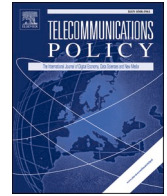




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Conflicting national policies: The creation of the euro and the rebalancing of telecommunications prices

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ABSTRACT

Government departments have diverse interests, and on certain occasions, the need to achieve a priority objective in one department may lead to the adoption of inefficient policies in other areas, with long-lasting consequences. In this paper, we analyze the rebalancing of the telecommunications tariffs that took place in the European Union before and after the liberalization of the market in 1998. We show that the objective of satisfying the Maastricht inflation condition to allow participation in the European Monetary Union from 1999 led some national governments to block the rebalancing of telecommunications tariffs. Specifically, we demonstrate that in the years immediately before the liberalization of the telecommunications market, those countries that faced greater difficulty achieving the inflation objectives of the Maastricht Treaty reduced, rather than increased, the prices of local telephone calls and line rental. Furthermore, these countries did not intensify efforts to rebalance their tariffs after the creation of the euro. Our paper also shows that in this period the countries that diverged most from the inflation condition invested less in their telecommunications infrastructure.

1. Introduction

Government departments have diverse interests, and on some occasions, the need to achieve a priority objective in one department may lead the government to adopt inefficient policies in other areas, with long-lasting consequences. One example of this situation is the rebalancing of the telecommunications tariffs that took place in the European Union before (and after) the liberalization of the market in 1998. Before this liberalization, most national governments kept the tariffs of international and long-distance calls deliberately high in order to cross-subsidize the price of local telephone calls and line rental (monthly subscription fee). The objective of this policy was to facilitate universal access to telephony services, but with the liberalization of the market European authorities thought that these distorted tariffs would be an obstacle for the development of competition (Cherry & Bauer, 2002; Grzybowski, 2008). On this basis, they required member States to rebalance the tariffs of incumbent telecom operators before 1998. However, at this time price rebalancing turned out to be extremely inconvenient for those European countries facing difficulties in satisfying the inflation condition established in the Maastricht Treaty for participation in the euro. In this paper, we show that the priority objective of controlling inflation led some national governments to block the rebalancing of telecommunications tariffs, affecting competition and the investment decisions of telecommunications operators in this critical period.

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At the beginning of the 1990s, European countries initiated several important reforms aimed at reinforcing the construction of the European Union and creating a Single Market. One essential policy for this was the liberalization of public services such as telecommunications, electricity and transportation services, with the objective of eliminating entry barriers and increasing the efficiency of European firms. In the case of the telecommunications sector, during the 1980s most European countries were providing services by means of state-controlled national monopolies. However, technological change and reforms initiated by countries such as the US, the UK and Japan showed European authorities that their large monopolies were inefficient and reduced innovation and the competitive ability of European economies (Boylaud & Nicoletti, 2001; Duso & Seldeslachts, 2010; Levy & Spiller, 1994; Li & Xu, 2002, 2004; Wallsten, 2002). This situation led to the liberalization of the market. In 1993, after intense negotiations, all member states agreed to completely liberalize their national telecommunications markets by 1998. The European Commission also established that before 1998 national governments had to rebalance the price of telecommunications services to facilitate the financial stability of incumbent monopolies.

Another important policy adopted by the European Commission to favor the consolidation of the Single Market was the creation of the euro (European Union, 1992; Wyplosz, 1997 and, 2006, Jabko, 1999; Dominguez, 2006; De Grauwe, 2016). In 1989, the Commission decided to create the European Monetary Union, and the process culminated in the introduction of the euro at the beginning of 1999. Interestingly enough, the liberalization of basic services like telecommunications and the creation of the monetary union took place in the same period, and were conceived as two policies to enhance the integration of European markets. Despite this, in some countries the stabilization conditions established to create the euro became an obstacle to the rebalancing of telecommunication tariffs.

After the launch of the European Monetary Union in 1990, the Treaty of Maastricht set several criteria that national economies had to satisfy to participate in the euro. One of these criteria was that the inflation level of the participants in the euro could not be higher than 1.5% above the average of the EU countries with the three lowest inflation rates (Kenen & Meade, 2003; Jonas, 2006; Lewis, 2009; Lewis & Staehr, 2010; Paleta, 2012). In 1994, the European Monetary Institute, the precursor of the European Central Bank, was created with the objective of supervising the attainment of the Maastricht conditions before the introduction of the euro in 1999.¹ Moreover, after the creation of the euro it had to verify that the inflation rates of euro members were not diverging significantly and persistently from a 2% target.

By the time of its creation on January 1 of 1999, the euro zone comprised 11 countries: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, Netherlands, Portugal and Spain. The euro was later extended to Greece (2001), Slovenia (2007), Cyprus and Malta (2008), Slovakia (2009), Estonia (2011), Latvia (2014), and Lithuania (2015). Despite the successful creation of the monetary union, during the 1990s European countries faced many difficulties in meeting the inflation objectives established by the Maastricht Treaty and adopted several structural reforms and ad-hoc measures to reduce their prices, such as reducing the prices of regulated services. In the case of the telecommunications market, it was expected that the rebalancing of tariffs would increase the Retail Price Index (RPI) and reduce the ability of some countries to satisfy the Maastricht conditions (Calzada & Costas, 2016).

In this paper, we use linear models with country fixed effects to test the hypotheses that the objective of satisfying the Maastricht inflation condition to participate in the euro led some national governments to block the rebalancing of telecommunications tariffs. OLS estimates show that in the years immediately before the liberalization of the telecommunications sector, those countries that faced greater difficulty in achieving the inflation objectives of the Maastricht Treaty reduced, rather than increased, the prices of local telephone calls and line rental. Although European authorities supervised the reform of the market and enacted several measures to enforce tariff rebalancing, the greater need to meet the inflation condition led these countries to reduce the price of line rental and local calls. Moreover, these countries did not compensate for this situation by carrying out price restructuring in subsequent years. Our paper also shows that in the years prior to 1998 the countries that diverged most from the Maastricht inflation condition invested the least in telecommunications infrastructure. Our results are robust and the conclusions are maintained when we estimate all models using Instrumental Variables (IV) to control for the potential endogeneity of the relationship between the regulated prices and the inflation at the national level.

Our study draws from several public data sets. Data on incumbents' prices were obtained from the consultancy agency Teligen, which during the period we examine provided price information to the European Commission. Pricing data are available for all EU countries for the years between 1995 and 2011.² We also use information describing the market characteristics obtained from Eurostat, the International Telecommunications Union and the OECD.

The main contribution of our paper is the demonstration that during the creation of the European Single Market and the Monetary Union in the 1990s, the priority of participating in the euro led some countries to establish inefficient telecommunications tariffs. The objective of satisfying the inflation condition of the Maastricht Treaty could also explain why during the first years of the liberalization many countries did not delegate the regulation of the prices to independent regulatory agencies. Our hypothesis is that the urgency in reducing the inflation led national governments to retain the control of regulated prices and to delay tariff rebalancing.

Our paper is related to the literature analyzing the interplay of the different actors participating in the regulatory process. In liberalized markets, the emergence of multi-level and multi-actor regulatory frameworks has created complex governance systems that

¹ The euro was introduced to the world financial markets as an accounting currency on 1 January 1999, replacing the former European Currency Unit (ECU). Physical euro coins and banknotes entered into circulation on 1 January 2002. See https://ec.europa.eu/info/business-economy-euro/euro-area_en.

² Data on prices are available in the reports provided by the consultancy agency Teligen for the Commission since 1998, but Teligen provided us with information for the years 1995–1997.

have important consequences for the regulation output. Some studies have analyzed the dispersion of powers that has resulted from both decentralization and supranational trends (Aubin & Verhoest, 2014; Jensen et al., 2014; Mathieu et al., 2017; Rosenau, 2007). Other papers have examined the coordination problems and the agreements that emerge among the constellation of agencies participating in the regulatory process (Jordana & Sancho D, 2004; Mathieu et al., 2017; González & Verhoest, 2020; Mathieu et al., 2021). Our paper contributes to this literature, as we examine the interaction between the government departments and the regulators participating in the establishment of fixed telephony prices. We explain that during the liberalization, the actors with a responsibility in the regulation of prices had conflicting interests and that the prices were finally set considering the governments' inflation objective. In this sense, the regulation of prices is a good example to illustrate the governance problems associated to multi-actors regulatory frameworks. In the European Union, the urgency for reducing the inflation lead some governments to inefficiently set the prices of telecommunications services. This measure was against the European Commission competition directive and the objective to promote infrastructure competition. In spite of this, the direct regulation of prices was more effective to control the inflation than the adoption of structural reforms.

The paper is structured as follows. In section 2, we review the literature related to our research. In section 3 we present the conceptual framework of the paper. In section 4, we describe the data. In section 5, we explain the empirical model and present the econometric results. Finally, section 6 summarizes and concludes.

