Preliminary and Incomplete
Do not quote without permission

Political Determinants of Competition

Mara Faccio

Purdue University

and

Luigi Zingales*

University of Chicago, NBER & CEPR

First Version: June 2016

Abstract

Do political factors affect the degree of product market competition? To explore this hypothesis we first look at the international variability in PPP-adjusted retail prices. We find a greater variability of international prices in regulated sectors (where the political influence is greater) and lower prices in more democratic countries. To probe deeper we focus on the mobile telecommunication sector. After controlling for differences in market size, we find that the degree of competition is higher in more democratic countries, especially in Scandinavian ones, and lower when the incumbent phone operators have more political connections. We also find some direct evidence of how political power affects the degree of competition through spectrum auctions and antitrust enforcement (or lack thereof). Not surprisingly, in the mobile sector more competition leads to lower prices. Yet, there is no evidence that it leads to lower quality or less investments, if anything it is the other way around. Finally, we estimate the potential welfare transfer of reduced competition. U.S. consumers would gain $72bn a year if U.S. prices were in line with Danish ones and $32bn if they were in line with German ones.

* We gratefully acknowledge financial support from the Stigler Center at the Univeristy of Chicago Booth School of Businsess. We also thank Sara Bagagli for her excellent research assistance and several participatnts at the University of Chicago Micro lunch and at the University of Michigan Mitsui Seminar for comments. Luigi Zingales was an independent board member of Telecom Italia from April 2007 to April 2014.

While most neoclassical economists viewed product market competition as a natural outcome, Polanyi (1944) saw it as an institutional construct. According to this latter view, the degree of competition prevailing in a market is not only the product of economic forces, but of political ones as well.

In this paper we test whether political factors systematically affect the degree of product market competition. The political sector can impact competition in several ways: licenses and restrictions on entry (De Soto, 1989; Djankov et al., 2002), tariffs and import licenses (Beckman, 1999), direct intervention on prices, expropriation of non-government owned operations, regulatory decisions, and antitrust intervention, or just the threat of intervention (or lack thereof). By and large these powers are at the national level. Thus, if there is a political effect on competition this effect should manifest itself in very different prices of goods across borders and this difference should be more pronounced in regulated sectors, i.e., in sectors where political intervention is potentially more pervasive.

We start by looking at retail prices at the international level, by using Numbeo, a new online dataset. Contrary to the Law of One Price, we find that prices–even PPP adjusted prices–vary greatly across countries: the 95th percentile of the distribution is roughly four times the 5th percentile. This is true in the tradable sector, but also in the non-tradable sector. Surprisingly, it is not true in regulated sectors: in these sectors the 95/5 ratio is 6.7. Interestingly, we also find that retail prices tend to be lower in more democratic societies.

There are many non-political reasons why market conditions can differ across countries, from access to natural resources to geographic barriers to entry. It is very difficult, thus, to make any inroad on the subject by looking across all sectors. For this reason, we focus on a single industry where there is a substantial degree of variation in prices across countries: the mobile telecommunication industry. Focusing on this industry presents several benefits: the technology is similar across countries, there are no natural advantages, there are very good data both on prices and quality, and the industry is still very highly regulated at the national level (for example in Europe national barriers are still important).

To the extent that a government can affect the degree of competition, it is going to do so under the pressure of conflicting interests. The producers in that industry will want less competition, to enjoy higher margins, while producers who use that product as an input and final consumers will want low prices but high quality. Thus, their pressure in favor of competition is highly dependent upon competition being able to deliver on those two margins. Since the mobile industry is mostly a retail industry, the concentrated interests would favor less competition, while the diffuse ones will favor more, especially if we can show that in that industry higher competition will lead to lower prices, but not lower quality.

We find that, indeed, countries in which political decisions are more influenced by private interests tend to have less competition. For example, the more common political connections among phone operators are, the lower the degree of competition. Similarly, the stronger democracy is in a country, the

higher the degree of competition. The two effects interact, so that the effect of political connections is less pronounced in more democratic countries. Competition is also stronger in Scandinavian countries, which score at the top not only for the absence of corruption, but also for their impartiality in the application of rules (Rothstein, 2011), which fosters a competitive level playing field.

There is also a correlation between political connections (at the operator level) and an operator's market share. The largest operator in each market is the one that benefits the most from restricting competition. Thus, this is suggestive of the reason why the negative correlation between political connection and degree of competition exists.

To substantiate the importance of the political determinants of competition we identify the four countries with the largest (absolute) variation in concentration (measured as C2) during the period 2000-2014. These four countries are: the United States, with an increase in C2 from 34% to 66%, Ireland, with a decline from 100% to 67%, Iceland with a decline from 100% to 71%, and Italy with a decline from 90% to 61%.

The U.S. mobile industry started the millennium very fragmented as a result of the way spectrum was auctioned off in the late 1990s. The subsequent increase in concentration was the result of regulatory forbearance of several mergers. Had the Department of Justice and the FCC been more tolerant in the last few years, the increase in concentration would have been even stronger. The variation in the other three countries is the result of the way spectrum auctions were run to promote more entry. In both sets of cases, government intervention shaped the market outcome.

We then systematically investigate the impact of competition on prices. We find that prices are lower both in markets with at least four real competitors (i.e., operators with at least a 5% market share) and in markets with a lower concentration, measured as C2. This is true if we look at the price of a given basket of services, the price per minute of conversation, the Average Revenue per Unit (ARPU), and the EBITDA margin. The effect is true, even if we instrument the degree of competition in the marketplace with its political determinants or we look at changes in the degree of competition over time.

By contrast, we find no evidence that a higher degree of competition leads to lower quality or less investments. If anything, the results go in the opposite direction. A higher degree of competition is correlated with lower wages, but the effect is not statistically significant at conventional levels. The same is true for churn: higher competition leads to marginally higher churns among customers.

To assess the potential impact of a political decision on welfare distribution, we look at the difference between U.S. prices of cellular services and prices prevailing in similarly developed countries with more competition, like Denmark and Germany. U.S. consumers would gain $72bn a year if U.S. prices for mobile services were in line with Danish ones and $49bn if they were in line with German ones. This is a

transfer, not necessarily a deadweight loss. Yet, a fraction ends up being dissipated in rent-seeking: telecommunication companies are among the most active lobbyists and most generous corporate givers.

The rest of the paper proceeds as follows. Section 1 presents the data used. Section 2 analyzes the cross country differences in retail prices. Section 3 introduces the political economy of competition in the mobile sector and tests its validity with international data. Section 4 explores the impact of competition on prices, quality, and investments, while Section 5 attempts to estimate the welfare transfer produced by lower competition in the United States. Section 6 concludes.

1. The Data

In the following we present the various datasets used in this study.

1.1 Data on Retail Prices

For international retail prices we used a new international online dataset produced by Numbeo (http://www.numbeo.com). Numbeo (with 2,687,888 prices in 5,846 cities, entered by 307,465 contributors) claims to be the world's largest database of user contributed data about cities and countries worldwide. Data collection relies on users' inputs and manually collected data from different sources, like websites of supermarkets, governmental institutions, newspapers articles, surveys, taxi company websites, etc. In order to control for noise, Numbeo removes outlier prices observed within a certain area and at a point in time. Then, the 25% lowest and 25% highest values are discarded, and the average value of the remaining entries is estimated.

Data are archived generally after 12 months. If there is lack of fresh data (and the country's inflation is low), they can be kept current for up to 18 months. Currency exchange rates are updated almost every hour, using multiple currency feeds (including that of the ECB). Prices, which include GST and VAT, are PPP adjusted by Numbeo using the World Bank (GDP) conversion factors.

We downloaded the entire data set of prices for the capital city in each country in October 2015 and computed the 2010-2014 average of each given variable in each country. We eliminated Venezuela from the sample because in recent years the country has been undergoing hyperinflation and the ratio came out incredibly high (three to 4 times the U.S. prices). We also eliminated all alcohol items because they are highly taxed in Muslim countries (in Kuwait the price of a bottle of wine is 16 times the price of one in the United States). Then, we averaged these ratios for each item over the time series (2010-2014).

The summary statistics for a few items are reported in Table 2, Panel C. On average a McDonald's meal costs $9.95, with a minimum of $6.12 and a maximum of $19.74. The range is much bigger for a pre-paid minute of phone call (the maximum is 6 times the minimum) and for a 10 Mbps unlimited internet package (the maximum is 9 times the minimum).

1.2 Data on Mobile Phone Prices and Margins

The International Telecommunication Union (ITU) is the U.N. specialized agency for Information and Communication Technologies. ITU relies directly on statistics provided by national agencies. The main dataset we are going to use has prices of ITC services. The data are collected through an annual questionnaire addressed to government agencies responsible for telecommunication/ICT industry. Price data that should be submitted refer to those offered by the largest national operator in terms of market share. A strict set of rules is provided in order to improve the accuracy and the degree of homogeneity in cross-country comparisons. Finally, the third set of data concerns data on access to and use of ICTs by households and individuals. This information is collected through an annual questionnaire addressed to the national statistical offices.

Data collected from national agencies and statistics offices–whose complete list is available on ITU website–are validated and harmonized by ITU, and finally published. When there are missing values (especially for countries that do not reply to the questionnaire), then ITU collects the information from government websites and operators' annual reports. Data for mobile operators are widely available only since year 2000.

An alternative source for mobile data is the Groupe Speciale Mobile Association (GSMA), an association of nearly 800 operators and more than 250 companies in the broader mobile sector. It provides extensive global mobile data for 237 countries and territories: data cover every operator group, network, and mobile virtual network operator (MNVO) in every country worldwide. As a result, GSMA Intelligence is the source of mobile operator data, analyses, and forecasts on which telecommunication industry players rely on.

Data are updated daily and available for download on a quarterly basis–generally over the previous 5 years. The type of information available comprises: market data (e.g., market penetration rates, number of unique subscribers); data traffic and prices of services; operators' financial data (e.g., revenues, net profits).

1.3 Measures of Concentration

The mobile phone industry is highly concentrated. The sum of the market share of the four largest operators (C4), a standard measure of concentration, has a mean of 96%. Even the sum of the market share of the two largest operators (C2) has a mean of 0.83 (Table 3, Panel B).

For this reason, as a measure of the competitiveness of the industry we will use the presence of at least four major carriers. That four is the "magic number" is well recognized in the industry.[1] The key variable is what we mean as "major." In Table 3 (and in the rest of the paper) we use as a cutoff a market share of at least 5%. If we were to use a lower cutoff (1%), the results would be very similar. Roughly one quarter of all the countries has at least four major mobile operators.

1.4 Institutional Variables

As a measure of democracy we use an additive eleven-point scale (0-10) from Polity-IV. It captures the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders, the existence of institutionalized constraints on the exercise of power by the executive, and the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation.

