	-1.4734	0.0374	-1.5468	-1.4001
Croatia	-1.1201	0.0145	-1.1486	-1.0916
Czech Republic	-1.1279	0.0101	-1.1477	-1.1081
Estonia	-1.3093	0.0236	-1.3557	-1.2629
Hungary	-1.2828	0.0220	-1.3259	-1.2396
Latvia	-1.2846	0.0223	-1.3282	-1.2409
Lithuania	-1.2895	0.0210	-1.3307	-1.2484
Poland	-1.1328	0.0129	-1.1581	-1.1076
Romania	-1.2922	0.0163	-1.3242	-1.2602
Slovakia	-1.2718	0.0320	-1.3346	-1.2090
Slovenia	-1.1573	0.0118	-1.1804	-1.1342
<i>ln(k)_{data}</i>				
Austria	3.2019	0.0232	3.1556	3.2482
Belgium	3.6848	0.0198	3.6451	3.7244
Denmark	3.4799	0.0056	3.4688	3.4911
Finland	3.2141	0.0243	3.1656	3.2625
France	3.6323	0.0114	3.6096	3.6549
Germany	3.3513	0.0239	3.3036	3.3990
Greece	2.8960	0.0557	2.7849	3.0072
Ireland	3.6855	0.0099	3.6658	3.7053
Italy	2.9179	0.0100	2.8979	2.9379
Netherlands	3.3975	0.0103	3.3770	3.4179
Norway	4.2667	0.0181	4.2306	4.3027
Portugal	2.9068	0.0409	2.8251	2.9885
Spain	3.4525	0.0192	3.4143	3.4908
Sweden	3.8329	0.0311	3.7709	3.8949
Switzerland	4.5434	0.0165	4.5106	5.5763
UK	3.4632	0.152	3.4328	3.4936
Bulgaria	2.5952	0.0837	2.4280	2.7625
Croatia	2.7555	0.0267	2.7021	2.8089
Czech Republic	3.0262	0.0227	2.9809	3.0715
Estonia	2.7676	0.0239	2.7199	2.8153
Hungary	2.8070	0.0308	2.7456	2.8685
Latvia	2.7927	0.0261	2.7405	2.8450
Lithuania	2.2643	0.0360	2.1924	2.3362
Poland	2.4448	0.0268	2.3913	2.4983
Romania	1.9633	0.0120	1.9393	1.9872
Slovakia	3.2079	0.0669	3.0744	3.3415
Slovenia	3.3683	0.0146	3.3391	3.3975
Observations		1842		
R-square		0.9942		

Figure 6 below represents the evolution of voice traffic and voice prices. Each curve represents a country and the black scatter plot represents the average evolution for the 27 countries. As we saw above for the data, the slope of the regression straight line represents the price elasticity. The curves for voice are less straight than for data and the results are less precise, but they remain very significant for almost all countries. No country has a price elasticity less than -1 . This means that a decrease in voice price by 10% leads to an increase in voice traffic less than 10%.

Figure 6: Relationship between voice price and traffic per user



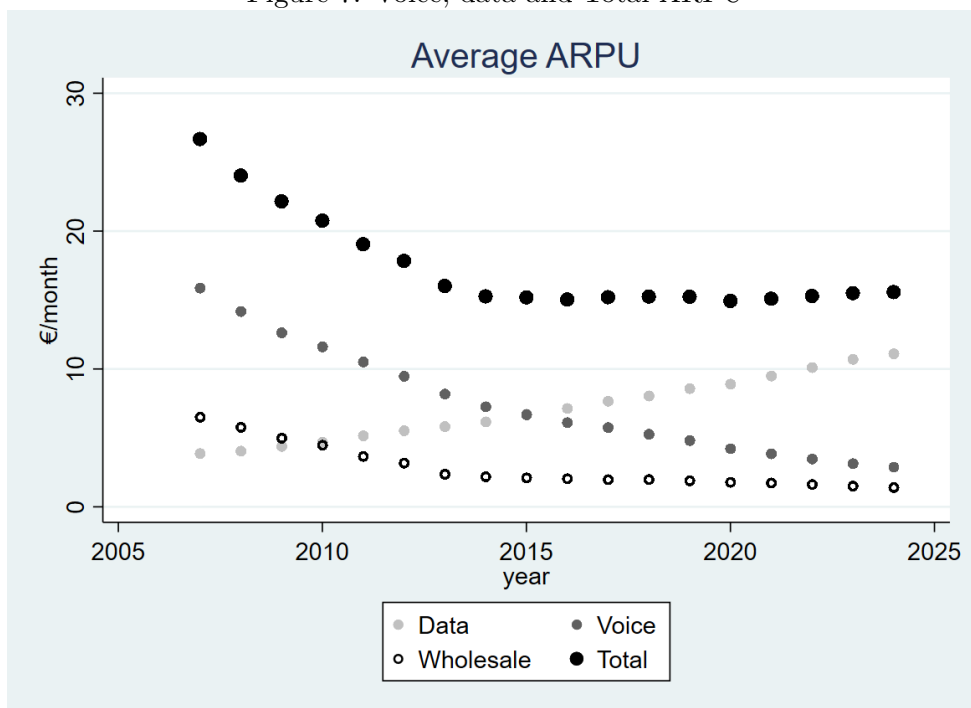
The table below, Table 3, estimates the price elasticity of voice for the 27 countries.