2. Related literature

A substantial body of economic literature has shown the relevance of the political ideology (Olson, 1965; Romer & Rosenthal, 1987), the influence of interest groups (Becker, 1983; Peltzman, 1976; Stigler, 1971) and countries' institutional organizations (Lijphart, 1999; Henisz & Zelner, 2006; Duso & Seldeslachts, 2010) in the formation of public policies. Our paper shows that national governments have diverse objectives, and that the prioritization of these objectives might lead to inefficient policies that affect some economic activities. Our analysis focuses on the conflict between the control of inflation and tariff rebalancing in the telecommunications sector, but there are other examples of conflicting policies at the national level, such as the tensions between environmental protection and economic growth, competition policy and the protection of national firms, or the sanitary measures required to control the COVID-19 pandemic and the measures established to reactivate the economic activity. As explained by Duso and Seldeslachts (2010), while the traditional private interest view of regulation stresses the role of interest groups in the formation of policies, this approach does not model policy-making bodies (governments, policy makers, and regulatory agencies), which create and shape the regulatory process.³ Governments and politicians care about the policy outcome and focus on the objectives that they consider as socially more relevant and that offer them more internal and international political support. Our paper shows that the need to achieve some general objectives might act as an internal justification for relegating other policies, or even for adopting inefficient regulations.⁴

Our paper is also related to the extensive literature analyzing the liberalization of the telecommunications market (Grajek & Röller, 2012; Li & Xu, 2004), although this is the first empirical work examining how the control of inflation in the years before and after this liberalization affected the prices of telecommunications services. Several papers concerning this period have analyzed problems such as the effect of competition on the diffusion of telecommunications services, the relevance of regulatory agencies (Edwards & Waverman, 2006), the privatization of national monopolies, and the regulatory design (Ros, 2003; Gutierrez & Berg, 2000; Wallsten, 2001; Wallsten, 2002).

Very few papers have studied the prices of fixed-line telephony during the liberalization process. While some papers have considered the effect of liberalization, privatization and technological change on the prices, other have assessed the impact of specific regulations, such as carrier pre-selection, number portability or the regulation of termination charges. Boylaud and Nicoletti (2000) examined the effects of competition on productivity, prices and quality in long-distance domestic and international telephone calls in 23 OECD countries from 1991 to 1997. They found that liberalization had immediate benefits on productivity and prices after its announcement. Bacchiocchi et al. (2011) analyzed fixed-line telephony prices for 15 EU countries for the period 1997–2003, showing that privatization had a limited role in explaining the prices of international, national, and local calls, and connection charges. Moreover, they found that privatization and liberalization contributed to reducing the prices of local calls, which is in contrast with the idea of tariff rebalancing. Grzybowski (2008) analyzed the prices of fixed-line telephony for residential consumers during the period 1998–2002 using data from the consultancy agency Teligen. He found that the regulation of carrier pre-selection and number portability reduced average prices across the EU by 8.2%. Moreover, the regulation of termination charges to access incumbent networks reduced incumbent national prices at peak time, but had no impact on local calls. Other papers have analyzed the effects of regulation on the prices and diffusion of mobile services (Bauer, 2003; Gruber & Verboven, 2001; Grzybowski, 2005).

The literature focusing on the determinants of tariff rebalancing during the liberalization of the telecommunications markets is even scarcer. Ros and Banerjee (2000) analyzed a group of 23 Latin American countries in the period 1995–96 and concluded that tariff rebalancing, privatization, and network technology upgrades reduced the proportion of unmet demand for basic residential services in

³ Duso and Seldeslachts (2010) explain that politicians make their choices not only to be re-elected, but also because they genuinely care. This implies that decisions of politicians may not be in line with the preferred policy of interest groups (Kalt & Zupan, 1984).

⁴ The literature on Public Administration has examined how Europeanization has changed national administrative systems, which has affected the beliefs and roles of public employees, the time and resources devoted to EU-related work, and the impact of Europeanization on national ministries and agencies (Bach & Ruffing, 2013; Bach et al., 2015; Egeberg, 1999 and 2009; Geuijen, Hart, Princen, & Yesilkagit, 2008; Knill, 2001; Lægrend et al., 2004; Mastenbroek & Princen, 2010; and Müller et al., 2010).

a country. The paper that is closer to ours is [Cherry and Bauer \(2002\)](#), who presented descriptive evidence of tariff rebalancing in the US and Europe during 1994–2000. They found that in the EU, usage charges dropped significantly for residential customers (−37.0%) and business customers (−44.4%) and that the bulk of the decrease happened after the full liberalization of the voice telecommunications markets in 1998. During 1997–2000 local residential usage charges were fairly stable and the long-distance components decreased fairly dramatically in the EU (−52.7%). As a result, the share of fixed components in the total basket costs increased by 44.56% for residential users. Our paper complements this research by showing that tariff-rebalancing at the national level was affected by the governments' inflation objectives.

This paper is also related to the literature examining the relevance of the institutional organization for the development of the telecommunications markets. Several empirical papers have shown that the political constraints and the stability of regulatory institutions were essential factors for the development of the market and the operators' investment decisions ([Levy & Spiller, 1994](#); [Henisz, 2000](#); [Henisz & Zelner, 2001](#); [Andonova & Diaz-Serrano, 2009](#); [Jordana et al., 2011](#), [Perkins, 2014](#)). Other papers have shown that the creation of independent regulatory agencies had a positive effect for the entry in liberalized markets and for the investments of private firms ([Bortolotti & Milella, 2008](#); [Edwards & Waverman, 2006](#); [Fink & Rathindran, 2002](#); [Gutierrez, 2003](#); [Gutierrez & Berg, 2000](#)).⁵ Most of the European countries considered in our analysis created their telecommunications regulatory agencies at the end of the nineties,⁶ but in most cases national governments maintained the responsibility to regulate the retail prices during the first years after the liberalization. This situation created important conflicts in the interior of some governments ([Calzada & Costas, 2016](#)).

Finally, to our knowledge, there is little evidence in the economics literature on how governments' macroeconomic objectives might affect the mission of industry regulators. One exception is [Joskow \(1973 and 1974\)](#), who explained that in the late 1960s the US regulatory commissions in charge of the electricity sector were more concerned about the increase in prices than about an accurate application of the rate of return regulation. The existence of conflicting objectives between regulatory bodies has also been highlighted in [Duso and Seldeslachts \(2010\)](#). These authors examined liberalization in the mobile telecom industries during the period 1991–1997 for 24 OECD countries, and showed that while strong incumbents and pro-regulation governments slowed down the liberalization of the telecommunications market, governing bodies that favored a small welfare state sped up entry. Moreover, in line with the agency theories of regulation, they found that independent industry regulators slowed down liberalization.⁷

3. Conceptual framework

3.1. Telecommunications liberalization and tariff rebalancing

In the 1980s, European institutions were very concerned about the bad state of their telecommunications services, and more specifically, about the loss of competitiveness and innovative capacity of the EEC with respect to the United States. It was considered that the excessive fragmentation of national markets and the entry barriers imposed by national monopolies were an obstacle to the development of the service.⁸ The lack of initiative by the EEC became apparent after the breakup of AT&T in 1984, and when the UK and Japan privatized their public monopolies and liberalized their telecommunications markets. In 1984, the “American challenge” forced the European Parliament and the Council of Ministers of the EEC to launch a coordinated program to reform the telecommunications sector. Later on, the Directorate General XIII of the European Commission, encouraged by the creation of the European Single Market in 1993, undertook a comprehensive analysis of the telecommunications market in the *Green paper on the development of the Common Market for telecommunications services and equipment* of 1987. This document contained a Telecommunications Program in which the Council and the Commission agreed to liberalize the market. The terminal equipment market was liberalized in 1988 and the value-added services in 1990. Moreover, the 1990 ONP Framework Directive established the conditions of access and open use of the existing telecommunications networks. This was the first major blow to national monopolies and initiated the harmonization of telecommunications infrastructure across the ECC.

⁵ More generally, the creation of specialized public agencies is a phenomenon that started in the eighties with the surge of an important decentralization process in the public administration, and was reinforced in the nineties with the liberalization of network industries and the creation of independent regulators ([Christensen & Lægheid P, 2002](#)). Specialized agencies were considered to have less hierarchical and political dependence from their parent government departments, and received the support of the New Public Management (NPM) doctrine, which considered that agencies will modernize managerial practices in the public sector ([Christensen & Lægheid, 2006](#); [Verhoest & Lægheid, 2010](#)). This view was later on challenged by the post-NPM movement, which highlighted some problems created by agencification, as the fragmentation of the public sector, which makes coordination and supervision of agencies very complex ([Christensen & Lægheid, 2007](#); [Bouckaert et al., 2010](#); [Verhoest et al., 2012](#)).

⁶ According to the 1998 report by the European Commission, the regulators in all Member States, except Belgium, were legally independent from the Ministry ([European Commission, 2004](#); [Grzybowski, 2008](#)). However, there were concerns as to whether in some countries the control of the incumbent and regulatory functions were sufficiently separated. In the countries studied in this paper, Austria, France, Ireland, Luxembourg and Netherlands created their telecommunications regulators in 1997, and Germany, Greece and Italy in 1998. In the rest of countries, regulators were created at the beginning of the nineties; Finland (1990), Belgium (1993) and Portugal (1990).

⁷ They explained that the cost of delegating to specialized regulators is that these may not implement policies reflecting the government's preferences. “Regulators may abuse their informational advantages to collude with industry incumbents. This agency problem is to some extent confirmed by the observation that regulators who are financed by industry incumbents have a (weak) tendency to slow down liberalization”.

⁸ An illustration of this situation is that in this period the per capita consumption of telecommunications services in the EEC was approximately one third lower than that of the United States, while the demand for advanced services was growing much more slowly ([Little, 1983](#)).