As a measure of corruption we use the Institute of Economic Freedom's measure of corruption. It is based primarily on Transparency International's Corruption Perceptions Index (CPI), for 2011. The CPI is based on a 10-point scale in which a score of 10 indicates very little corruption and a score of 0 indicates a very corrupt government. In scoring freedom from corruption, the Index converts the raw CPI data to a scale of 0 to 100 by multiplying the CPI score by 10. For example, if a country's raw CPI data score is 5.5, its overall freedom from corruption score is 55. For countries that are not covered in the CPI, the IEF determines the score by using the qualitative information from internationally recognized and reliable sources. This procedure considers the extent to which corruption prevails in a country. The higher the level of corruption, the lower the level of overall economic freedom and the lower a country's original IEF score. We rescaled the index (=100-original index), so that a higher number denotes higher corruption.

Finally, Scandinavian countries are known to be not only relatively free of corruption, but also very good at the impartial enforcement of rules (Rothstein, 2011). We consider Scandinavian Iceland, Norway, Sweden, Denmark, and Finland.

1.5 Political Connections

Extending Faccio (2006), we measure political connections by computing the fraction of executives and board members of a country's phone operators who served as government minister, chief of state, or members of parliament. For every firm in the Telecommunication Services industry (as reported in

---

[1] *The Economist*, "Four is a magic number," March 15, 2014.

Capital IQ) we gather (also from Capital IQ) the biographies of each and every individual covering the top positions.[2]

This initial sample includes the biographies of 55,656 unique individuals affiliated with 5,890 firms in the Telecommunication Services industry. These include fixed, mobile, and internet operators, as well as other firms. Capital IQ does not indicate whether a given company is a mobile phone operator. Therefore, we manually match these firms from Capital IQ with the mobile telecom operators covered in the GSMA database. This matching yields a sample of 6,121 individuals affiliated with 410 mobile telecom operators with bios in Capital IQ and pricing data from GSMA.

We employ a C# text parsing program to identify whether these individuals have political experience, e.g., served as heads of state, government ministers or members of parliament in their home countries, or worked (in the government) for anybody in those positions. To identify chiefs of states and government ministers we use the political "titles" reported in the "Chiefs of State and Cabinet Members of Foreign Governments" directory published by the CIA (https://www.cia.gov/library/publications/world-leaders-1/index.html). Examples of such titles include Emperor, Eternal General Secretary, Eternal President, Secretary for Commerce, Secretary for Communications, and Supreme Leader. We supplement the CIA database with the names of all Presidents, Chancellors, Chairmen, and Emirs ruling as of or after 1980, identified from http://www.rulers.org/index.html.

The parsing program extracts any sentence listing the political titles described above. We then read each of those sentences to verify that the person in question indeed covered a political position. We include both current and past political roles. Examples of political connections include (1) Laura D'Andrea Tyson (Board Member of AT&T Inc.) who "is a Member of President Barack Obama's Economic Recovery Advisory Board (PERAB)… [and] served as National Economic Adviser to the President of the United States from 1995 to 1996 and Key Architect of President Clinton's domestic and international policy agenda… [and] is a member of Secretary Hillary Clinton's Foreign Affairs Policy

---

[2] The positions are: Chief Executive Officer; Co-Chief Executive Officer; Chairman of Management Board; Co-Chairman of Management Board; President; Co-President; Vice Chairman of Management Board; Co-Owner; Top Key Executive; Chief Financial Officer; Co- Chief Financial Officer; Chief Operating Officer; Co-Chief Operating Officer; Member of Management Board; Chief Investment Officer; Co-Chief Investment Officer; Chief Accounting Officer; Head of Investment Banking; Head of Corporate Finance; Head of Research; Chief Technology Officer; Chief Information Officer; Chief Scientific Officer; Chief Administrative Officer; Head of Investor Relations; Chief Compliance Officer; Chief Legal Officer; Head of Corporate Communications; Head of Corporate Development; Head of Marketing; Head of Sales; Head of Human Resources; Senior Key Executive; Controller; Secretary; Treasurer; Unit CEO; Unit President; Other Key Executive; Assistant Secretary; Assistant Treasurer; Consultant; Administrative Professional; Corporate Communication Professional; Corporate Development Professional; Equity Analyst; Finance and Accounting Professional; Fixed Income Analyst; Human Resources Professional; Investment Banking Professional; Investment Professional; Investor Relation Professional; Legal Professional; Marketing Professional; Operations Professional; Other Analyst; Other Professional; Sales Professional; and Technology Professional.

Board"; and (2) William E. Kennard (also Board Member of AT&T Inc.) who "is a Member of Secretary of State John Kerry's Foreign Affairs Policy Board and U.S. Department of State Foreign Policy Advisory Board."

We use this information to build a 0/1 indicator denoting whether a given individual covered a political position at any point in his/her life. For each operator, we then compute the fraction of affiliated individuals with political experience. In the analyses that use the operator as the unit of observation, we use this fraction of politically connected affiliated individuals. (We compute the fraction to avoid a mechanical correlation between the size of the operator and the presence of political connections.) Whenever we present country-level regressions, we use the average of the fraction of connected individuals across all operators from each given country as a measure of connections.

2. International Differences in Prices

2.1 International price variation

We divide the good and services for which we have data into three categories: tradable, non-tradable non-regulated, and regulated (which are all non-tradable). To compare these prices, we divide them by the price of the same good in the United States. When the U.S. price for a given good in a certain year was missing, we substituted with the previous year's price if available, in order to not miss the entire cross section of data items.

Not surprisingly, the cross-country average of relative price of tradable goods is very close to one. Thus, on average tradable goods are priced equally across countries. By contrast, the average ratio of non-tradable non-regulated goods and services is 0.6, while the average ratio of regulated goods and services is 0.5.

In Table 3 we compute the ratio of the 95th percentile of the distribution of prices for an item with the 5th percentile and then we average these ratios across countries. Contrary to the Law of One Price, we find that prices–even PPP adjusted prices–vary greatly across countries: the 95th percentile of the distribution is roughly four times the 5th percentile. This is true in the tradable sector, but also in the non-tradable sector (3.5). Yet, it is not true in regulated sectors: in these sectors the 95/5 ratio is 6.7, while in the telecom sector 7.5.

2.2 Price variation and political regime

While travelling we have all experienced very different dollar prices for a sandwich or a bottle of water. One reason is the difference between flexible wholesale prices and more sticky retail prices, so much so

that the magazine *The Economist* has developed an index based on the price of McDonald's sandwiches around the world as a measure of a temporary currency overvaluation or undervaluation.

Another reason is that while water, bread, and meat are tradable goods, a sandwich or a bottle of water available to individual consumers is a bundle of goods, some tradable (like water, bread, and meat) and some not (like rent and local labor). Thus, differences in labor cost or in the costs of some inputs, possibly driven by specific geographical constraints, is another reason for this price variation.

Yet, there is a third reason why prices might be different: the different degree of competition of local markets. To see whether this hypothesis has any bite, in Table 4 we correlate the PPP-adjusted retail price level of goods and services with the log of per capita income of a country and its level of democracy. The idea is that, after controlling for the level of development, democratic countries, where diffuse interests have more influence than in autocratic regimes, should have lower prices.

On average we find it to be true. The coefficient on the Polity IV measure of democracy has a negative sign 36 out of the 42 times, and in 33 of those it is statistically significant at least at the 10% level. By contrast, of the 6 positive signs only 3 are statistically significant.

Interestingly, the pattern of positive signs does not appear to be random. Democracy seems to be associated with higher prices in gasoline and taxis and not lower prices in cigarettes, transportation, and utilities. Those tend to be the sector that autocratic regimes tend to subsidize. Vice versa, democracy seems to exhibit lower prices in all the tradable goods.

2. Political Determinants of Competition

3.1 Why Politics Matter for Competition

There is a very extensive literature in industrial organization about the determinants of competition within each industrial sector. Much of that literature focuses on the impact that sectoral needs for fixed investments and advertising have in shaping market concentration (e.g., Sutton, 1991), i.e., that literature focuses on why concentration differs across industrial sectors.

In this paper we try an alternative route. We keep the industrial sector the same and we look across countries at the political determinants of competition. This job is made easier by the fact we look at an industry (telecommunication) that is regulated at the national level in every country. More specifically, we look at the mobile telecommunication industry. Unlike fixed telecommunication, the mobile industry is less affected by legacy fixed investments: both because it is a relatively young industry and because the fixed investments are much smaller. In addition, the mobile industry is heavily dependent upon a scarce resource controlled by the government: the electromagnetic spectrum used to transmit.

Ideally, we should trace all government actions that shape the competitive environment in the mobile industry of each country. In part we will do that, by looking at regulation on number portability and on some major antitrust enforcement actions. Yet, a comprehensive study of all such actions is impossible to undertake, since many of these actions are "behind the scenes" and difficult to document. For example, in 2014 a U.S. industry source (FierceWireless) reported that a declaration by the Department of Justice that "any wireless merger among the four Tier 1 carriers would face heightened scrutiny," was a "strong hint that any potential deal between Sprint and T-Mobile would face an uphill battle with the DOJ." Not surprisingly, this merger, previously rumored, did not take place. The same can be said about Europe, where the decision to undertake an in-market merger is very much affected by the expected attitude of the local and European antitrust authorities, expectations not easy to observe for an outside researcher. For example, the Financial Times reported that the European Commission allowed a merger of mobile phone operator in Germany under the intense pressure of Angela Merkel.[3]

For this reason we prefer to use a reduced form approach, by looking at the correlation between political conditions and the competitive environment in the mobile industry across countries. In traditional IO analysis, political conditions should be irrelevant to the degree of competition. By contrast, our political economy view has clear predictions about the impact of various political variables.

In particular, we expect that the stronger the connections between mobile industry executives and politicians, the more the government would like to restrict competition. By contrast, the more democratic a country is, the more weight the interest of consumers should have in political decisions, and thus the more competition we expect. We also expect democracy to attenuate the negative impact of political connections on competition: a connection with an autocrat in power (like former Indonesian president Suharto) has more ability to suppress competition than a connection with a former member of a democratically elected government (like the American one).

Finally, competition is enhanced by an impartial application of rules. As Rothstein (2011) explains, corruption is only the most extreme form of violation of the "impartiality principle." In all the international rankings, Scandinavian countries score at the top as not only free from corruption, but also very meritocratic, and very unbiased in the application of rules (Rothstein, 2011). For all these reasons we expect Scandinavian countries to score particularly well in the competitive metric.

3.2 Evidence on the Correlation between Politics and Competition

In Table 5 we regress our measures of competition on several controls for the size of the market and our measures of political influence. As controls we use the log of GDP per capita as a measure of economic

---

[3] Daniel Thomas and Alex Barker "Telecoms: Europe's scrambled signal", Financial Times, June 30, 2014

development and so as a measure of demand for advanced phone services, the log of population as a measure of the size of the market, and a World Development Indicator measure of population density as a proxy of the costs of servicing that market. The coefficients of population size and population density have the expected sign, statistically significant at the 1% level.

In column 1 we add to these controls the diffusion of political connections. When phone operators are more connected, there is less competition. A one standard deviation increase in the frequency of political connection reduces by six percentage points (one quarter of the sample mean) the probability of having four major phone operators.