Table 3: Voice Price Elasticity by country

Variable	coefficient	std.err (robust)	95%	conf.interval
<i>ln(T)_{voice}</i>				
<i>ε_{voice}</i>				
Austria	0.649	0.0210	0.0237	0.1062
Belgium	-0.1677	0.0110	-0.1893	-0.1461
Denmark	-0.2011	0.0066	-0.2141	-0.1882
Finland	0.2427	0.0405	0.1633	0.3221
France	-0.1802	0.0114	-0.2024	-0.1579
Germany	-0.3879	0.0162	-0.4198	-0.3561
Greece	-0.3263	0.0125	-0.3508	-0.3017
Ireland	-0.0984	0.0207	-0.1390	-0.0579
Italy	-0.2993	0.0153	-0.3293	-0.2693
Netherlands	-0.3080	0.0137	-0.3349	-0.2811
Norway	-0.2470	0.0136	-0.2737	-0.2202
Portugal	-0.2260	0.0119	-0.2494	-0.2027
Spain	-0.1468	0.0096	-0.1657	-0.1280
Sweden	-0.2425	0.0128	-0.2677	-0.2174
Switzerland	-0.1685	0.0083	-0.1849	-0.1522
UK	-0.7174	0.1614	-1.0340	-0.4009
Bulgaria	-0.3793	0.0164	-0.4114	-0.3472
Croatia	-0.4359	0.0221	-0.4792	-0.3926
Czech Republic	-0.3079	0.0088	-0.3251	-0.2906
Estonia	-0.1415	0.0107	-0.1625	-0.1204
Hungary	-0.4352	0.0130	-0.4606	-0.4098
Latvia	-0.2865	0.0348	-0.3546	-0.2184
Lithuania	-0.5288	0.0139	-0.5561	-0.5016
Poland	-0.2533	0.0132	-0.2790	-0.2275
Romania	-0.4725	0.0167	-0.5053	-0.4396
Slovakia	-0.2066	0.0104	-0.2270	-0.1861
Slovenia	-0.1815	0.0189	-0.2185	-0.1444
<i>ln(k)_{voice}</i>				
Austria	6.3452	0.0633	6.2188	6.4716
Belgium	5.3206	0.0299	5.2609	5.3803
Denmark	5.4058	0.0199	5.3661	5.4455
Finland	6.8170	0.1206	6.5765	7.0576
France	5.7800	0.0354	5.7094	5.8505
Germany	4.5324	0.0397	4.4531	4.6117
Greece	5.2278	0.0441	5.1398	5.3158
Ireland	6.0137	0.0529	5.9082	6.1191
Italy	5.2453	0.0456	5.1543	5.3364
Netherlands	5.1230	0.0336	5.0560	5.1899
Norway	5.6820	0.0306	5.6208	5.7431
Portugal	5.1844	0.0361	5.1123	5.2565
Spain	5.5602	0.0271	5.5062	5.6142
Sweden	5.5204	0.0361	5.4484	5.5924
Switzerland	5.4350	0.0172	5.4007	5.4694
UK	3.7405	0.4291	2.8843	4.5967
Bulgaria	4.7410	0.0636	4.6140	4.8580
Croatia	4.5998	0.0718	4.4565	4.7431
Czech Republic	4.9763	0.0246	4.9273	5.0254
Estonia	5.5090	0.0330	5.4432	5.5747
Hungary	4.7849	0.0433	4.6985	4.8713
Latvia	5.0733	0.1463	4.7814	5.3652
Lithuania	4.1216	0.0538	4.0142	4.2290
Poland	5.0661	0.0517	4.9630	5.1692
Romania	4.4779	0.0627	4.3528	4.6029
Slovakia	5.3616	0.0347	5.2924	5.4308
Slovenia	5.6364	0.0506	5.5355	5.7374
Observations		1890		
R-square		0.8789		