In 1992, the European Commission reviewed the results achieved by the “first European liberalizing wave” and sent two communications to the Council of Ministers identifying two important problems affecting the market. The first communication pointed out that the rebalancing of tariffs of incumbent national operators had been insufficient, except in the case of the UK where the market was liberalized in 1982. The second communication concluded that the ongoing reforms were not enough to help Europe get out of the deep economic crisis that it was experiencing, and stressed the importance of incorporating the new information technologies into economic and social life. After this, in 1993 the European Council of Ministers resolved to completely liberalize fixed telephony services in all countries before January 1, 1998.⁹ In addition, this “second liberalizing wave” established the liberalization of telecommunications infrastructure.¹⁰ Specifically, the Competition Directive (96/19/EC) approved the total abolition from January 1, 1998 of special and exclusive rights in voice telephony and the supply of public telecommunications networks.

After the liberalization of 1998, the telecommunications market experienced a substantial transformation. Hundreds of operators entered the market offering new and specialized services, mobile telephony and the Internet began to expand, and cable and satellite television services began reaching larger audiences. During this period, national regulators developed multiple policies to promote competition, such as the establishment of cost-oriented interconnection prices, the identification of operators with significant market power (which were subject to specific access regulations and supervision), and the regulation of numbering and number portability. In spite of this, investment in new infrastructure occurred at a much slower pace than expected. This led national and European authorities to introduce new economic and technical regulations to increase competition (Cave et al., 2019). An important measure for this objective was the “unbundling of the local loop”, established on January 1, 2001, which allowed entrants to use the incumbent’s local exchanges to access consumers.¹¹

In the following years, the European Commission reviewed the state of the market and decided to deepen the reforms. In 2002, in the midst of a global crisis in the telecommunications sector, a new regulatory framework, the so-called “telecom package”, was approved.¹² The new legislation integrated many of the partial regulations introduced in previous years into a new coherent and harmonized system. This set of measures completed the liberalization process, if we take this to be the political process aimed at breaking the national monopolies, introducing new competitors and eliminating legal barriers to entering the sector.

Tariff rebalancing was one of the main regulatory objectives during the liberalization process. The Competition Directive required that Member States completed tariff rebalancing by January 1, 1998, following the Commission’s guidelines for cost orientation and adjustment of pricing structures (European Commission, 2004). The correction of the prices was aimed at removing the distortions previously generated by the cross-subsidization of certain services by others. The Commission considered that this policy was essential to favor entry in local markets, as the excessive low prices of the incumbents’ local services and the rental price were eroding the entrants’ incentives to invest in their own infrastructures (European Commission, 1999).

Before 1998, national governments were in charge of setting the tariffs of the incumbent operators, and they did not remove the price regulation until several years after the liberalization, when it was considered that market competition was sufficiently strong. During this period, most countries implemented a price cap regulation for voice telephony, with the objective of giving some flexibility to the incumbent operators. Several governments delegated the supervision of the prices to the newly created national regulators, but they retained the control and the design of price regulations (Boylaud & Nicoletti, 2000; Thatcher, 2001; Bel et al., 2006; Calzada & Costas, 2016). According to the European Commission, some Member States introduced the price cap regulation before completing the tariff rebalancing (European Commission, 1999), which implied that they used the design of this regulation to complete the tariff rebalancing.

The Commission began to examine whether the Member States were satisfying the tariff rebalancing requirement in 1997 (European Commission, 1997). The reports of the Commission on the implementation of regulatory package showed a decline in the EU average price for long-distance and international calls over the period 1997 to 2000, and a significant increase in the average monthly rentals and in the price of local calls (European Commission, 1999, 2002). In spite of this, the Commission considered that the rebalancing was not completed in most Member States, and this situation caused important disputes between the Commission and some Member States (European Commission, 2000 and 2002; Cherry & Bauer, 2002; Grzybowski, 2008).¹³ As we explain in the next section, our hypothesis for the lack of a complete tariff rebalancing is that the prices of telecommunication services had an important effect in the Harmonized Index of Consumer Prices (HICP), which in this period was used by the European authorities to assess if

⁹ To overcome the reluctance of some countries to open their markets, the Council established three conditions that each country had to satisfy: 1) adjustment of the tariffs to costs; 2) universal coverage of the basic telephone service; and 3) high usage of basic telephony services by the whole population. The European Council gave Spain, Portugal, Greece and Ireland 5 more years to liberalize telephony services, arguing that they needed significant investment to universalize access to their services.

¹⁰ In 1994, the Green Book on telecommunications infrastructure and cable television networks set out the principles for regulating the use of infrastructure. The Green Book was published in two parts: (1) Principles and Calendar (COM 94/440); and (2) Common Approach (COM 94/682).

¹¹ Regulation (EC) No 2887/2000 on the unbundling of the local loop. This measure was considered as an intermediate step in the so-called “ladder of investment”, which promoted the entrants’ progressive investments in their own networks (Cave, 2006; Cambini & Jiang, 2009; Bourreau et al., 2010; Bacache et al., 2014; Briglauer et al., 2013; Vogelsang, 2013; Calzada & Martínez-Santos, 2014a and 2014b).

¹² The Telecoms Package was adopted in 2002 and amended in 2009. It included four Directives: Directive 2002/20/EC, ‘Authorization Directive’; Directive 2002/19/EC, ‘Access Directive’; Directive 2002/22/EC, ‘Universal Service Directive’; Directive 2002/58/EC, ‘Privacy and electronic communications’.

¹³ In 1999, the Commission reported that “In most Member States, there is little evidence that voice telephony tariffs applied by the incumbents have actually been rebalanced, in particular when looking at monthly rental fees charged by incumbents, and that appropriate cost-accounting systems are in place to verify this.” (European Commission, 1999).

Member States were satisfying the Maastricht inflation condition.

Newly privatized telecommunications operators in Spain and Italy complained in front of the European Commission that their governments had not complied with the tariff rebalancing instructions.¹⁴ In a similar vein, on December 6, 2001, the European Court of Justice handed down a judgment in a dispute between the Commission and France over the mechanism for financing the universal service. The Court backed the Commission's position, and argued that France had also failed to complete the rebalancing of tariffs.

3.2. The European Monetary Union and the inflation criteria

Several papers have studied the economic and policy process followed for the creation of the European Monetary Union (EMU) and its effects (Buiter, 2005; Dobrinsky, 2006; Jabko, 1999; Jonas, 2006; Paleta, 2012; Wyplosz, 2006). The process can be divided into three stages. In 1989, the European Council of the EU established that the first stage towards the creation of the EMU would begin in 1990. In this stage, the members of the European Monetary System (EMS) abolished all existing capital controls and cooperation between the central banks increased. In 1991, the Treaty of Maastricht set out the framework for stages two and three for the creation of the EMU.¹⁵ The Treaty established several criteria to be part of the EMU, which required the convergence of the economies participating in the Eurozone and the establishment of a common monetary policy.

The second stage of the EMU began in 1994, with the creation of the European Monetary Institute (EMI), the precursor of the European Central Bank (ECB). One of the missions of this institution was to supervise the satisfaction of the Maastricht criteria. Regarding price stabilization, it was established that inflation in each country could not "exceed by more than 1.5 percentage points that of, at most, the three best performing Member States in terms of price stability".¹⁶ This condition had to be satisfied to participate in the third stage of the EMU, and was kept during the enlargement of the EU from 15 to 28 countries in subsequent years. This measure was considered essential to allow the ECB to effectively carry out a common monetary policy, and to avoid inflation differentials that could lead to imbalances that would require structural interventions or the abandonment of the euro by some countries. Other criteria included in the Treaty were to have participated in the European Exchange Rate Mechanism II for at least 2 years without devaluation or substantial exchange rate tensions; that the government budget deficit could not exceed 3% of GDP; and that public debt could not exceed 60% of the GDP (Lewis & Staehr, 2010). The satisfaction of the criteria determined whether a country had achieved "sustainable convergence" and thus was qualified to adopt the euro.¹⁷

According to the Maastricht Treaty, the final decision on adopting the euro had to consider the Convergence Reports from the European Commission (EC) and the European Monetary Institute (EMI) and later on the ECB.¹⁸ By 1994, none of the EU Member States had fulfilled the convergence criteria and most of them did not satisfy the deficit targets, but in 1995 the Cannes European Council confirmed the start of the Economic and Monetary Union in 1999 and the Madrid European Council decided to name the new currency the 'euro'. After this, Member States increased their efforts towards convergence (Delivoras, 2015). In 1997, only Finland, Luxembourg and Portugal met all criteria, but by 1998 11 Member States satisfied them. In 2000, Greece also met the convergence criteria and was able to adopt the euro. As a result, 12 countries eventually adopted the euro and a common monetary policy: Austria, Belgium, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Portugal and Spain.¹⁹

The third stage of the EMU began in 1999. The ECB established that national inflation rates could not diverge significantly and persistently from a target of 2% (ECB, 2004a, 2004b). The empirical evidence shows that in this period the dispersion of the inflation rates in the Eurozone decreased steadily, reaching the lowest level in 1999, although it then increased and remained stable for some years (Gregoriou et al., 2006). In the period 1999–2001, the inflation rate increased, reflecting several price shocks, such as the 300%

¹⁴ According to European Commission (2002), in Spain the key objective of the Ministry of Economy and the Government's Executive Committee for Economic Affairs was to keep inflation down, and this aim was not always convergent with the sector specific policies of the Ministry of Science and Technology and the sector regulator.