In column 2 we insert a dummy equal to one if the country belongs to the Scandinavian legal tradition, for two related reasons. First, contrary to the general perception, Scandinavian countries tend to be very much pro-competitive markets. Second, in Scandinavian countries law is applied in a more unbiased way, favoring a level playing field for all firms. For both reasons, if political factors are important, we expect the Scandinavian dummy to be positive. Indeed it is and very economically large. Ceteris paribus, Scandinavian countries are 45 percentage points more likely to have four major phone operators.

In column 3 we insert the Polity IV measure of democracy. Democratic countries are more likely to have competitive mobile markets. This effect leaves the previous two results practically unchanged. The same is true if we add (as a control) the level of corruption (column 4).

In column 5 we interact political connections with our measure of democracy. More political connections are associated with less competition. This effect is reduced when the country is democratic, albeit this latter effect is not statistically significant at the conventional levels.

3.3 Case Studies on the Effect of Politics and Competition

To gain some confidence on the causal effects of the correlation between politics and competition we undertake some case studies. First we focus on the four countries with the largest (absolute) variation in concentration (measured as C2) during the period 2000-2014. These four countries are: the United States (an increase in C2 from 34% to 66%), Ireland (a decline from 100% to 67%), Iceland (a decline from 100% to 71%), and Italy (a decline from 90% to 61%).

The United States' mobile phone market started the new millennium highly fragmented as a result of two political decisions: the AT&T breakup of 1984 and the way spectrum was auctioned off in the late 1990s. During the new millennium the concentration greatly increased thanks to three mergers: Bell Atlantic and GTE that formed Verizon wireless in 2000, Cingular Wireless with AT&T in 2004, and Verizon Wireless Communications with Alltel Corporation in 2008. All three transactions faced the

scrutiny of both the Department of Justice and the Federal Communication Commissions and all three had to spin off some assets to comply with the requirement. Thus, the consolidation of the U.S. mobile industry in the 2000s was enabled by a series of political decisions.

By contrast, Ireland ended the second millennium with only two mobile operators. To enhance competition in 1998, the Irish Director of Telecommunications Regulation held a competition to award the third mobile telecommunications license. In spite of the fact that there were two competitors, only one license was awarded. Thus, there was a political decision to enhance competition, and a political decision to enhance it only in a limited way. In 2002, when the 3G licenses were auctioned off a fourth operator came in. Thus, the increase in competition is entirely driven by political decisions.

At the end of the second millennium, Iceland had a duopoly in the mobile sector. In early 2000, a new law on telecommunication was approved and within six months four new phone licenses were auctioned off to promote competition. Thus, also in this case the increase in competition is the result of a specific government action.[4]

Finally, the evolution of the mobile industry in Italy was entirely driven by government decisions. Until 1995 there was only one state-owned mobile company (Tim). In 1995, the government licensed a second one (Omnitel, then Vodafone). In the years 1998 and 1999, the Government conceded two additional licenses (Wind and Blue). Finally, with the 2000 auction of the 3G spectrum a fifth operator 3 Italia came in. Thus, all entry in the sector has been driven by government decisions.

4 Impact of Competition on Prices, Quality, and Investments

The political pressure for more competition depends crucially on what competition can achieve in this market. Thus, we now turn to studying the impact of competition on prices, quality, and investments.

4.1 Effect of Competition on Prices and Profitability Margins

In Table 6 we estimate several specifications of this type

$$Y_i = \alpha + \beta X_i + \delta C_i + \varepsilon_i \quad (1)$$

where Y_i is a measure of price or margin in country *i* measured as average of the 2010-2014 period, X_i a set of country-level control variables, and C_i our country-level measure of competition, measured as average of the 2010-2014 period. All the prices are translated into US$ with the exchange rate (or the PPP exchange rate) of the time.

---

[4] OECD Economic Surveys: Iceland 2005.

As in Table 5, in the regression we control for the log of GDP per capita as a measure of economic development and also as a measure of demand for advanced phone services, for the log of population as a measure of the size of the market, and for a World Development Indicator measure of population density as a proxy of the costs of servicing that market. In addition, we control for the average level of inflation in that country between 2010 and 2014. There is a mechanical reason for that. Since the left hand side variables are averages over several years, countries that have high inflation tend to delay the price adjustment in local currency vis-à-vis exchange rates adjustments, so this delay will create a negative (and statistically significant) correlation between average price in dollars and level of inflation. This is confirmed by the fact that when we look at margins, this correlation disappears.

Our first measure of competition (the presence of at least four major operators) always has a negative and statistically significant effect on prices and margins. The estimates in Panel A suggest that in markets with at least four major operators the ARPU is lower by 3 dollars (14%), the GSMA effective price per minute by 4 cents (25%), the EBITDA margin by 5 percentage points (13%), the price of an ITU mobile basket by $5.7 (22%), and the Numbeo price per minute by 7 cents per minute (29%).

While the discontinuity at four major operators is well-recognized in the industry (for example *The Economist* calls it the "magic number" [5]), we wanted to explore the robustness of our results. Figure 1 plots the ARPU by number of operators with at least a 5% market share. There is a clear downward trend in ARPU: with three operators it's lower than with 2, and with four it's lower than with 3. There are very few countries with 5, none with 6, and only one (India) with 7. We also experimented with a lower market share threshold to define major operators (i.e., 1%), the results are very similar.

The results are also very similar when we use the combined market share of the two largest operators as a measure of competition (or lack thereof) (Panel B). A one-standard deviation decrease in C2 will reduce ARPU by $1.3 (6%), the GSMA effective price per minute by 2 cents (14%), the EBITDA margin by 4 percentage points (10%), the price of an ITU mobile basket by $2 (7.7%), and the Numbeo price per minute by 3 cents per minute (13%). The only difference is that the coefficient of C2 on ARPU is not statistically significant at conventional levels (p=0.15).

In non-reported regressions we estimate the same equation with a variable equal to 1 if there is partial portability and 2 if there is total portability (ITU data) as a measure of competition. While all the signs are consistent with number portability lowering prices and margins, the effect is statistically significant at conventional levels only for the EBITDA margin.

One obvious objection is that the degree of competition is endogenously determined. For this reason, in Panel C we instrument the degree of competition with the three determinants identified in Table 5:

---

[5] *The Economist*, "Four is a magic number," March 15, 2014.

political connections, Polity IV democracy, and Scandinavian origin. The results are similar, albeit the coefficients tend to grow (which is not a good sign for the quality of our instruments) and the level of statistical significance sometimes fall below conventional levels.

In Table 6.C we estimate the same specification in a panel-data format from 2000 to 2014, with country fixed effects. Note that it is an unbalanced panel, because as we go back in time the number of countries for which we have data drop significantly.

The panel-data estimates are very similar, also quantitatively, to our OLS cross-sectional estimates. When in a market the number of major mobile operators increases from three to four the ARPU drops by 3 dollars (14%), the GSMA effective price per minute by 3 cents (19%), the EBITDA margin by 4 percentage points (11%), the price of an ITU mobile basket by $1.2 (5%). Only the effects on ARPU and margins are statistically significant at the conventional levels.

The same can be said when we use C2 as a measure of competition (Table 7). A one-standard deviation drop in C2 reduces ARPU by $3.4 (16%), the GSMA effective price per minute by 6 cents (39%), the EBITDA margin by 4 percentage points (10%), and all these coefficients are statistically different from zero at the conventional level. Surprisingly, the coefficient of the regression of the ITU basket price on C2 has a negative coefficient, but this is not statistically different from zero. As before, when we use as a measure of competition the categorical variable about number portability, the effect is nil.

In sum, the overwhelming evidence suggests that more competition (measured as higher number of major operators or as lower market share of the top two carriers, not as number portability) leads to lower margins and even lower prices. This does not come as a surprise. Yet, industry lore is that these lower prices and margins come from a reduction in investment and hence in quality. We now explore this aspect.

4.2 Effect of Competition on Quality of Connections

Table 8 analyzes the relationship between quality and competition. We use a specification similar to (1), with several measures of quality as left hand side variables and different measures of completion in the different Panels.

In panel A the measure of competition is the presence of at least four major operators. The first measure of quality is the percentage of people covered with a network at least third generation (3G). In column 1 we estimate it by OLS. While richer countries and countries with a higher population density show a higher percentage of 3G coverage (as expected, not reported), having four major carriers does not seem to have any impact (the OLS coefficient is positive, but statistically not different from zero). The IV coefficient, however, is positive and statistically significant (column 2).

A similar pattern is present when we use as a left hand side variable the percentage of four generation coverage (4G, sometimes called LTE). The OLS coefficient is negative, but not significant, while the IV is positive and statistically significant.

In columns 5 and 6 we use the percentage of connections that are at least 3G. Here the impact of competition is positive but not significant both in the OLS and IV estimates. In columns 7 and 8 the measure of quality is the percentage of 4G connections. The OLS coefficient is positive, but not significant, while the IV is positive and statistically significant.

Panel B repeats the same estimations with C2 as a measure of competition (or lack of thereof). All the coefficients are negative, suggesting that more concentrated markets lead to the use of less advanced technologies and when it comes to % of 3G and 4G connections the effect is also statistically significant.

Panel C reports the same estimations with number portability as a measure of competition. Two coefficients are positive and statistically significant, consistent with number portability increasing the quality of the infrastructure. All the others are statistically not different from zero.

Table 9 re-estimates the specification in Table 8 in a panel data contest. As before, this is a highly unbalanced panel. Panel A reports the regression with the presence of four operators as a measure of competition. In three of the four specifications the coefficient is positive (consistent with competition leading to higher quality), but in no case it is statistically significant. Panel B uses C2 as a measure of competition. In all four specifications the coefficient is negative (consistent with competition leading to higher quality) and in two out of four the coefficient is statistically significant at conventional levels. Panel C uses number portability as a measure of competition. In three of the four specifications the coefficient is positive (consistent with competition leading to higher quality) and one of these three positive coefficients is statistically significant at conventional levels.

4.3 Effects of Competition on Investments

In Table 10.A we explore the effects of competition on physical investment (Capex). The specification is the same as (1), with the ratio of Capex over revenues as the left hand side variable. The three columns contain the IV estimates, with the three different measures of competition. The first two have a coefficient consistent with competition increasing investments, while the third one with competition (higher degree of number portability) decreasing the investments, but none of the three coefficients are statistically significant.

In Table 10.B we repeat the same exercise with the number of employees and the cost of personnel on the left hand side. All but one estimated coefficients' signs are consistent with competition reducing the number of employees and the total wage bill, but none of the coefficients are statistically significant.

Finally, in Table 10.C we look at the effect of competition on customers' churn. This churn is very expensive from the operators' point of view and in aggregate is a deadweight loss. Two out of three signs are consistent with competition increasing churn, but none of the coefficients are statistically significant.

In sum, we find a lot of evidence that competition reduces prices and margins, but no evidence that it reduces quality and investments, nor any evidence that it affects employment and wages.

