# Liberalizing telecommunications in Europe: path dependency and institutional complementarities

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# Liberalizing Telecommunications in Europe:
## Path Dependency and Institutional Complementarities

Filippo Belloc  Antonio Nicita  Pier Luigi Parcu

**ABSTRACT**

We empirically investigate the nature and outcomes of the liberalization process in European telecommunications. First, we show that decisions to liberalize a country´s telecommunications sector have followed a path dependent and cumulative pace. Moreover, we investigate the extent to which path-dependency might have forced liberalizations, regardless of the creation of complementary institutions governing pro-market outcomes. We find that the impact of liberalizations on competition is strongly enhanced by the establishment of complementary institutions, such as the national regulatory authority. Our findings contribute to the existing literature by outlining the role played by path dependency and institutional complementarities in the process of European liberalization. Our conclusions may provide useful lessons for the optimal policy design of pro-market policies in those European network industries that still wait for substantial liberalization.

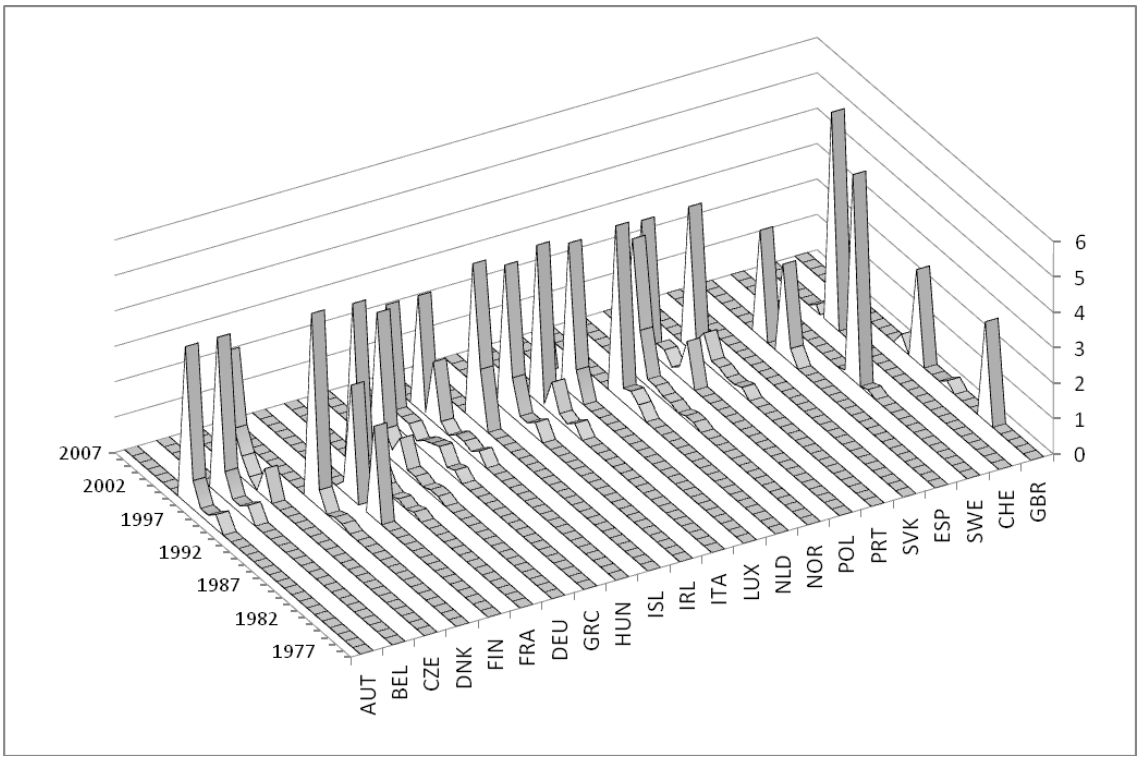
**KEYWORDS**: competition, liberalization, path dependency, telecommunications.