¹⁵ The Treaty of the EU established the introduction of a monetary policy (Article 3a TEU), implemented by a single and independent central bank (Article 4a TEU), with price stability as a primary objective.

¹⁶ The inflation criterion was established in Article 1 of the Protocol on Convergence Criteria of the Maastricht Treaty (European Union, 1992). Wyplosz (2006) and De Grouve (2003) stated that the main purpose of the criterion was to bind South European countries with traditionally high inflation to the lower inflation typical for Germany.

¹⁷ In some countries, the urge to meet Maastricht criteria was a major driver in the decision to privatize public utilities, as financially distressed governments were more eager to privatize (Armstrong et al., 1994; Megginson & Netter, 2001; Bortolotti, D'Souza, Fantini, & Megginson, 2001). This policy could also influence price regulation, due to the governments' objective to increase the price of the assets of privatized firms.

¹⁸ See https://ec.europa.eu/economy_finance/publications/european_economy/convergence_reports_en.htm for a review of the Convergence Reports. The report of 1998 assessed the first countries that adopted the euro. The report of 2000 assessed Greece and Sweden using the inflation reference value of the EU-15. In 2006, Lithuania and Slovenia were assessed considering EU-25 members, and in 2007 Malta and Cyprus considering 27 members.

¹⁹ Gregoriou et al. (2006) and De Grauwe (2009) explain that during 1996–1998, inflation differentials with respect to the Maastricht criteria were constantly negative in Austria, Belgium, Finland, France, Germany and Luxembourg, while Ireland, Italy, Portugal and Spain had both positive and negative differentials. After 1999, large positive deviations from the criteria took place in Greece, Ireland, Netherlands, Luxembourg, Portugal and Spain. These deviations usually responded to a cyclical behaviors. Before 1998, Greece was the country with the highest inflation, and in the following years Ireland had the highest inflation rate, and the Mediterranean countries (Greece, Italy, Portugal and Spain) typically featured in the list of high-inflation countries. The countries with a better performance usually included France and Germany, as well as Austria, Finland, UK and Sweden. Luxembourg, was one of the best performers in 1996, and became the worst performers in 2004 and 2005.

rise in oil prices between early 1999 and mid-2000, the depreciation of the euro, and significant increases in food prices in 2001.²⁰

3.2.1. A common measure of inflation

The measure that the European authorities have used to examine the evolution of inflation in each country is the annual Harmonized Index of Consumer Prices (HICP), which is calculated on a monthly basis. For each month, the annual HCPI inflation rate is defined as the percentage change in the 12-month average HICP index relative to the same index one year earlier. This measure ensures that the time series of the annual HICP inflation rate is relatively smooth (Lewis & Staehr, 2010). The HICP reflects the prices of consumer goods and provides a common measure of inflation that allows comparisons among countries.

According to the Maastricht Treaty, during the period January 1996 to December 1998 the inflation reference value was 1.5% plus the average inflation of the three best-performing EU countries in terms of inflation control. The three best performers during 1996 were Sweden (0.78%), Finland (1.06%) and Luxemburg (1.16%). As a result, the inflation reference value was 2.5%. In 1997, the three best performers were Austria (1.158%), Finland (1.21%) and Ireland (1.23%) and the inflation reference value was 2.7%. Finally, in 1998, the three best performers were Germany (0.59%), France (0.66%) and Austria (0.82%) and the inflation reference value was 2.19%. In the case of Greece, where stage two of the euro adoption process was delayed to the end of 2000, the inflation reference value was 2.04% in 1999 and 2.82% in 2000. On the other hand, since January 1999 the inflation reference value has been 2%. We used these reference values in our empirical analysis to calculate the degree of misalignment of each country with respect to the reference rate:

$$\tilde{I}_{it} = I_{it} - I_t^* \quad (1)$$

where I_{it} reflects country i inflation in period t and I_t^* is the inflation reference established by the Maastricht Treaty in this period. Fig. 1 shows inflation in the eurozone in the period 1995–2009. During 1996–1998, inflation differentials were constantly negative in Austria, Belgium, Finland, France, Germany and Luxemburg, while Ireland, Italy, Portugal and Spain exhibited both positive and negative differentials (Dominguez, 2006; Gregoriou et al., 2006). During 1999–2005, relatively large positive deviations from the policy reference value were observed in Greece, Ireland, Netherlands, Luxemburg, Portugal and Spain. Notice also that in May 1998, when the European Council decided about EMU membership, only Greece exhibited a significant positive inflation misalignment. This difference was reduced later and Greece joined the EMU in January 2001. The objective of our empirical analysis is to examine whether the size of the inflation misalignments in the period 1995–2009 led national governments to concentrate their efforts towards the reduction of inflation and led them to stop tariff rebalancing in the telecommunications market.

3.2.2. The use of regulated prices to control inflation

In the years before and after the creation of the euro, national and European economic authorities adopted several strategies to reduce inflation, considering the situation in each country. The rate of inflation can be brought down either permanently by credible monetary policy and market-oriented reforms; or temporarily by short-term measures (Bulir & Hurník, 2006). At the end of the nineties, the reduction of the HICP was facilitated by the secular decline in inflation in European countries, but the Maastricht inflation criterion also motivated a change of preferences regarding inflation by European authorities. Most countries adopted structural reforms, but these were insufficient to adjust to the Maastricht criteria (Ahearne & Pisani-Ferry, 2006; OECD, 2002). In their rush to the euro, national authorities found the opportunity to reduce the inflation through changes in regulated prices and indirect taxation and with measures in the factor markets (Ahearne & Pisani-Ferry, 2006; Bulir & Hurník, 2006; Koen & van den Noord, 2005). These measures were justified by their temporary nature as compared to the permanent benefits of Eurozone membership.²¹

In the late nineties, there was also the common believe that regulatory reforms in network industries will have general economic benefits. These reforms had to generate permanently lower price levels within the network industries and also had to have a temporary downward effect on inflation in the euro area.²² Between 1999 and 2000, the combined price decreases in the telecommunications and electricity sectors directly reduced overall euro area HICP inflation by 0.1 percentage point (European Central Bank, 2001). It was considered that this effect was a consequence of the regulatory reforms introduced in these sectors. Indeed, in this period telecommunications, electricity and gas account for around 5–6% of the total euro area HICP (European Central Bank, 2001).²³

²⁰ Several papers have examined the impact of the euro on trade flows within the EMU area and with non-EMU countries, the consequences for the reduction of inflation and convergence in the eurozone. See for example, Maćkowiak et al. (2009) for a review of different studies.

²¹ According to Bulir and Hurník (2006), the Maastricht inflation condition “biased the choice of the disinflation strategy toward fiat measures in countries that have a lot to gain from the euro. These countries tend to opt for “low inflation now, reforms later,” which yields low inflation instantly at the cost of postponing structural reforms and preserving comparatively high sacrifice ratios”.

²² Several papers for the EU have shown the relationship between product market competition and inflation rates (Neiss, 2001; Cavelaars, 2003; Przybyła & Roma, 2005; Correa-Lopez et al., 2014).

²³ The weight of the communication in the HICP was around 4% in this period 1996–2018, The weight reached an all-time high of 4,8% in 2004 and a record low of 2,0% in 1996. Notice that although the direct regulation of the prices in this period could help to reduce the inflation, it was possibly not enough to produce a large effect in the HICP. Historical information on the weight of communication services in the HICP can be found here: https://www.ecb.europa.eu/stats/ecb_statistics/escb/html/table.en.html?id=JDF_ICP_COICOP_INW.



Note: This figure shows the evolution of the inflation in the euro area in the period 1996–2009. In the years before the creation of the euro inflation decreased importantly, and averaged little more than 1% in 1999. By 2000, the ECB took over its mandate and inflation raised. Average inflation amounted to 2.2% on an annual basis during the period from January 1999 to September 2008. During the period of the Great Recession in 2009–10, inflation fell sharply but quickly rebounded afterwards. Inflation was persistently low after 2012 despite the progressive economic recovery (Ciccarelli, and Osbat, 2017).
Source: HICP — inflation rate, annual average rate of change Eurostat.

Fig. 1. Harmonized index of consumer prices in the Eurozone (1996–2009).

4. Data

Our empirical analysis uses as outcome variables the telecommunications tariffs and the investments in telecommunications infrastructure in the countries that have participated in the euro. Information about the tariffs was obtained from the consultancy agency Teligen, which during the period examined provided tariff information to the European Commission.²⁴ Our data set covers the period 1995–2009 and focuses on the EU-15 Member States that were considered for the assessment of the Maastricht inflation criteria. The use of Teligen tariffs entails two important advantages. First, the data provides information about the tariffs of the incumbent telecommunication operators, which are the only ones that had tariffs regulated in this period. Second, the data includes information on the prices of different types of calls, which allowed us to study tariff rebalancing in the countries participating in the euro. Specifically, we consider the monthly line rental (*PLR*), the prices of local calls of around 3 km (*PLC*), the prices of provincial calls of around 50 km (*PPC*), and the prices of national calls of around 200 km (*PNC*). To make homogeneous comparisons, all tariffs refer to a 10-min call on a Wednesday at 11 a.m., have been converted to US\$ and include VAT.²⁵

Information on the countries' Public Telecommunication Investment (*PIT*), excluding spectrum fees, was collected from the OECD Communications Outlook.²⁶ In the late 1990s and the early 2000s telecommunication operators invested large amounts of resources in long-distance networks. This was a period of rapid expansion in demand and operators had to upgrade their networks due to technological developments and the liberalization of the market. Operators' investments decreased substantially after the dotcom crisis in 2002. At the end of the 2000s investments were more related to local access networks, including wireless networks (3G and the first 4G), upgraded copper networks (e.g. DSL), cable television networks, and fiber networks (FTTH).