5 The Welfare Transfer

5.1 Why do we care about the welfare transfer

Traditionally, economists focus on the deadweight losses created by imperfect competition, often referred to as Harberger's triangle. Harberger (1964) himself, however, has shown that this triangle is generally small. From a quantitative point of view, the transfer of surplus from consumers to producers is much more important. Yet, economists tend to ignore it because it is simply a transfer, not a loss. Nevertheless, it can be important for at least three reasons. First, as Tullock (1967) and Kruger (1974) have taught us, large rents generate inefficient rent seeking, which may end up dissipating most (if not all) the value of the rent. One example of rent-seeking behavior is lobbying to politically protect those rents. In the United States, AT&T and Verizon, the two largest mobile carries, are at the top of the lobbying list. In 2015 the four major U.S carriers spent $36 million in lobbying.[6] Another, more sophisticated, form of rent seeking is charitable giving. All too often corporations make donations to buy political consensus, which ultimately allow them to maintain and increase their rents. In 2010 AT&T and Verizon were at the top of corporate giving with a total of $300 million.[7] While–as we will see momentarily–this flow is trivial vis-à-vis the size of the transfer, it can be seen as the tip of the iceberg. Thus, the size of the welfare transfer is important because it represents the maximum amount of potential waste in rent seeking.

The second reason is that any transfer from consumers to producers leads to an increase in taxation (at least as far as corporations pay taxes), since consumer surplus is not taxed and corporate profits are: in the United States between federal and state taxes, almost 40%.

The third reason regards the impact of these transfers on inequality. Carlos Slim, the world's second richest man in 2015, between 2015 and 2016 lost $27.1bn.[8] The primary reason for that loss was a reform approved by the Mexican government in 2014, aimed at enhancing competition in the Mexican mobile market, where Carlos Slim's company was dominant.[9] In other terms, a large chunk of Slim's wealth was

---

[6] Data from www.opensecret.org.
[7] http://usatoday30.usatoday.com/money/companies/2010-08-08-corporate-philanthropy-interactive-graphic_N.htm.
[8] http://www.forbes.com/profile/carlos-slim-helu/
[9] https://www.oecd.org/eco/surveys/Mexico-Overview-2015.pdf.

given by the value of the future rents he was able to extract from Mexican consumers. Thus, the degree of product market competition in key consumer markets (like telecommunication) can be an important factor in generating inequality.

5.2 Size of the Welfare Transfer in the United States

The United States has four major operators and a C2 concentration of 0.71, i.e., below the cross-country median, but above many developed nations, like Germany (0.62) and Denmark (0.68). Its prices, however, are relatively high vis-à-vis these developed nations. For example, the U.S ARPU is $67.61, significantly above the $31.01 ARPU in Denmark, and the $23.48 in Germany. One reason for this large difference could be that the U.S. carriers tend to subsidize the headsets, while the European ones do not. The typical subsidy for an iPhone is $500 dollars (they charge $199 for a phone worth $699). Even factoring in this difference, each U.S. consumer pays $189 a year more than a Danish consumer and $280 a year more than a German one. If we assume that the Danish or the German price is the competitive one, we can obtain the size of the welfare transfer from consumers to producers by multiplying this difference by the number of mobile contracts in the United States. By doing so, we estimate the transfer to be $44bn or $65bn per year.

We arrive at very similar numbers if we start from the ITU price of a monthly bundle. The U.S. price is $35.62, the Danish price $9.88, and the German one $18.02. Thus, each U.S. consumer appears to be paying $308 a year more than a Danish one and $211 more than a German one. Since the ITU ensures comparability, we do not need to correct for the cost of the headset subsidy. By multiplying this difference by the number of mobile contracts in the United States, we estimate the size of the transfer from consumers to producers at $49bn or $72bn per year.

5.3 Reality Check

Thus, assuming an overall tax rate of 40%, our estimates suggest that the after tax abnormal profits that the U.S. mobile industry enjoy thanks to its market power vary between $26bn and $43bn. Is this magnitude reasonable? Lindberg and Ross (1981) associate the difference between the market value of assets and the book value of assets to the abnormal profits a firm can earn as a result of some stable market power position. If we apply this logic to the four major U.S. carriers (AT&T, Verizon, T-Mobile, and Sprint) at the end of 2015, we get that the capitalized value of abnormal profits in the U.S. mobile industry equals $311bn.

If we assume that the abnormal profits are equal to the after tax transfer from consumer to producers, we can easily calculate the implicit rate at which these abnormal profits are capitalized, assuming they are fixed in perpetuity. These implicit capitalization rates vary between 8% and 14%. These are very

reasonable rates. Thus, the magnitude of the transfer in welfare from consumer to producers is very plausible.

5.4 Extraction Through Auctions

In principle, the Government could have extracted the full value of that transfer through the electromagnetic spectrum auctions. There have been two major waves of auctions: one in the early 2000 (the 3G spectrum auctions) and another around 2011 (the 4G spectrum auctions).

Germany raised €50Bn in 2000 and €5bn in 2010, for a total of $62.6, equal to roughly $850 per customer at the end of the period.[10] Denmark raised $3.8bn in 2000 and $0.3bn between 2010 and 2012, for a total of $4.1bn, or roughly $800 per customer at the end of the period.[11] Finally, the United States raised $19.59bn with the 3G auctions, and $19.1bn in 2008 and $44.9bn in 2015 with the 4G, or roughly $360 per customer at the end of the period. Thus, there is no evidence that the extra surplus captured by the U.S. mobile providers vis-à-vis their Danish and German counterparts has been appropriated by the Federal Government through auctions.

Even in absolute terms, the price paid by U.S. carriers for the auctions seems small: twenty year licenses are paid for with the value of one year of abnormal profits.

6 Conclusions

We regard the contribution of the paper as twofold. First, we provide some preliminary evidence on the importance of political factors in shaping product market competition. These factors are potentially important in cross-country comparisons, but they tend to be ignored in international comparisons, as well as in policy making.

Second, we document how in the mobile communication market competition seems to reduce prices but not impact negatively quality and investments. This finding is very relevant in the current antitrust debate on both sides of the Atlantic.

---

[10] http://www.mobileworldlive.com/featured-content/top-three/german-spectrum-auction-totals-e5-08b/
[11] http://www.umtsworld.com/industry/licenses.htm and http://www.dotecon.com/expertise/auction-software/

References

Cramton, Peter C., The FCC Spectrum Auctions: An Early Assessment, Journal of Economics and Management Strategy, 6:3, 431-495, 1997.

De Soto, Hernando. *The other path: The invisible revolution in the Third Worlds*. New York: Harper and Row Publishers, 1989.

Djankov, Simeon; La Porta, Rafael; Lopez de-Silanes, Florencio and Andrei Shleifer, 2002, "The Regulation of Entry." *Quarterly Journal of Economics*, *117*: 1-37.

Faccio, Mara, and Hung-Chia Hsu, 2016, "Politically Connected Private Equity and Employment", working paper.

Faccio, Mara, Ronald W. Masulis, and John J. McConnell, 2005, "Political connections and corporate bailouts," Journal of Finance, 61: 2597-2635.

Fulmer, Sarah and April M. Knill, 2012, "Political contributions and the severity of government enforcement**," working paper,** Florida State University.

Goldman, Eitan, Jorg Rocholl, and Jongil So, 2013, "Political connections and the allocation of procurement contracts," *Review of Finance,* 13: 1617-1648.

Harberger, Arnold C., The measurement of waste, American Economic Review, May 1964, 54 (3), 58-7

Krueger, Anne (1974). "The Political Economy of the Rent-Seeking Society". American Economic Review 64 (3): 291–303.

Lindenberg, Eric B., and Stephen A. Ross. 1981. "Tobin's q Ratio and Industrial Organization." Journal of Business 54:1-32.

OECD Economic Surveys: Iceland 2005.

Polanyi, Karl. 1944, 1957. The Great Transformation: The Political and Economic Origins of Our Time. Boston: Beacon Press by arrangement with Rinehart & Company, Inc

Rothstein, Bo 2011, The Quality of Government: Corruption, Social Trust, And Inequality In International Perspective. University of Chicago Press

Sutton, John, 1991, *Sunk Costs and Market Structure. Price Competition, Advertising, and the Evolution of Concentration. MIT Press.*

Tullock, Gordon (1967). "The Welfare Costs of Tariffs, Monopolies, and Theft". Western Economic Journal 5 (3): 224–232.

FIGURE 1: ARPU and Number of Major Mobile Carriers in each Market

The ARPU is measured in McDonald meal units. The ARPU data are from GSMA, the price of BigMcMeal from Numbeo.

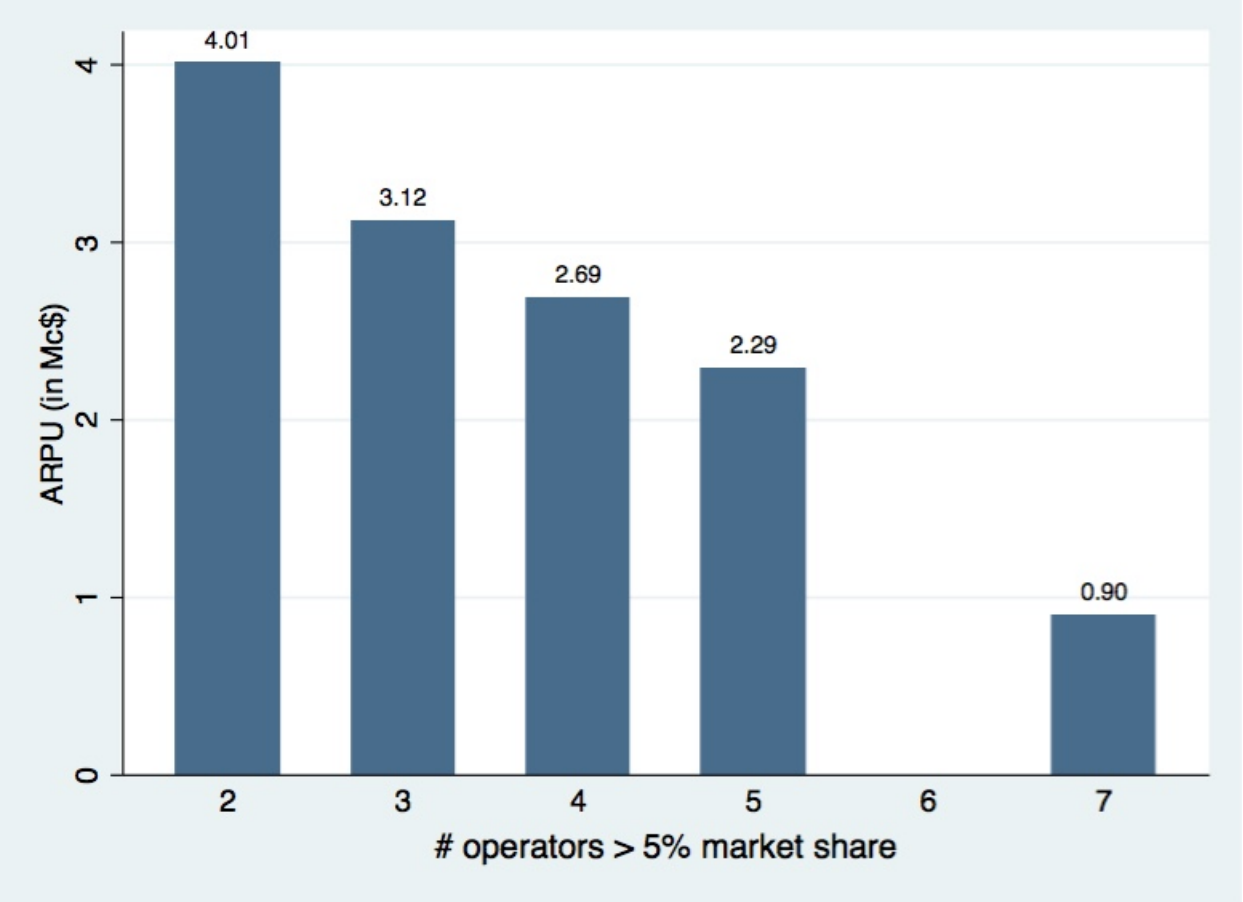

Table 1. Variables Description

This table provides definitions and sources of the variables, which are grouped in the following categories: Prices, Quality of Service, Competition, Regulatory Variables , Institutional Variables, Other Firm Level Variables.