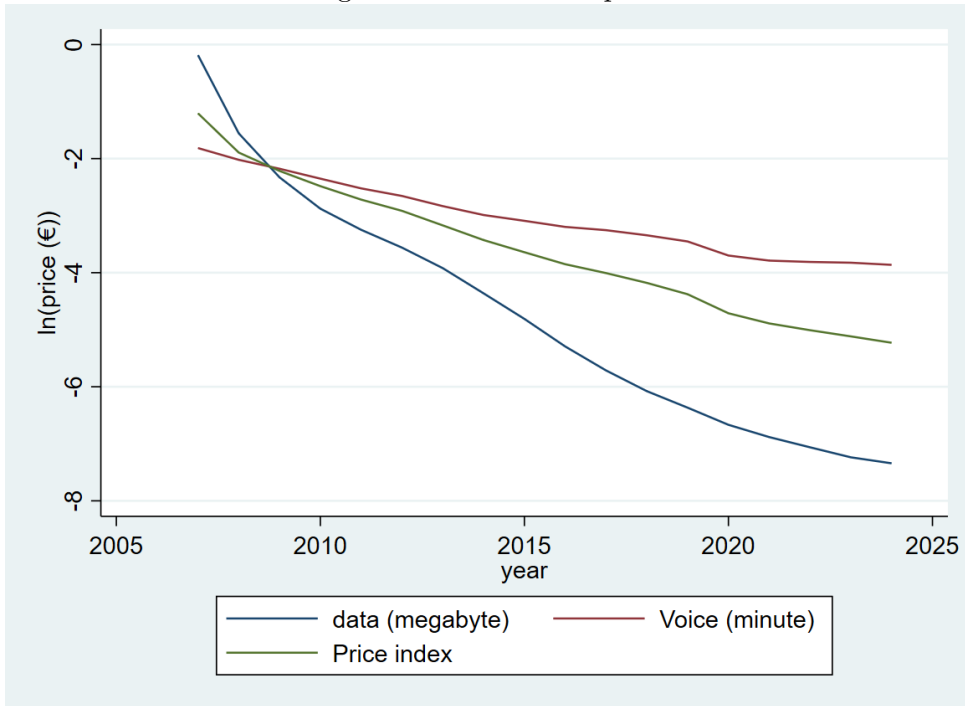
The graph below, Figure 7, represents the evolution of ARPU year on year detailed with ARPU for data, ARPU for voice and wholesale ARPU.

Figure 7: Voice, data and Total ARPU



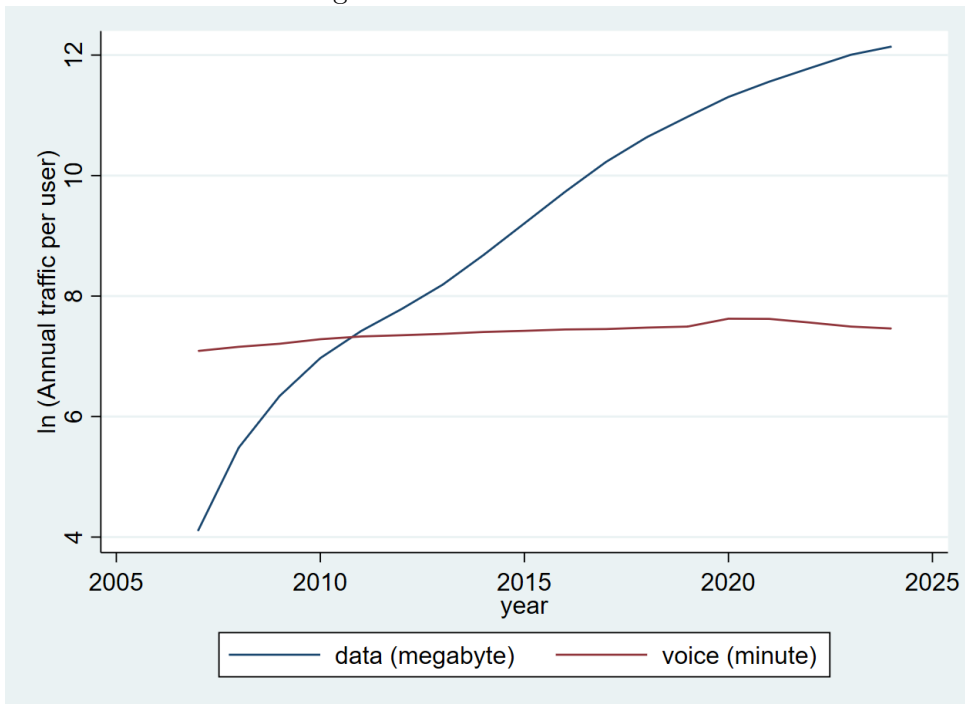
The graph below, Figure 8 represent the evolution of average data and voice prices as well as the price index.

Figure 8: Evolution of prices



The graph below, Figure 9 represents the evolution of average data and voice traffic.

Figure 9: Evolution of Traffic



The graph below, Figure 10 represents the relationship between the average price of megabyte (including voice) and total ARPU. In this graph, the voice traffic is converted in data and added to the data traffic. We convert voice traffic to data traffic using the following formula: (voice traffic in number of minutes) * (60 s) * (2 * 12000 bits)/second)/(8 * 1000000) = 0.18. That is to say 1 min of voice traffic consumes 0.18 megabytes of data, where (voice traffic in number of minutes) is the number of minutes reported by Analysys Mason in the European quarterly metrics; (60 s) multiply by 60, we obtain voice traffic in number of seconds; (2 * 12000 bits/second) 12 kbits/sec is the bandwidth used by the mobile voice, * 2 for downlink + uplink; Divide by 8 to get byte, 1 byte is equal to 8 bits; We divide by 1 000 000 to get traffic in megabyte (to have the same unit as data traffic in Telecom Market Matrix).

Figure 10: Relationship between total ARPU and the price of megabyte (including voice)