To calculate countries' misalignment with respect to the Maastricht inflation criteria defined in Eq. (1), we used the Harmonized Index of Consumer Prices (HICP). The HICP is a harmonized consumer price index that is calculated by national statistics institutes, and is published by Eurostat. Following the Maastricht Treaty, the HICP was used to make comparisons between consumer price inflation in the EU and in the euro area, and to analyze the countries' satisfaction of convergence and stability conditions for entry into the euro.²⁷ After the creation of the euro, the HICP was used to examine the price stability of potential new members of the EMU.

Our analysis also uses a group of control variables reflecting the country's economic characteristics and the regulation of the

²⁴ A summary of this information can be obtained from *Report Telecoms Price Development, from 1998 to 2010*. European Commission, Directorate General for Information Society. Teligen Strategy Analytics.

²⁵ Some of the papers reviewed in the introduction considered baskets of services to calculate the average expenditure of consumers with low, moderate and high expenditure on telecommunications services. This information is not useful for analyzing tariff rebalancing. Cherry and Bauer (2002) used data from Teligen for the period 1997–2000. We used detailed data from Teligen for the period 1995–2009.

²⁶ <https://www.oecd.org/sti/broadband/oecdcommunicationsoutlook2011.htm>.

²⁷ In 1995, the European Union's Council of Ministers adopted a regulation providing the legal basis for the establishment of a harmonized methodology for compiling consumer price indices in the Member States and European Economic Area countries (Regulation (EC) No 2494/1995).

telecommunications market. Specifically, we used the OECD indicators “Public Ownership” and “Market Structure”.²⁸ The variable *Public Ownership* shows the percentage of shares owned, either directly or indirectly, by the government in the largest operator in the sector, for fixed-line and mobile services. The variable takes values between 0 and 6, with 6 indicating that a firm is completely state-owned. The variable *Market Structure* reflects how many firms compete in the same market in the sector (fixed-line network; fixed-line services; and mobile services), and also reflects the entrants’ market share (domestic fixed-line telephony and international fixed-line telephony). This indicator takes values between 0 and 6, with 0 being the case in which the entrants in the market have the largest share. The model also includes a variable reflecting the number of subscriptions for 100 inhabitants for fixed telephone services (*FTS*), using data from the International Telecommunications Union.²⁹ The variables *Public Ownership*, *Market Structure* and *FTS* are in logs and were included in the model with a lag, two avoid potentially endogeneity problems. Other control variables related to the economic situation of the countries are the *GDP* per capita, the *Population*, and the *Urban Population*, which were obtained from the OECD. These variables are in logs and were included in the model with a lag.

The model also includes a dummy variable considering the existence of a National Regulatory Agency (*NRA*), and a dummy variable accounting for the full liberalization of the market (*Full Liberalization*). Finally, information on specific market regulations (*Number Portability*, *Carrier Pre-Selection* and *Unbundling of the Local Loop*) are obtained from Grzybowski (2008) and the reports of the European Commission on the implementation of the Telecommunications Regulatory Package.

Table 1 shows the summary statistics for all the variables used in the empirical analysis. The left panel shows the information for the period 1996–1999, the central panel for the period 2000–2009, and the right panel shows the differences of the means of the two-samples and the *t-test* for differences of means. Focusing in the telecommunications services, we do not find significant differences in the prices of local calls (PLC) before and after 1999, which is the year in which the ECB took the control of the monetary policy in the euro area. However, we do find a significant increase in the line rental and a reduction in the prices of long-distance national calls (PPC and PNC) between these two periods.

Finally, Fig. 2 plots the outcome variables of the European countries participating in the euro, differentiating between countries satisfying the inflation condition (blue line) and those that did not satisfy it (red line). To correctly interpret these figures, notice that the composition of the countries that satisfied and not satisfied the Maastricht inflation condition changed over time, which explain the discontinuities in the observed trends. The four first panels reflect the tariffs of the incumbent telecommunications operators (*PLR*, *PLC*, *PPC*, *PNC*), demonstrating a clear increase in the cost of line rental and in the prices of local telephone calls, and a strong reduction in the prices of province and national calls. However, in the case of those countries that did not satisfy the inflation condition, the evolution of line rental costs and of the tariffs of local calls in the years before and after the creation of the euro seemed to be driven by a different pattern. The fifth panel shows the country’s investment in telecommunications infrastructures (*PIT*). Here we can also see a different pattern of evolution in the two groups of countries, with a high increase in investments in countries that did not satisfy the inflation condition after 1998, and with a reduction of investments in other countries.

5. Empirical analysis

5.1. Econometric model

To examine how the Maastricht inflation objectives affected tariff rebalancing in the telecommunications market, we estimated the following regression model:

$$\Delta \ln \left(y_{it} \right) = \rho \ln \left(y_{it-1} \right) + X_{it} \beta + \gamma I_{it} + \sum_{t=1996}^{2009} \lambda_t \left(\tilde{I}_{it} \cdot d_t \right) + \mu_i + \delta_t + e_{it} \quad (2)$$

where y_{it} represents the outcome variables (line rental, price of local calls, price of intra-province calls, price of national calls, and public investment in telecommunications) for country i at year t . The model includes country fixed-effects, μ_i , and time fixed-effects, δ_t , that consider 3-year dummies covering the period 1996–2009. In this regard, the first dummy is for the period 1996–1998, which reflects the 3 years before the creation of the euro. The variable \tilde{I}_{it} is an indicator variable defined in Eq. (1) that picks up the differential between the inflation in country i at year t and the inflation target established by the Maastricht Treaty. On the other hand, d_t is the interaction between the inflation differential and the 3-year dummies. The coefficients associated with these interactions λ_t are our main parameters of interest, and measure the impact on the outcome variables that are associated with differentials between a country’s inflation and the Maastricht inflation threshold in a particular period. Note that a negative coefficient for these variables implies that in the time interval t the countries exhibiting a large inflation differential reduced their telecommunications prices, or their investments.

Eq. (2) includes a lag of the outcome variable. This is because the growth rate for the outcome is dependent on the level of the outcome in the previous year. In addition, X_{it} contains two sets of variables that control for differences in countries’ economic characteristics and for the regulations introduced in this period. The variables reflecting the countries’ economic characteristics are:

²⁸ The OECD indicators summarize regulatory provisions in several sectors, such as telecoms, electricity and air passenger transport. The ETCR indicators are described in detail in the OECD Economics Department Working Paper No. 530 “Product market regulation of non-manufacturing sectors in OECD countries: measurement and highlights”. See also <https://www.oecd.org/regreform/reform/44754663.pdf>.

²⁹ See <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>.

Table 1
Summary statistics.

	1996–1999			2000–2008			Test equal means	
	N	Mean	Std. dev.	N	Mean	Std. dev.	diff	t-value
\bar{I}_{it}	72	1.015	3.563	162	0.948	1.733	-0.068	-0.153
Δ Log PLR	44	0.440	3.368	135	0.612	1.359	0.172	0.330
Δ Log PLC	44	0.005	0.086	135	0.000	0.051	-0.005	-0.364
Δ Log PPC	44	-0.145	0.628	135	-0.080	0.278	0.065	0.668
Δ Log PNC	44	-0.417	0.764	135	-0.146	0.375	0.271***	2.267
Δ Log PIT	47	0.092	0.325	155	0.020	0.303	-0.072	-1.354
Log PLR	59	2.808	0.275	135	3.045	0.214	-0.237***	-5.886
Log PLC	59	0.543	0.217	135	0.518	0.154	-0.025	-0.805
Log PPC	59	1.837	1.100	135	0.991	0.469	-0.847***	-5.690
Log PNC	59	2.777	1.730	135	1.098	0.630	-1.680***	-7.252
Log PIT	64	7.197	1.479	157	7.227	1.533	0.031	0.138
FTS (%)	59	52.78	8.876	135	51.34	8.691	1.440	1.046
Public Ownership	72	3.945	2.140	162	2.051	1.837	-1.894***	-6.516
Market Structure	72	3.864	1.431	162	2.031	0.800	-1.833***	-10.186
Log GDP PC	72	9.907	0.382	162	10.251	0.363	0.344***	6.454
Urban Population (%)	72	71.639	12.369	162	72.754	12.366	1.115	0.636
Population (millions)	72	16.078	1.395	162	16.108	1.387	0.029	0.149
Creation NRA	72	0.750	0.436	162	0.994	0.079	0.244***	4.711
Full Liberalization	60	0.533	0.503	135	0.993	0.086	0.459***	7.025
Unbundling	60	0.150	0.360	135	0.948	0.223	0.798***	15.875
Number Portability	60	0.200	0.403	135	0.970	0.170	0.770***	14.241
Carrier Preselection	60	0.150	0.360	135	0.970	0.170	0.820***	16.832