Variable Name	Definition	Source
PRICES		
Mobile Basket USD	The mobile-cellular sub-basket refers to the price of a standard basket of mobile monthly usage for 30 outgoing calls per month (on-net, off-net to a fixed line and for peak and off-peak times) in predetermined ratios, plus 100 SMS messages, in USD. The mobile-cellular sub-basket is based on prepaid prices, although postpaid prices are used for countries where prepaid subscriptions make up less than 2 per cent of all mobile-cellular subscriptions. When indicated, the price of the basket, as reported by ITU, was PPP adjusted using the WB (GDP) conversion factors.	International Telecommunication Union Link: World Telecommunication/ICT Indicators Database, 19th edition 2015, and ITU "Measuring the Information Society" reports, 2009-2014.
Effective Price Per Minute	Blended ARPU, in USD, divided by minutes of use per connection. When indicated, the indicator was PPP adjusted using the WB (GDP) conversion factors.	GSMA Link: https://gsmaintelligence.com/
ARPU by Connection	Average revenue per user (ARPU), in USD. Total recurring (service) revenue generated per connection per month in the period. Despite the acronym, the metric is strictly average revenue per connection, not per subscriber. When indicated, the indicator was PPP adjusted using the WB (GDP) conversion factors.	GSMA Link: https://gsmaintelligence.com/
EBITDA Margin	Total operating profit in the period, before interest, tax, depreciation and amortization, expressed as a fraction of total revenue.	GSMA Link: https://gsmaintelligence.com/
McMeal at McDonalds	USD price of a McMeal at McDonalds (or Equivalent Combo Meal). To collect data Numbeo relies on user inputs and manually collected data from authoritative sources (websites of supermarkets, taxi company websites, governmental institutions, newspaper articles, other surveys, etc.). There are automatic and semi-automatic filters to filter out noise data. We focus on the price in the capital city. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city
Tradable	Tradable comprises: (i) Apples (1kg), (ii) Oranges (1kg), (iii) Potato (1kg), (iv) Lettuce (1 head), (v) Tomato (1kg), (vi) Rice (white), (1kg), (vii) Loaf of Fresh White Bread (500g), (viii) Chicken Breasts (Boneless, Skinless), (1kg), (ix) Local Cheese (1kg), (x) Eggs (12), (xi) Milk (regular), (1 liter), (xii) Water (1.5 liter bottle), (xiii) Pack of Cigarettes (Marlboro), (xiv) 1 Pair of Jeans (Levis 501 Or Similar), (xv) 1 Summer Dress in a Chain Store (Zara, H&M, ...), (xvi) 1 Pair of Nike Running Shoes (Mid-Range), (xvii) 1 Pair of Men Leather Business Shoes, (xviii) Gasoline (1 liter), (xix) Volkswagen Golf 1.4 90 KW Trend line (Or Equivalent New Car). This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city

Non-tradable	Non-tradable comprises: (i) Water (0.33 liter bottle) at a Restaurant, (ii) Coke/Pepsi (0.33 liter bottle) at a Restaurant, (iii) Cappuccino (regular) at a Restaurant, (iv) Meal, Inexpensive Restaurant, (v) Meal for 2 People, Mid-range Restaurant, Three-course, (vi) McMeal at McDonalds (or Equivalent Combo Meal), (vii) Fitness Club, Monthly Fee for 1 Adult, (viii) Tennis Court Rent (1 Hour on Weekend), (ix) Cinema, International Release, 1 Seat. This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city
Regulated	Regulated comprises: (i) One-way Ticket (Local Transport), (ii) Monthly Pass (Regular Price), (iii) Basic (Electricity, Heating, Water, Garbage) for 85m2 Apartment, (iv) 1 min. of Prepaid Mobile Tariff Local (No Discounts or Plans), (v) Internet (10 Mbps, Unlimited Data, Cable/ADSL), (vi) Taxi Start (Normal Tariff), (vii) Taxi 1km (Normal Tariff), and (viii) Taxi 1hour Waiting (Normal Tariff). This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city
Utilities	Basic (Electricity, Heating, Water, Garbage) for 85m2 Apartment. This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city
Telecom	Telecom comprises: (i) 1 min. of Prepaid Mobile Tariff Local (No Discounts or Plans) and (ii) Internet (10 Mbps, Unlimited Data, Cable/ADSL). This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city
Taxi	Taxi comprises of (i) Taxi Start (Normal Tariff), (ii) Taxi 1km (Normal Tariff), and (iii) Taxi 1hour Waiting (Normal Tariff). This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city
Transports	Transports comprises:(i) One-way Ticket (Local Transport) and (ii) Monthly Pass (Regular Price). This indicator is expressed in US dollars. When indicated, the price was PPP adjusted using the WB (GDP) conversion factors.	Numbeo Link: http://www.numbeo.com/cost-of-living/historical-prices-by-city

QUALITY OF SERVICE

3G/4G Connections (% Total)	3G and 4G connections, expressed as a percentage of total connections. Third generation (3G) network technologies are listed under [help and definitions](/help/74/).	GSMA Link: https://gsmaintelligence.com/
4G Connections (% Total)	4G connections, expressed as a percentage of total connections. Fourth generation (4G) network technologies are listed under [help and definitions](/help/74/).	GSMA Link: https://gsmaintelligence.com/
3G/4G Network Coverage (% Total Area)	3G and 4G mobile coverage, expressed as a percentage of the total market geographic surface area, at the end of the period. Third generation (3G) network technologies are listed under [help and definitions](/help/74/).	GSMA Link: https://gsmaintelligence.com/
4G Network Coverage (% Total Area)	4G mobile coverage, expressed as a percentage of the total market geographic surface area, at the end of the period. Fourth generation (4G) network technologies are listed under [help and definitions](/help/74/).	GSMA Link: https://gsmaintelligence.com/

COMPETITION

Magic Four	Indicator variable equal to 1 if there are 4 or more mobile operators with at least a 5% market share in a given country during a given quarter, and 0 otherwise.	GSMA Link: https://gsmaintelligence.com/
C2	Market share of the two largest operators in a given country during a given year.	GSMA Link: https://gsmaintelligence.com/
Market share	Total connections (of a given operator) at the end of the period, expressed as a share of the total market connections.	GSMA Link: https://gsmaintelligence.com/
Number Portability	Is number portability required from: b) Mobile operators?/ If yes, is this service currently available to fixed subscribers? No=0; Partial=1; Yes=2.	International Telecommunication Union Link: ITU ICT Regulatory Tracker.
INSTITUTIONAL VARIABLES		
Corruption	Corruption erodes economic freedom by introducing insecurity and uncertainty into economic relationships. The score for this component is derived primarily from Transparency International's Corruption Perceptions Index (CPI) for 2011, which measures the level of corruption in 183 countries. The CPI is based on a 10-point scale in which a score of 10 indicates very little corruption and a score of 0 indicates a very corrupt government. In scoring freedom from corruption, the Index converts the raw CPI data to a scale of 0 to 100 by multiplying the CPI score by 10. For example, if a country's raw CPI data score is 5.5, its overall freedom from corruption score is 55. For countries that are not covered in the CPI, the freedom from corruption score is determined by using the qualitative information from internationally recognized and reliable sources.1 This procedure considers the extent to which corruption prevails in a country. The higher the level of corruption, the lower the level of overall economic freedom and the lower a country's original IEF score. We rescaled the index (= 100-original index), so that a higher number denotes higher corruption	Heritage Foundation Link: http://www.heritage.org/index/explore?view=byregioncountryyear
Democracy	Institutionalized Democracy: Democracy is conceived as three essential, interdependent elements. One is the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders. Second is the existence of institutionalized constraints on the exercise of power by the executive. Third is the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation. Other aspects of plural democracy, such as the rule of law, systems of checks and balances, freedom of the press, and so on are means to, or specific manifestations of, these general principles. We do not include coded data on civil liberties. The Democracy indicator is an additive eleven-point scale (0-10).	Democracy Link: http://www.systemicpeace.org/polity/polity4.htm
Scandinavian Legal Origin	Scandinavian legal origin is a dummy variable equal to 1 if the origin of the company law or commercial law of the country is Scandinavian. Source: Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002), "The Regulation of Entry", Quarterly Journal of Economics, CXVII, pp. 1-37.	Djankov et al. (2002) Link: http://scholar.harvard.edu/shleifer/publications
GDP per capita PPP	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current international dollars based on the 2011 ICP round.	World Bank, "World Development Indicators" Link: http://data.worldbank.org/data-catalog/world-development-indicators
Inflation	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average	World Bank, "World Development

	consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	Indicators" Link: http://data.worldbank.org/data-catalog/world-development-indicators
Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are midyear estimates.	World Bank, "World Development Indicators" Link: http://data.worldbank.org/data-catalog/world-development-indicators
Population Density	Population density is midyear population divided by land area in square kilometers. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. Land area is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes.	World Bank, "World Development Indicators" Link: http://data.worldbank.org/data-catalog/world-development-indicators

OTHER FIRM LEVEL VARIABLES

Political Connections (%)	Fraction of the individuals affiliated with a given operator who have experience in the country's government (including as President) or in the parliament. Political "titles" are identified from the "Chiefs of State and Cabinet Members of Foreign Governments" directory published by the CIA (https://www.cia.gov/library/publications/world-leaders-1/SM.html). Names of all Presidents, Chancellors, Chairmen, Emirs ruling as of or after 1980 are identified from http://www.rulers.org/index.html. The experience is based on keyword searched in each person's biography, as reported in Capital IQ.	CapitalIQ (for bios) and other sources
Churn	Total gross disconnections per month as a percentage of average total connections at the end of the period.	GSMA Link: https://gsmaintelligence.com/
Capex (Total) / Revenues	Total capital expenditure incurred in the period, including both intangible and tangible assets. Scaled by revenues.	GSMA Link: https://gsmaintelligence.com/
# Employees / Revenues	Total employed head count (fulltime equivalent) for the telecoms business at the end of the period, and if applicable, only within mobile operations. Scaled by revenues.	GSMA Link: https://gsmaintelligence.com/
Cost Personnel / Revenues	Operating expenditure incurred in the period related to the cost of employees, including salary costs. Scaled by revenues.	GSMA Link: https://gsmaintelligence.com/

Table 2. International Price Comparisons

For the definitions of the variables see Table 1. All prices are averages 2010-2014. p95/p5 is the ration between the 95th percent of the cross country distribution of prices and the 5th percentile. McDonalds adjusted column is based on prices scaled by the price of a McMeal at McDonalds (in each country) as reported in Numbeo.

Panel A. Numbeo Prices

Variable	Actual prices		PPP adjusted		McDonalds adjusted	
	# Obs.	p95/p5	# Obs.	p95/p5	# Obs.	p95/p5
McMeal at McDonalds	98	2.9	98	3.2	98	1.0
Tradable	98	5.5	98	3.9	98	4.4
Non-tradable	98	5.5	98	3.5	98	3.6
Regulated	98	11.1	98	6.7	98	7.9
Utilities	98	5.1	98	3.7	98	5.2
Telecom	98	10.2	98	7.5	98	7.8
Taxi	98	17.2	98	8.1	98	9.2
Transportation	98	13.7	98	6.4	98	9.1

Panel B. Telecommunications Prices

Variable	Actual prices		PPP adjusted		McDonalds adjusted	
	# Obs.	p95/p5	# Obs.	p95/p5	# Obs.	p95/p5
Mobile Basket USD	179	9.8	179	6.0	98	11.4
Effective Price Per Minute	91	20.9	91	9.3	67	16.1

Table 3. Summary Statistics

This table displays summary statistics for the variables used in the estimations. Price variables in Panels A and D were winsorized at the top/bottom 5%. ($) prices are all PPP adjusted (using the WB (GDP) conversion factors). In all panels we report the average of a given variable in a given country during 2010-2014. For the definitions of the variables see Table 1.

Panel A. ITU data

Variable	# Obs.	Mean	Median	Std. dev.	Min	Max
Mobile Basket USD	179	$26.43	$25.71	$11.37	$8.92	$53.49
3G/4G Connections (% Total)	111	0.30	0.25	0.23	0.00	0.95
4G Connections (% Total)	111	0.02	0.01	0.04	0.00	0.27
3G/4G Network Coverage (% Total Area)	172	0.60	0.60	0.28	0.11	1.00
4G Network Coverage (% Total Area)	104	0.34	0.27	0.25	0.01	0.99
Number Portability	147	0.97	1.00	0.86	0.00	2.00

Panel B. GSMA data (country-level variables) *** See below (Panel E) for statistics at the firm-level

Variable	# Obs.	Mean	Median	Std. dev.	Min	Max
Magic Four	179	0.26	0.00	0.40	0.00	1.00
C2	179	0.83	0.83	0.13	0.39	1.00
Effective Price Per Minute	91	$0.16	$0.14	$0.09	$0.04	$0.36
ARPU by Connection	179	$21.15	$18.99	$10.46	$8.35	$48.74
EBITDA Margin	110	0.38	0.39	0.09	0.24	0.55

Panel C. Numbeo data

Variable	# Obs.	Mean	Median	Std. dev.	Min	Max
McMeal at McDonalds	98	$9.95	$8.84	$3.47	$6.12	$19.74
Prepaid Mobile Tariff, 1 Min Local	98	$0.24	$0.23	$0.12	$0.08	$0.48
Internet, Unlimited Data (10Mbps)	98	$62.89	$43.08	$46.73	$20.88	$187.23

Panel D. Institutional data

Variable	# Obs.	Mean	Median	Std. dev.	Min	Max
Corruption	174	59.20	66.79	20.94	6.20	87.50
Democracy	154	5.88	7.00	3.72	0.00	10.00
Scandinavian Legal Origin	174	0.03	0.00	0.17	0.00	1.00
GDP per capita PPP	179	$17,894.35	$10,589.78	$20,946.09	$659.00	$136,102.70
Inflation	173	5.15	3.64	5.20	0.00	35.63
Population	179	38,500,000	7,934,857	142,000,000	52,663	1,350,000,000
Population Density	178	327.51	78.58	1576.53	1.81	18551.93

Panel E. GSMA firm-level data

Variable	Data Type	# Obs.	Mean	Median	Std. dev.	Min	Max
Market share	Panel	9,222	0.29	0.25	0.26	0.00	1.00
Effective Price Per Minute	Panel	4,622	$28.11	$23.86	$17.14	$6.55	$70.66
ARPU by Connection	Panel	1,944	$0.20	$0.16	$0.13	$0.04	$0.54
EBITDA Margin	Panel	3,410	0.31	0.35	0.20	-0.26	0.58
Political Connections (%)	Cross-Section	391	0.03	0.00	0.07	0.00	0.50

Table 4. Democracy and Prices

This table shows OLS estimates of the effect of democracy on the prices of tradable and non-tradable goods, utilities, telecom. services, taxi and transports, after controlling for income per capita. Notice that the dependent variables appear in row and the regressors in column. The intercept is omitted in the table, but is always included. Regressions are cross-sectional. The sample is restricted to countries with available data in GSMA and Numbeo. Observations are the 2010-2014 average of each given variable in each country. For the definitions of the variables see Table 1. Robust standard errors are reported in parentheses. ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Dependent Variable	Democracy	Log GDP per capita (PPP)	# Obs.	R-Sq	F
Tradable Goods, Prices (PPP-adj)					
Apples (1kg)	-0.221***	-0.998***	94	0.459	43.27
	(0.039)	(0.161)			
Oranges (1kg)	-0.127***	-0.622***	94	0.322	16.81
	(0.031)	(0.15)			
Potato (1kg)	-0.080***	-0.112	94	0.162	10.2
	(0.02)	(0.092)			
Lettuce (1kg)	-0.073***	-0.018	94	0.206	10.13
	(0.0175)	(0.061)			
Tomato (1kg)	-0.075**	0.0214	94	0.065	2.994
	(0.031)	(0.115)			
Rice (1kg)	-0.118***	-0.197	94	0.215	9.538
	(0.033)	(0.14)			
Loaf Bread (500g)	-0.034	-0.0289	94	0.036	1.769
	(0.022)	(0.074)			
Chicken Breasts (1kg)	-0.268***	-0.794**	94	0.219	9.02
	(0.081)	(0.346)			
Local Cheese (1kg)	-0.702***	-2.760***	94	0.393	35.82
	(0.147)	(0.61)			
Eggs (12)	-0.126***	-0.248***	94	0.37	27.46
	(0.026)	(0.082)			
Milk (Regular, 1L)	-0.128***	-0.351***	94	0.479	44.82
	(0.019)	(0.082)			
Water (1.5L Bottle)	-0.017	-0.243***	94	0.203	11.8
	(0.013)	(0.061)			
Pack of Cigarettes (Marlboro)	0.002	0.409*	94	0.047	2.141
	(0.057)	(0.217)			
Pair of Jeans	-5.872***	-1.735	94	0.302	13.9
	(1.149)	(4.313)			
Summer Dress in Chain Store	-5.528***	-8.763**	94	0.462	29.36
	(0.765)	(3.427)			
Pair of Nike Running Shoes	-8.712***	-28.94***	94	0.648	81.49
	(1.059)	(4.331)			
Pair of Men Leather Shoes	-7.808***	-10.07*	94	0.354	26.93
	(1.256)	(5.989)			

Gasoline (1L)	0.066***	-0.672***	94	0.504	48.69
	(0.018)	(0.068)			
New Car (like Volkswagen Golf 1.4)	-3032.5***	-11303.6***	94	0.502	37.81
	(598.1)	(2506.1)			
Non-Tradable Goods, Prices (PPP-adj)					
Water (0.33 L Bottle) at Restaurant	0.048***	0.075	94	0.179	12.31
	(0.012)	(0.0477)			
Coke/Pepsi (033 L Bottle) at Restaurant	0.031	0.076	94	0.06	4.425
	(0.02)	(0.073)			
Cappuccino at Restaurant	-0.293***	-0.183	94	0.461	44.26
	(0.031)	(0.169)			
Meal at Inexpensive Restaurant	-0.267**	0.853*	94	0.083	4.027
	(0.112)	(0.443)			
Meal For Two, Mid-range Restaurant	-1.570***	1.992	94	0.118	6.036
	(0.453)	(1.772)			
McMeal at McDonalds	-0.371***	-1.930***	94	0.509	27.4
	(0.071)	(0.369)			
Fitness Club, Monthly Fee	-7.509***	-10.22**	94	0.533	38.23
	(1.079)	(4.774)			
Tennis Court Rent, 1h (w-e)	-1.386***	-0.219	94	0.3	16.9
	(0.257)	(0.999)			
Cinema, International Release	-0.408***	0.049	94	0.254	13.55
	(0.079)	(0.297)			
Utilities, Prices (PPP-adj)					
Basic (Electricity, Heating, Water, Garbage)	2.924*	-11.77	94	0.047	2.635
	(1.604)	(7.686)			
Telecom., Prices (PPP-adj)					
Prepaid Mobile Tariff, 1 Min Local	0.001	-0.012	94	0.009	0.415
	(0.003)	(0.014)			
Internet, Unlimited Data (10Mbps)	-5.749***	-18.74***	94	0.41	24.12
	(1.319)	(5.222)			
Taxi, Prices (PPP-adj)					
Taxi, Start Normal Tariff	-0.027	-0.409	94	0.028	1.3
	(0.063)	(0.283)			
Taxi, 1km Normal Tariff	0.016	-0.388***	94	0.114	3.916
	(0.023)	(0.139)			
Taxi, 1h Waiting Normal Tariff	0.552*	4.449***	94	0.255	15.16
	(0.288)	(1.092)			
Transports, Prices (PPP-adj)					
One-way Ticket, Local Transport	0.048**	0.322***	94	0.259	10.78
	(0.019)	(0.093)			
Monthly Pass, Regular	-0.423	4.247	94	0.019	0.571
	(0.941)	(4.013)			

Table 5. Political Determinants of Competition

This table shows the effects of institutional, economic and demographic factors on different measures of competition in the telecommunication sector. At county-level, they are: Magic Four (Panel A), C2 (Panel B), and Number Portability (Panel C). At firm level, competition is measured by operators' Market Share (Panels D, E). The sample is restricted to countries with available data in GSMA. Observations are the 2010-2014 average of each given variable in each country (country-level results, Panels A-C) or for each firm (firm-level results, Panels D and E). For the definitions of the variables see Table 1. Robust standard errors are reported in parentheses. In the firm-level regressions, standard errors are clustered at the country-level. ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Panel A. Country Level Regressions: Magic Four