***p < 0.01, **p < 0.05, *p < 0.1.

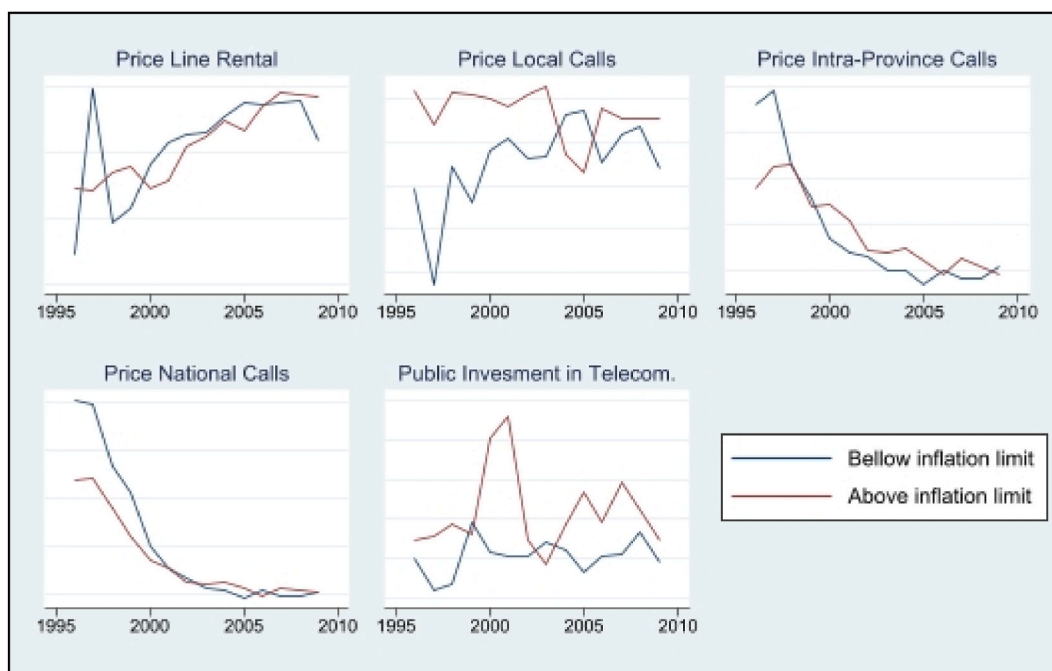


Fig. 2. Average tariffs and investments in the EU countries launching the euro (1996–2009).

the GDP per capita; the country population; and the country urban population. The variables controlling for the market regulations are: public ownership of the incumbent telecommunications operator; market structure; number of fixed-telephone subscriptions; existence of a national regulator; and full liberalization of the market. In addition, we consider three specific market regulations that were important in this period: portability of the telephone number for fixed lines; carrier pre-selection for national calls; and the unbundling of the local loop.

Table 2
 OLS estimates of the effect of inflation misalignments on the incumbent's prices and investments.

	ΔLogPLR		ΔLogPLC		ΔLogPPC		ΔLogPNC		$\Delta \text{Log PIT}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\text{Log}(y)_{it-1}$	-0.272*** (0.0468)	-0.391*** (0.0545)	-0.353*** (0.0491)	-0.411*** (0.0523)	-0.446*** (0.0573)	-0.549*** (0.0663)	-0.256*** (0.0485)	-0.486*** (0.0594)	-0.445*** (0.0539)	-0.493*** (0.0630)
\tilde{I}_{it}	0.00610 (0.00877)	0.00929 (0.00862)	-0.00123 (0.0100)	-0.00156 (0.00972)	-0.0162 (0.0224)	-0.00645 (0.0227)	-0.0327 (0.0206)	-0.0153 (0.0196)	0.0412** (0.0190)	0.0348 (0.0272)
Year dummies (Base: 2008–09)										
d96–98	-0.127*** (0.0275)	-0.00697 (0.0649)	-0.0134 (0.0249)	0.160** (0.0736)	0.343*** (0.0687)	0.447** (0.173)	0.191** (0.0766)	0.312** (0.157)	-0.0778 (0.0637)	0.290 (0.205)
d99–01	-0.0328 (0.0249)	0.0288 (0.0508)	-0.0467* (0.0248)	0.0936 (0.0577)	0.0671 (0.0634)	0.278** (0.138)	-0.0218 (0.0630)	0.242* (0.127)	0.0290 (0.0635)	0.340** (0.160)
d02–04	-0.0112 (0.0223)	0.0174 (0.0381)	-0.0293 (0.0244)	0.0858** (0.0430)	0.0494 (0.0560)	0.215** (0.103)	-0.0198 (0.0516)	0.204** (0.0922)	-0.103* (0.0622)	0.130 (0.120)
d05–07	0.000395 (0.0218)	0.0224 (0.0271)	-0.0406 (0.0247)	0.0204 (0.0305)	0.00687 (0.0552)	0.0829 (0.0717)	-0.0231 (0.0507)	0.0746 (0.0627)	0.0466 (0.0618)	0.180** (0.0853)
Interactions										
d96–98* \tilde{I}_{it}	-0.122*** (0.0152)	-0.114*** (0.0151)	-0.0293* (0.0171)	-0.0375** (0.0169)	0.0195 (0.0374)	-0.00459 (0.0383)	0.0571* (0.0342)	0.0279 (0.0332)	-0.0617** (0.0267)	-0.0749** (0.0368)
d99–01* \tilde{I}_{it}	-0.00141 (0.0153)	-0.0131 (0.0157)	0.00363 (0.0181)	0.00470 (0.0182)	0.0362 (0.0394)	0.0308 (0.0404)	0.0361 (0.0361)	0.0267 (0.0349)	-0.0419 (0.0347)	-0.0875* (0.0485)
d02–04* \tilde{I}_{it}	0.00681 (0.0204)	0.00189 (0.0199)	0.0172 (0.0233)	0.00804 (0.0224)	-0.0473 (0.0524)	-0.0511 (0.0524)	-0.0338 (0.0479)	-0.0414 (0.0452)	-0.0631* (0.0354)	-0.0537 (0.0629)
d05–07* \tilde{I}_{it}	-0.000384 (0.0218)	-0.0271 (0.0222)	0.000566 (0.0247)	-0.00546 (0.0252)	0.0140 (0.0556)	0.0169 (0.0589)	0.0342 (0.0511)	0.0116 (0.0511)	-0.00922 (0.0432)	-0.104 (0.0701)
Constant	0.859*** (0.148)	-3.270 (6.612)	-0.212*** (0.0380)	1.865 (7.580)	-0.114** (0.0436)	-23.20 (17.66)	-0.0406 (0.0394)	-55.29*** (16.05)	3.252*** (0.405)	-21.83 (20.25)
Regulation Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Econ. Market Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	208	208	208	208	208	208	208	208	236	210
R-squared	0.512	0.581	0.269	0.391	0.313	0.379	0.250	0.399	0.303	0.316

***p < 0.01, **p < 0.05, *p < 0.1; standard errors in parentheses.

5.2. OLS results

This section examines the effect of the Maastricht inflation criteria on tariff rebalancing in the telecommunications market. Table 2 presents the results of the OLS estimates of Eq. (2) for the whole set of outcome variables. The first eight columns show the effects of the inflation condition on the prices of telecommunications services (*PLR*, *PLC*, *PPC*, *PNC*) and the last two on the investments (*PIT*). For each outcome variable, the first column presents the results of the model without including the controls for the countries' economic characteristics and the market regulations, and the second column includes them.

The variable $\text{Log}(y)_{it-1}$ represents the outcome variable lagged one period. This variable had a negative sign and was significant in all specifications. The significant coefficient for this variable indicates that the change in the outcome variable is stronger, either positive or negative, as the level of prices in the previous period is higher. The indicator variable \tilde{I}_{it} , is a continuous variable that reflects the differential between inflation in country i at year t and the objective of the inflation condition. Considering that we include interactions of this variable for the triannual dummies from 1996 to 2007, the coefficient for this variable shows the effect of the inflation misalignment during the reference period 2008–09. This variable was positive for the cost of line rental and negative for the prices of the three types of calls. However, the coefficient was not significant for any of the calls. This suggests that in the period 2008–09 the evolution of the inflation did not affect the prices.

The coefficients associated with the dummy time intervals reveal that the prices of the three types of calls increased to a greater extent in the period 1996–1998 than in the reference period 2008–2009. This result is clearer in the regressions reported in columns (4), (6) and (8) that include the control variables. Moreover, in the intervals 1999–2001 and 2002–2004 the increase of the prices was higher than in the reference interval, although the coefficients for these periods were smaller. The results for the line rental were not significant in the regressions that consider all the control variables.

Our parameters of interest, i.e. those associated with the interaction between the 3-year dummies and the indicator of inflation misalignment ($\delta_i \tilde{I}_{it}$), reflect how national governments adjusted the prices of the incumbent operators in the periods in which they did not satisfy the Maastricht inflation condition. Our results show that in the period 1996–1998 (before the launch of the euro), those countries that were further away from satisfying the inflation criteria *reduced* the cost of line rental and prices of local calls more (or increased them by a smaller proportion). We also observe a negative result for provincial calls (PPC) and a positive coefficient for national calls (PNC), but these coefficients were not significant once we account for the control variables. The coefficients for the other time intervals were not significant and could have a negative or positive sign. Hence, these results confirm our hypothesis that before the creation of the euro the countries with the greatest difficulties in satisfying the Maastricht inflation conditions were those that progressed less in the rebalancing of telecommunications prices. As explained in Section 3.1, two examples of this situation are the cases of Spain and Italy, where the newly privatized operators denounced their national governments to the European Commission because they were not undertaking tariff rebalancing, and this was creating an access deficit.

Focusing now on the effect of the Maastricht inflation conditions on the investments in the telecommunications market, we find that the interaction of the time intervals and the inflation indicator ($\tilde{I}_{it} \delta_I$) had a negative and significant coefficient for the period 1996–1998 and 1999–01, and a negative and non-significant coefficient for the other periods. This implies that in the years before and immediately after the liberalization the countries with greater inflation misalignment invested *less* in the maintenance and expansion of their network. This result suggests that the lack of complete tariff rebalancing during these years could reduce the resources available for incumbent telecommunications to expand their networks.³⁰

Next, we discuss the results for the control variables included in the model, although for the sake of brevity we do not report the estimated coefficients associated to these variables in Table 2. The variable for public ownership was not statistically significant in any of the price equations estimated. The variable for market structure shows that the more concentrated the market the higher were the prices for national calls. This implies that in those countries in which incumbents faced less competition prices were higher. We also obtain that full liberalization of the market was associated to higher prices for local calls and to lower prices for national calls. This is an interesting result that shows that the process of tariff rebalancing continued after the liberalization.

The analysis of the penetration of fixed telephony (fixed-telephone subscriptions per 100 inhabitants) reveals that it had an important impact on prices. Countries with a larger increase in the penetration level in the previous year set a higher line rental and charged lower prices for telephone calls. Thus, a 1% higher penetration implied a 0.25% increase in the cost of line rental, a 0.18% decrease in the tariffs for local calls and a 0.6% and 0.7% decrease in the prices of province and national telephone calls, respectively. Finally, we found that those countries with a larger increase in the GDP per capita in the previous year set a higher line rental and a higher tariff for local calls. Moreover, they invested more in the maintenance and expansion of the telecommunications network.

We complete our analysis by examining whether the countries that did not rebalance tariffs for telecommunications services before 1998, due to the more urgent need to meet the Maastricht inflation criteria, did so in subsequent years. Our hypothesis is that telecommunications authorities and operators in these countries could have been able to negotiate with national governments a subsequent adjustment of prices. In Table 3, we replicate the analysis of Table 2, but instead of using the inflation misalignment indicator of Eq. (1), we consider the dummy variable $\tilde{D}_{i,96}$, which takes the value 1 for countries that did not meet the inflation condition in 1996.

³⁰ We have repeated this analysis using as outcome variables the countries' public investment in road and railroad, using data from the OECD (<https://data.oecd.org/transport/infrastructure-investment.htm#indicator-chart>). In this case, we do not find a significant effect for the interaction between the inflation differential and the 3-year dummies, which suggest that the adjustment in the level of investments did not occur in other markets.

Table 3
 OLS estimates of the effects of inflation misalignments in 1996 on the incumbent's prices and investments.

	ΔLogPLR		ΔLogPLC		ΔLogPPC		ΔLogPNC		$\Delta \text{Log PIT}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\text{Log}(y)_{it-1}$	-0.458*** (0.0515)	-0.570*** (0.0566)	-0.356*** (0.0477)	-0.418*** (0.0487)	-0.465*** (0.0566)	-0.561*** (0.0664)	-0.270*** (0.0487)	-0.491*** (0.0582)	-0.452*** (0.0546)	-0.501*** (0.0639)
Year dummies (Base: 2008–09)										
d96–98	-0.0989*** (0.0331)	0.0537 (0.0714)	0.0218 (0.0273)	0.204*** (0.0712)	0.318*** (0.0707)	0.442*** (0.167)	0.165** (0.0778)	0.307** (0.151)	-0.0498 (0.0758)	0.258 (0.203)
d99–01	-0.0584* (0.0296)	0.0128 (0.0567)	-0.0436 (0.0273)	0.108* (0.0566)	0.0109 (0.0662)	0.239* (0.135)	-0.0538 (0.0643)	0.235* (0.123)	0.0148 (0.0742)	0.267* (0.161)
d02–04	-0.0267 (0.0283)	0.00676 (0.0441)	-0.0450 (0.0273)	0.0777* (0.0438)	0.0352 (0.0621)	0.208** (0.105)	-0.00566 (0.0573)	0.232** (0.0931)	-0.103 (0.0755)	0.103 (0.126)
d05–07	0.00399 (0.0278)	0.0237 (0.0316)	-0.0374 (0.0274)	0.0224 (0.0313)	-0.0268 (0.0612)	0.0551 (0.0740)	-0.0345 (0.0565)	0.0745 (0.0645)	0.0599 (0.0739)	0.173* (0.0901)
Interactions										
d96–98* \tilde{I}_{it}	-0.243*** (0.0561)	-0.212*** (0.0550)	-0.105* (0.0552)	-0.138** (0.0550)	0.129 (0.124)	0.0870 (0.128)	0.108 (0.114)	0.00675 (0.110)	-0.118 (0.127)	-0.174 (0.150)
d99–01* \tilde{I}_{it}	-0.0819 (0.0554)	-0.0680 (0.0550)	-0.00906 (0.0543)	-0.0401 (0.0550)	0.267** (0.119)	0.189 (0.126)	0.137 (0.111)	0.0435 (0.109)	0.0300 (0.124)	-0.0225 (0.154)
d02–04* \tilde{I}_{it}	-0.0219 (0.0539)	-0.00475 (0.0516)	0.0719 (0.0528)	0.0419 (0.0510)	-0.00281 (0.119)	-0.0384 (0.120)	-0.128 (0.110)	-0.161 (0.103)	-0.0453 (0.122)	-0.0206 (0.147)
d05–07* \tilde{I}_{it}	-0.0336 (0.0536)	-0.0296 (0.0504)	-0.0138 (0.0530)	-0.0125 (0.0502)	0.111 (0.119)	0.102 (0.117)	0.0168 (0.109)	-0.0152 (0.101)	-0.00573 (0.118)	-0.0789 (0.143)
Constant	1.439*** (0.163)	-6.088 (7.169)	-0.214*** (0.0369)	3.002 (6.998)	-0.113*** (0.0427)	-22.76 (16.77)	-0.0355 (0.0388)	-57.41*** (15.15)	3.308*** (0.410)	-18.45 (19.64)
Regulation Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Econ. Market Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	208	208	208	208	208	208	208	208	236	210
R-squared	0.362	0.474	0.294	0.408	0.330	0.387	0.259	0.407	0.284	0.302

***p < 0.01, **p < 0.05, *p < 0.1; standard errors in parentheses.

The results for the interaction of the time interval 1996–98 and this dummy variable ($d96-98 * \tilde{D}_{i,96}$) confirm our previous finding that countries that did not satisfy the inflation condition in this period did not rebalance their tariffs. In addition, we find that the coefficient of the interactions for the other periods are not significant, which indicates that these countries did not intensify efforts to rebalance their prices in subsequent years.

The results presented in Table 3 are also important to validate the robustness of our conclusions. As we will discuss in the next subsection, the OLS estimates reported in Table 2 might be potentially affected by an endogeneity problem. However, this problem does not affect the results in Table 3, since the set of countries that do meet the Maastricht requirements are fixed in 1996 and held constant during all our sample period. All in all, our results show that in the period 1996–98 those countries that did not meet the inflation condition of the Maastricht Treaty did not rebalance their telecommunications tariffs according to the European Commission liberalization directive. This situation also affected investment by incumbent telecommunications operators in the years before the opening of national markets. We consider that this result is an illustration of the conflicting interests that could had the different actors participating in the regulatory process in this period. Before the creation of the euro, the regulation of the telecommunications prices was used by some countries to satisfy the Maastricht inflation condition and to reach the priority objective of participating in the euro. This policy was against the European Commission competition directive and could had relevant consequences for the development of the market.

5.3. IV results

A potential shortcoming of our analysis that might obscure identification and bias our OLS estimates is the existence of bidirectional causality. Notice that if governments' strategies to reduce inflation were effective, they will be less needed to reduce inflation in the next period, which in turn will imply that they will be less interested in reducing the telecommunications prices. This bidirectional causality might cause an endogeneity problem that could bias the estimation of our parameter of interest, that is, the interaction between the inflation differential and the dummy variable for the period 1996–1998. We consider that this potential endogeneity problem should not be severe in our case, as the weight of telecommunications prices on the HICP was relatively small in this period (less than 3%). Therefore, while price regulation could help reduce inflation, it is not clear whether telecommunications services were important enough to produce a large effect on the HICP and modify the governments' policy. In addition, notice that before 2000 the Maastricht inflation condition was calculated considering the inflation of the three Member States with the lower inflation. Hence, the success of each country was determined by the performance of the other countries.