	Magic Four					
	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita (PPP)	-0.001	-0.019	-0.036	0.004	-0.028	0.014
	(0.029)	(0.028)	(0.027)	(0.037)	(0.034)	(0.038)
Log Population	0.081***	0.084***	0.086***	0.084***	0.084***	0.080***
	(0.017)	(0.017)	(0.022)	(0.022)	(0.02)	(0.022)
Population Density (1,000th)	0.053***	0.058***	0.016	0.037	0.026	0.044*
	(0.012)	(0.012)	(0.021)	(0.024)	(0.023)	(0.024)
Political Connections (%)	-0.862***	-0.852***	-0.725**	-0.760**		-1.711**
	(0.313)	(0.314)	(0.307)	(0.307)		(0.819)
Scandinavian Legal Origin		0.454**	0.497**	0.610**	0.627***	0.628***
		(0.202)	(0.234)	(0.238)	(0.234)	(0.233)
Democracy			0.018*	0.024**	0.024***	0.016
			(0.009)	(0.01)	(0.009)	(0.012)
Corruption				0.004	0.003	0.004
				(0.003)	(0.002)	(0.003)
Interaction Democracy & Pol. Connections						0.194
						(0.147)
Intercept	-0.985**	-0.892**	-0.876*	-1.476**	-1.162**	-1.488**
	(0.405)	(0.411)	(0.489)	(0.594)	(0.521)	(0.589)
# Obs.	141	139	128	128	150	128
R-sq	0.146	0.18	0.165	0.179	0.188	0.187
F	11.99	10.79	5.855	5.361	7.33	4.701

Panel B. Country Level Regressions: C2

	C2					
	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita (PPP)	-0.025***	-0.021**	-0.014	-0.012	-0.004	-0.017
	(0.008)	(0.009)	(0.009)	(0.012)	(0.011)	(0.012)
Log Population	-0.036***	-0.039***	-0.039***	-0.039***	-0.041***	-0.037***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Population Density (1,000th)	-0.011**	-0.012**	-0.023***	-0.022**	-0.017**	-0.025***
	(0.005)	(0.005)	(0.008)	(0.009)	(0.007)	(0.008)
Political Connections (%)	0.298**	0.286**	0.306***	0.305***		0.734***
	(0.119)	(0.112)	(0.112)	(0.112)		(0.246)
Scandinavian Legal Origin		-0.113***	-0.077***	-0.073**	-0.082***	-0.081**
		(0.031)	(0.026)	(0.029)	(0.03)	(0.032)
Democracy			-0.006*	-0.006	-0.006**	-0.002
			(0.003)	(0.003)	(0.003)	(0.004)
Corruption				0.000	0.000	0.000
				(0.001)	(0.001)	(0.001)
Interaction Democracy & Pol. Connections						-0.088**
						(0.043)
Intercept	1.609***	1.612***	1.586***	1.565***	1.537***	1.570***
	(0.119)	(0.119)	(0.144)	(0.196)	(0.172)	(0.191)
# Obs.	141	139	128	128	150	128
R-sq	0.288	0.325	0.292	0.292	0.32	0.312
F	14.25	16.51	10.31	9.43	13.76	8.212

Panel C. Country Level Regressions: Number Portability

	Number Portability (Mobile)					
	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita (PPP)	0.543***	0.534***	0.480***	0.481***	0.420***	0.517***
	(0.037)	(0.039)	(0.042)	(0.069)	(0.056)	(0.071)
Log Population	0.138***	0.150***	0.137***	0.137***	0.138***	0.130***
	(0.034)	(0.034)	(0.039)	(0.04)	(0.037)	(0.036)
Population Density (1,000th)	0.025	0.032	0.052	0.053	0.044	0.074
	(0.027)	(0.028)	(0.032)	(0.04)	(0.032)	(0.049)
Political Connections (%)	-1.019	-0.927	-0.476	-0.480		-3.623
	(0.879)	(0.903)	(0.867)	(0.904)		(2.271)
Scandinavian Legal Origin		0.218	-0.058	-0.055	-0.091	-0.003
		(0.226)	(0.203)	(0.232)	(0.23)	(0.234)
Democracy			0.049***	0.049**	0.052***	0.023
			(0.018)	(0.02)	(0.017)	(0.023)
Corruption				0.000	-0.003	0.001
				(0.004)	(0.004)	(0.005)
Interaction Democracy & Pol. Connections						0.631**
						(0.318)
Intercept	-6.183***	-6.326***	-5.914***	-5.934***	-5.266***	-6.068***
	(0.625)	(0.618)	(0.769)	(1.123)	(0.96)	(1.091)
# Obs.	123	121	112	112	128	112
R-sq	0.517	0.533	0.56	0.56	0.586	0.584
F	79.61	66.55	53.52	45.84	81.67	43.37

Panel D. Firm Level Regressions: Market Share

	Market Share					
	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita (PPP)	-0.015*	-0.012	-0.006	-0.016	-0.003	-0.016
	(0.009)	(0.009)	(0.009)	(0.013)	(0.011)	(0.013)
Log Population	-0.045***	-0.047***	-0.046***	-0.045***	-0.044***	-0.045***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Population Density (1,000th)	-0.010*	-0.012*	-0.02***	-0.024***	-0.004	-0.024***
	(0.006)	(0.006)	(0.005)	(0.006)	(0.008)	(0.007)
Operator's Political Connections (%)	0.478***	0.472***	0.540***	0.541***		0.497*
	(0.145)	(0.145)	(0.133)	(0.13)		(0.277)
Scandinavian Legal Origin		-0.073***	-0.053***	-0.073***	-0.085**	-0.072**
		(0.019)	(0.017)	(0.028)	(0.036)	(0.028)
Democracy			-0.005*	-0.007**	-0.004	-0.007*
			(0.003)	(0.003)	(0.003)	(0.004)
Corruption				-0.001	0.000	-0.001
				(0.001)	(0.001)	(0.001)
Interaction Democracy & Pol. Connections						0.009
						(0.04)
Intercept	1.160***	1.155***	1.125***	1.259***	1.026***	1.257***
	(0.126)	(0.129)	(0.129)	(0.188)	(0.172)	(0.188)
# Obs.	374	370	352	352	680	352
R-sq	0.184	0.188	0.186	0.189	0.132	0.189
F	27.09	21.95	20.78	18.41	19.39	16.44

Panel E. Firm Level Regressions: Market Share (with Country Fixed Effects)

	Market Share					
	(1)	(2)	(3)	(4)	(5)	(6)
Operator's Political Connections (%)	0.622**	0.622**	0.677**	0.677**		0.588
	(0.261)	(0.261)	(0.273)	(0.273)		(0.517)
Interaction Democracy & Pol. Connections						0.016
						(0.064)
Intercept	0.254***	0.253***	0.247***	0.247***	0.224	0.247***
	(0.009)	(0.009)	(0.009)	(0.009)	(.)	(0.009)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	374	370	352	352	680	352
R-sq	0.512	0.512	0.486	0.486	0.399	0.486
F	5.682	5.693	6.163	6.163	.	3.57

Table 6. The Price Effect of Four Major Operators

This table shows the effect of the first measure of competition on telecom. prices, after controlling for economic and demographic factors. Panel A reports cross-sectional OLS regressions; Panel B reports IV regressions; Panel C reports time-series regressions at the country-level. The sample is restricted to countries with available data in GSMA (columns 1-3) and Numbeo (column 5). In the OLS and IV regressions, observations are the 2010-2014 average of each given variable in each country. In the time series regressions, variables are measured in each year. For the definitions of the variables see Table 1. Standard errors are clustered at the country-level. Robust standard errors are reported in parentheses. . ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Panel A. Cross-Sectional OLS Regressions

	ARPU By Connection (1)	Effective Price Per Minute (2)	EBITDA Margin (3)	Mobile Basket USD (4)	Prepaid Mobile Tariff, 1 Min Local (5)
Log GDP per capita (PPP)	5.277***	-0.026***	-0.033***	-1.149*	-0.018
	(0.54)	(0.009)	(0.009)	(0.651)	(0.016)
Log Population	-0.041	-0.016***	0.003	0.404	0.007
	(0.378)	(0.006)	(0.005)	(0.493)	(0.009)
Population Density (1,000th)	0.381	0.000	0.001	-0.933**	-0.007
	(0.371)	(0.004)	(0.002)	(0.427)	(0.005)
Inflation	-0.211***	-0.008***	0.000	-0.653***	-0.003
	(0.078)	(0.002)	(0.001)	(0.18)	(0.004)
Magic Four	-2.979**	-0.042**	-0.054***	-5.698**	-0.074**
	(1.506)	(0.018)	(0.02)	(2.294)	(0.031)
Intercept	-24.82***	0.718***	0.663***	35.83***	0.337
	(7.586)	(0.132)	(0.126)	(9.713)	(0.241)
# Obs.	172	90	108	172	98
R-sq	0.465	0.329	0.235	0.142	0.091
F	24.91	8.836	8.151	6.628	3.487

Panel B. Cross-Sectional IV Regressions

	ARPU By Connection (1)	Effective Price Per Minute (2)	EBITDA Margin (3)	Mobile Basket USD (4)	Prepaid Mobile Tariff, 1 Min Local (5)
Log GDP per capita (PPP)	5.543***	-0.017	-0.035***	-1.521*	-0.025
	(0.805)	(0.01)	(0.01)	(0.889)	(0.02)
Log Population	0.968	-0.012*	-0.003	1.862	0.025
	(0.946)	(0.007)	(0.007)	(1.16)	(0.015)
Population Density (1,000th)	1.085**	-0.002	-0.002	-0.039	0.002
	(0.54)	(0.004)	(0.004)	(0.701)	(0.01)
Inflation	-0.334**	-0.007***	0.001	-0.761***	-0.004
	(0.146)	(0.002)	(0.001)	(0.214)	(0.004)
Magic Four	-20.43**	-0.068	-0.015	-21.85**	-0.28**
	(9.481)	(0.055)	(0.05)	(9.625)	(0.112)
Intercept	-38.02**	0.568***	0.755***	20.42	0.186
	(14.82)	(0.173)	(0.148)	(18.69)	(0.329)
# Obs.	138	82	98	138	96
R-sq	0.123	0.279	0.215	.	.
F	24.8	6.017	5.035	4.484	1.955

Panel C. Time Series Regressions (with Country Fixed Effects)

	ARPU By Connection (1)	Effective Price Per Minute (2)	EBITDA Margin (3)	Mobile Basket USD (4)
Log GDP per capita (PPP)	-44.100***	-0.313***	-0.077***	3.694
	(3.560)	(0.061)	(0.028)	(3.274)
Log Population	-54.56***	-0.508**	0.093	19.110*
	(13.840)	(0.231)	(0.112)	(10.170)
Population Density (1,000th)	0.729	0.139***	-0.093**	-0.346
	(3.908)	(0.035)	(0.044)	(2.465)
Inflation	0.029	0.002**	0.000	-0.062
	(0.024)	(0.001)	(0.001)	(0.070)
Magic Four	-3.388**	-0.031	-0.040***	1.183
	(1.509)	(0.022)	(0.015)	(1.739)
Intercept	1289.1***	11.57***	-0.384	-311.7**
	(194.500)	(3.508)	(1.744)	(153.3)
# Obs.	1654	652	1110	1072
R-sq	0.807	0.831	0.729	0.726
F	129	24.43	5.087	2.448