In order to test whether this endogeneity problem is present in our estimates, we carry out a robustness check consisting in estimating Eq. (2) using instrumental variables (IV). The IV estimation method will provide unbiased estimations of our parameter of interest. When endogeneity is present, finding suitable instruments that are truly exogenous is not an easy task. These instruments must be partially correlated with the variable of interest, but uncorrelated with the error term in the outcome equation. In analyses based on panel data, one common solution consists of using lags of the endogenous variable of interest as instruments. Generally, the correlation between contemporaneous values of the variable of interest and its lags tend to be significant, but these lags do not necessarily have to be correlated with the contemporaneous error term of the outcome equation. Since including all the interactions terms used in Table 2 will imply considering simultaneously four potential endogenous variables, which can be troublesome, we just focus on our period of interest, that is, the pre-euro period, 1996–1998. Hence, in the IV model we compare the pre-euro period to all the post-euro years.

Notice that with the use of only one instrument and one endogenous variable, the IV equation will be exactly identified and testing for the exogeneity of the instrument will not be possible (Wooldridge, 2002). Thus, we use two instrument to test for the exogeneity of the instruments. Specifically, we use as instruments the fifth and sixth lag of the interaction between the inflation differential and the year dummies.³¹

Results for the IV estimates of Eq. (2) are shown in Table 4. In this table, we also report the statistical tests for the exogeneity of the variable of interest (Hausman, 1978), as well as for the validity of the instruments. Exogeneity tests (column 1) reveal that the endogeneity problem is only present for line rental prices (PLR) and the price of local calls (PLC). For these two variables, the value of the test-statistic has turned out to be statistically significant at 5 percent level, and we find that the OLS estimates are slightly biased downwards respect to the IV estimates. On the contrary, the test-statistic for the endogeneity test is only significant at 10 percent level for provincial call prices (PPC), and non-significant for the price of national calls. (PNC). To some extent, these results could be explained by the fact that PLC and PLR are the only variables for which the inflation differential exhibits a significant effect.

The remaining statistical tests reveal that our IV instruments are good instruments. The under-identification test (column 2) indicates that the instrument is strongly correlated with our endogenous variable of interest, while the weak identification test (column 4) proves that the instrument is not weak. Finally, and more importantly, the Sargan (column 3) test confirms the exogeneity of the instruments. All these results taken together confirm that the main findings reported in Table 2 hold after controlling for endogeneity.

5.4. Robustness check

An additional identification problem that could invalidate our findings is the existence of a positive correlation between the prices

³¹ Our data regarding inflation starts in 1990, therefore the fifth and sixth are the most distant lags respect to 1996, which is the year when we start having full information for most of the variables. Recall that our estimates are based on annual data covering the period 1996–2009.

Table 4

IV estimates of the effects of inflation misalignments on the incumbent's prices and investments.

		Eq. (2)		(1)	(2)	(3)	(4)	
		Coef.	s.e.	χ^2	χ^2	χ^2	(4a)	(4b)
Δ LogPLR	OLS	-0.116***	0.0146					
	IV	-0.1280***	0.0153	5.617**	116.18***	0.002	137.91	19.93
Δ LogPLC	OLS	-0.0353**	0.0172					
	IV	-0.0470***	0.0165	4.494**	119.20***	0.349	147.38	19.93
Δ LogPPC	OLS	0.0091	0.0376					
	IV	0.0327	0.0365	2.865*	124.63***	0.065	166.48	19.93
Δ LogPNC	OLS	0.0575*	0.0338					
	IV	0.1671	0.1070	2.233	33.84***	0.155	19.21	19.93

Notes: ***p < 0.01, **p < 0.05, *p < 0.1.

(1) Endogeneity test (Hausman, 1978).

(2) Underidentification test (Anderson canon. corr. LM statistic).

(3) Sargan statistic (overidentification test of all instruments). Exogeneity of the instruments.

(4) Weak identification test.

(4a) Cragg-Donald Wald F statistic.

(4b) Stock-Yogo weak ID test critical values (10%).

of the services and our measure of the inflation. In order to check for this possibility, in this sub-section we carry out a robustness check that consists in re-estimating Eq. (2) considering as outcome variables the relative prices of the services. Specifically, we examine the relative prices for line rental (PLR), local calls (PLC), and provincial calls (PPC), taking as a reference the prices of national calls (PNC). The results of this analysis are reported in Table 5. We find that the interaction between the dummy variable for the period 1996–1998 and the inflation differential ($d96-98 * \tilde{I}_{it}$) were negative and statistically significant for the relative price of the rental line and the local calls. This implies that the inflation misalignments of these countries reduced tariff rebalancing, which confirms our previous findings.

6. Conclusions

This paper has shown that in the years immediately before the liberalization of the European telecommunications market, those countries that faced greater difficulty in reaching the inflation objectives set out in the Maastricht Treaty did not rebalance their tariffs according to the liberalization Directives. Although the European authorities supervised the reform of the market and enacted several measures to enforce price rebalancing, the greater need to meet the Maastricht Treaty's inflation objectives led these countries to reduce, rather than increase, the cost of line rental and the prices of local calls. Our research has also shown that those countries that did not rebalance their prices exhibited a reduction in their investments in telecommunications in these years.

Our papers contributes to the literature examining the interplay of the diverse actors participating in the regulatory process and provides empirical support to the idea that the existence of conflicting objectives among economic authorities can lead to inefficient policies. One aspect often neglected in the traditional private interest view of regulation is that policy-making bodies might have conflicting interests, and governments and politicians focus on the objectives that they consider as socially more relevant and that give them more political support (Duso & Seldeslachts, 2010). The use of regulated tariffs in the years before the creation of the euro is a good example of the existence of these conflicting interests. At the end of the nineties, the urgency to reduce the inflation and satisfy the Maastricht inflation criteria led the governments of some countries to block tariff rebalancing in the telecommunications in order to avoid raise of the cost of the rental fee and the prices of local calls. These measures were against the EU objective of adjusting the prices of regulated services to their costs before the liberalization, and faced the opposition of national incumbent operators and of those that promoted infrastructure competition. In spite of this, this strategy could have been useful to satisfy the "superior objective" of reducing the inflation and participating in the euro.

An aspect not addressed in the paper is the increasing relevance that regulatory agencies had for shaping the telecommunications policy after liberalization. Some years after the liberalization of 1998, most European governments delegated the regulation of the market to semi-autonomous agencies in order to improve the governance of the market and to establish a credible commitment to long-term policy goals (Bach et al., 2015). This situation led to the fragmentation of the administrative system and to changes in governance that have required additional supervision, accountability, and policy coordination. The Europeanization process strengthened the position of national regulators and made the implementation of sectorial policies less dependent on the government's priority objectives.³² From an academic perspective, this trend has been challenged by the post New Public Management doctrine, which argues that the agencification process of the public sector makes it more difficult for national governments to design and implement policies in a coherent and coordinated manner (Verhoest et al., 2012).

Another aspect not considered in this research is the possible differences in the national telecommunications operators in the years

³² For an analysis about the empowerment of National Regulatory Agencies in the EU see Levi-Faur (2004) and Gilardi (2005). For a discussion of the positive effect that national regulatory agencies for the telecommunications had on the development of the European Regulatory networks see Mathieu (2016).

Table 5
OLS estimates of the effect of inflation misalignments on the incumbent's relative prices.

	$\Delta \text{LogPLR/PNC (1)}$	$\Delta \text{LogPLC/PNC (2)}$	$\Delta \text{LogPPC/PNC (3)}$
$\text{Log}(y)_{it-1}$	-0.521*** (0.0630)	-0.449*** (0.0559)	-0.668*** (0.0658)
\tilde{I}_{it}	0.0248 (0.0215)	0.0147 (0.0203)	0.00547 (0.0182)
Year dummies (Base: 2008–09)			
d96–98	-0.348** (0.172)	-0.112 (0.158)	0.0221 (0.141)
d99–01	-0.251* (0.140)	-0.108 (0.126)	-0.0650 (0.110)
d02–04	-0.208** (0.102)	-0.0947 (0.0929)	-0.0414 (0.0813)
d05–07	-0.0590 (0.0688)	-0.0457 (0.0643)	-0.0135 (0.0576)
Interactions			
d96–98* \tilde{I}_{it}	-0.131*** (0.0372)	-0.0700** (0.0341)	-0.0249 (0.0310)
d99–01* \tilde{I}_{it}	-0.0461 (0.0383)	-0.0278 (0.0360)	0.00781 (0.0326)
d02–04* \tilde{I}_{it}	0.0424 (0.0496)	0.0466 (0.0465)	-0.00666 (0.0421)
d05–07* \tilde{I}_{it}	-0.0346 (0.0561)	-0.0209 (0.0530)	0.0178 (0.0472)
Constant	52.22*** (16.90)	54.49*** (17.38)	43.35*** (13.81)
Economic and Market Controls	Yes	Yes	Yes
Observations	208	208	208
R-squared	0.479	0.418	0.465

***p < 0.01, **p < 0.05, *p < 0.1; standard errors in parentheses.

before liberalization. One could argue that if those countries with higher misalignments regarding the Maastricht inflation condition were also those that could benefit more from cost reductions and efficiency gains, then those countries could have reduced all their tariffs and at the same time rebalanced their tariffs. This is a hypothesis that we cannot test with the available information. However, the legal disputes that took place between the incumbent operators in France, Italy and Spain and their national governments about tariff regulation and the accumulated access deficits lead us to conclude that these potential efficiency gains were not enough to compensate for the absence of tariff rebalancing.

Data availability

Data will be made available on request.

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