Table 7. The Price Effect of C2

This table shows the effect of the market share of the two largest operators on telecom. prices, after controlling for economic and demographic factors. Panel A reports cross-sectional OLS regressions; Panel B reports IV regressions; Panel C reports time-series regressions at the country-level. The sample is restricted to countries with available data in GSMA (columns 1-3) and Numbeo (column 5). In the OLS and IV regressions, observations are the 2010-2014 average of each given variable in each country. In the time series regressions, variables are measured in each year. For the definitions of the variables see Table 1. Standard errors are clustered at the country-level. Robust standard errors are reported in parentheses. . ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Panel A. Cross-Sectional OLS Regressions

	ARPU By Connection (1)	Effective Price Per Minute (2)	EBITDA Margin (3)	Mobile Basket USD (4)	Prepaid Mobile Tariff, 1 Min Local (5)
Log GDP per capita (PPP)	5.544***	-0.020**	-0.023***	-0.715	-0.013
	(0.584)	(0.009)	(0.009)	(0.660)	(0.017)
Log Population	0.122	-0.014**	0.010*	0.554	0.008
	(0.429)	(0.006)	(0.005)	(0.556)	(0.008)
Population Density (1,000th)	0.335	0.002	0.001	-1.064***	-0.005
	(0.390)	(0.004)	(0.002)	(0.359)	(0.006)
Inflation	-0.212***	-0.008***	0.000	-0.646***	-0.003
	(0.08)	(0.002)	(0.001)	(0.187)	(0.004)
C2	10.130	0.166**	0.304***	15.280*	0.243**
	(6.164)	(0.069)	(0.062)	(8.197)	(0.113)
Intercept	-38.940***	0.494***	0.189	15.410	0.064
	(13.31)	(0.176)	(0.165)	(16.040)	(0.263)
# Obs.	172	90	108	172	98
R-sq	0.465	0.327	0.305	0.128	0.076
F	24.62	9.415	17.78	6.907	2.487

Panel B. Cross-Sectional IV Regressions

	ARPU By Connection (1)	Effective Price Per Minute (2)	EBITDA Margin (3)	Mobile Basket USD (4)	Prepaid Mobile Tariff, 1 Min Local (5)
Log GDP per capita (PPP)	7.346***	-0.010	-0.036*	0.238	-0.007
	(1.027)	(0.014)	(0.02)	(1.281)	(0.022)
Log Population	2.006**	-0.011	-0.005	2.667*	0.022
	(0.962)	(0.010)	(0.022)	(1.515)	(0.015)
Population Density (1,000th)	0.795	0.001	-0.003	-0.432	0.005
	(0.525)	(0.004)	(0.006)	(0.395)	(0.008)
Inflation	-0.339**	-0.007***	0.001	-0.749***	-0.004
	(0.16)	(0.002)	(0.001)	(0.241)	(0.005)
C2	71.98***	0.213	-0.029	68.60**	0.733**
	(19.96)	(0.262)	(0.482)	(31.26)	(0.319)
Intercept	-135.3***	0.296	0.834	-70.390	-0.603
	(36.780)	(0.447)	(0.900)	(56.400)	(0.578)
# Obs.	138	82	98	138	96
R-sq	0.17	0.271	0.168	.	.
F	16.68	5.493	4.602	11.26	3.934

Panel C. Time Series Regressions (with Country Fixed Effects)

	ARPU By Connection (1)	Effective Price Per Minute (2)	EBITDA Margin (3)	Mobile Basket USD (4)
Log GDP per capita (PPP)	-41.520***	-0.218***	-0.046*	3.227
	(3.451)	(0.054)	(0.028)	(3.258)
Log Population	-51.780***	-0.527**	0.106	17.810*
	(13.41)	(0.207)	(0.098)	(9.862)
Population Density (1,000th)	0.825	0.101***	-0.114***	-0.650
	(4.004)	(0.036)	(0.03)	(2.528)
Inflation	0.027	0.002***	0.000	-0.056
	(0.022)	(0.001)	(0.001)	(0.069)
C2	26.070***	0.483***	0.294***	-9.182
	(7.801)	(0.132)	(0.082)	(8.084)
Intercept	1199.0***	10.580***	-1.137	-278.9*
	(193.4)	(3.287)	(1.575)	(151.9)
# Obs.	1654	652	1110	1072
R-sq	0.811	0.849	0.742	0.726
F	137.1	37.36	9.83	2.465

Table 8. The Impact of Competition on the Quality of Services – OLS and IV Regressions

Panels A to C report OLS and IV regressions estimates respectively of the effect of Magic Four, C2 and Number Portability on different measures of quality of telecom services, after controlling for the standard controls (i.e., as reported in Tables 6 and 7). The sample is restricted to countries with available data in GSMA. Observations are the 2010-2014 average of each given variable in each country. For the definitions of the variables see Table 1. Robust standard errors are reported in parentheses. ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Panel A. Magic Four

	3G/4G Connections (% Total)		4G Connections (% Total)		3G/4G Network Coverage (% Total Area)		4G Network Coverage (% Total Area)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Standard Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Magic Four	0.011	0.307**	-0.007	0.073***	0.012	0.115	0.005	0.276*
	(0.040)	(0.129)	(0.010)	(-0.023)	(0.037)	(0.092)	(0.039)	(0.140)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	109	98	109	98	169	138	102	93
R-sq	0.62	0.362	0.348	.	0.666	0.608	0.583	0.452
F	40.48	18.27	19.16	7.774	141.2	92.03	35.49	39.33

Panel B. C2

	3G/4G Connections (% Total)		4G Connections (% Total)		3G/4G Network Coverage (% Total Area)		4G Network Coverage (% Total Area)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Standard Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C2	-0.174	-0.989**	-0.001	-0.243***	-0.290**	-0.428	-0.279*	-0.865**
	(0.125)	(0.434)	(0.03)	(0.0832)	(0.133)	(0.287)	(0.164)	(0.339)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	109	98	109	98	169	138	102	93
R-sq	0.626	0.485	0.344	.	0.677	0.637	0.596	0.56
F	38.72	23.78	16.39	7.97	162.7	105.5	44.77	58.32

Panel C. Number Portability

	3G/4G Connections (% Total)		4G Connections (% Total)		3G/4G Network Coverage (% Total Area)		4G Network Coverage (% Total Area)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Standard Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number Portability	0.067***	0.655	0.001	0.162	0.091***	0.292	-0.004	0.539
	(0.022)	(0.695)	(0.004)	(0.167)	(0.027)	(0.257)	(0.030)	(0.54)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	98	90	98	90	143	121	92	85
R-sq	0.648	.	0.353	.	0.681	0.511	0.62	.
F	43.95	7.313	14.55	3.242	132.7	52.2	34.14	11.62

Table 9. The Impact of Competition on the Quality of Services – Time Series Regressions

Panel A, Panel B, and Panel C report Time Series Regressions respectively of the effect of Magic Four, C2 and Number Portability on different measures of quality of telecom. services, after controlling for the standard controls (reported in Tables 6,7). The sample is restricted to countries with available data in GSMA. Variables are measured in each year. Country fixed effects are always included. For the definitions of the variables see Table 1. Robust standard errors are reported in parentheses. ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Panel A. Magic Four

	3G/4G Connections (% Total)	4G Connections (% Total)	3G/4G Network Coverage (% Total Area)	4G Network Coverage (% Total Area)
Standard Controls	Yes	Yes	Yes	Yes
Magic Four	-0.050	0.024	0.012	0.108
	(0.047)	(0.049)	(0.028)	(0.145)
Intercept	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
# Obs.	319	326	1231	275
R-sq	0.951	0.456	0.841	0.838
F	9.475	9.572	133.3	28.84

Panel B. C2

	3G/4G Connections (% Total)	4G Connections (% Total)	3G/4G Network Coverage (% Total Area)	4G Network Coverage (% Total Area)
Standard Controls	Yes	Yes	Yes	Yes
C2	-0.048	-0.18	-0.589***	-2.421*
	(0.435)	(0.447)	(0.19)	(1.407)
Intercept	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
# Obs.	319	326	1231	275
R-sq	0.95	0.456	0.849	0.852
F	9.469	9.508	133.7	47.02

Panel C. Number Portability

	3G/4G Connections (% Total)	4G Connections (% Total)	3G/4G Network Coverage (% Total Area)	4G Network Coverage (% Total Area)
Standard Controls	Yes	Yes	Yes	Yes
Number Portability	-0.006	0.056	0.104***	0.044
	(0.098)	(0.052)	(0.023)	(0.273)
Intercept	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
# Obs.	196	203	805	162
R-sq	0.959	0.424	0.875	0.86
F	8.032	3.661	189.5	70.88

Table 10. The Impact of Competition on the Investments, Wages, and Churn

This table shows the effect of competition in the telecom. sector on investments, wages and churn, after controlling for the standard controls (as reported in Tables 6 and 7). Panel A, B and C report cross-sectional IV regressions of the effects of Magic Four (column 1), C2 (column 2) and Number Portability (column 3) respectively on Capex (scaled by revenues); Number of Employees and Cost of Personnel (both scaled by revenues); and on Churn. The sample is restricted to countries with available data in GSMA. Observations are the 2010-2014 time-series average of the annual weighted average of each variable in each country (where weights are each operator's relative market share). For the definitions of the variables see Table 1. Robust standard errors are reported in parentheses. ***significant at less than 1%; ** significant at 5%; * significant at 10%.

Panel A. Cross-Sectional IV Regressions: Capex

	Capex (Total) / Revenues		
	(1)	(2)	(3)
Standard Controls	Yes	Yes	Yes
Magic Four	0.004		
	(0.041)		
C2		-0.017	
		(0.221)	
Number Portability			-0.026
			(0.079)
Intercept	Yes	Yes	Yes
# Obs.	110	110	99
R-sq	0.176	0.174	0.196
F	7.768	7.805	4.724

Panel B. Cross-Sectional IV Regressions: Number of Employees and Cost of Personnel

	# Employees (*1000) / Revenues			Cost Personnel / Revenues		
	(1)	(2)	(3)	(1)	(2)	(3)
Standard Controls	Yes	Yes	Yes	Yes	Yes	Yes
Magic Four	-0.003			-0.051		
	(0.009)			(0.027)		
C2		0.011			0.104	
		(0.043)			(0.119)	
Number Portability			-0.006			0.011
			(0.011)			(0.049)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	117	117	104	59	59	51
R-sq	0.102	0.095	0.114	0.077	0.164	0.072
F	3.32	3.289	5.667	4.779	3.871	4.179

Panel C. Cross-Sectional IV Regressions: Churn

	Churn		
	(1)	(2)	(3)
Standard Controls	Yes	Yes	Yes
Magic Four	-0.000		
	(0.008)		
C2		0.006	
		(0.048)	
Number Portability			0.002
			(0.012)
Intercept	Yes	Yes	Yes
# Obs.	68	68	60
R-sq	0.401	0.386	0.297
F	6.606	7.069	2.933