## 1. INTRODUCTION

The evolution of the European telecommunications liberalization – i.e. the progressive removal of entry barriers to market – attracts significant attention from public policy scholars. The liberalization of the telecommunications industry is commonly considered among the most ambitious reforms implemented by the European Commission (EC). It is not surprising, therefore, that in the last three decades the telecommunications liberalization has been steadily at the heart of national and international debates about industrial policy. As Figure 1 shows, all the European countries experienced a remarkable liberalization wave in the telecommunications sector, progressively increasing their liberalization effort in the 1990s and then rapidly reducing the intensity of intervention after 2000. This radical move towards the full removal of the existing entry barriers in telecommunications market was aimed at establishing a single and unified market in Europe, with the final objective of protecting consumer interests, on the one hand, and of promoting economic growth, on the other.

The progress towards a truly competitive open market, however, was patchy (European Commission 2000), and the empowerment of a single European market incomplete, as a faster and easier entrance of enterprises (and, consequently, the ex-post degree of competition in the liberalized markets) did not follow successfully the same intensity of the liberalization process. Among others, Schneider (2002), for example, asserts that the progressive elimination of market barriers did not automatically implied the emergence of a homogeneous high level of competition in Europe.

*Figure 1.* The liberalization wave in European telecommunications, 1975-2007 period.

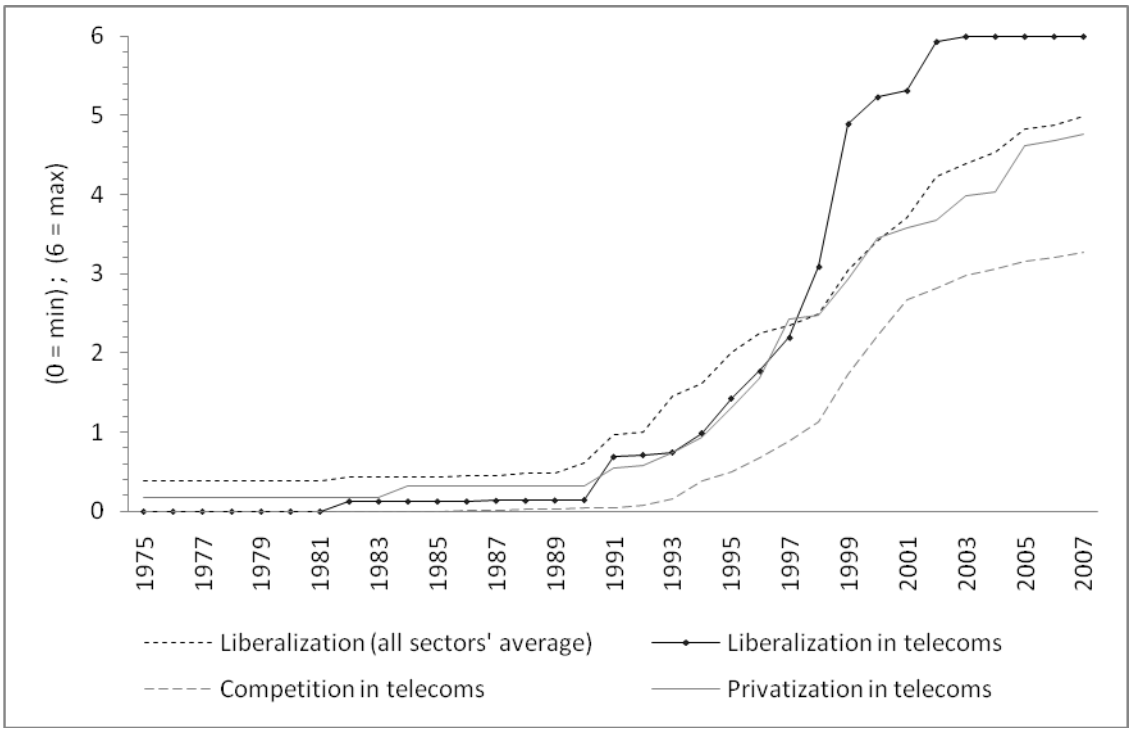



Note: liberalization initiatives' intensity (Y axis) is calculated as one-year variations of a liberalization index elaborated from OECD's (2009) data. Specifically, the liberalization index is obtained by subtracting the OECD's (2009) indicator of entry barriers to the telecommunications market from its maximum value (the liberalization index thus ranges from 0 – minimum liberalization – to 6 – maximum liberalization –). Source: authors' elaboration of OECD's (2009) data.

This gap between reformers' declared intentions and market outcomes emerges distinctly in Figure 2. As it can be noticed, the process of liberalization was much more intense in the telecommunications than in the other network industries (in particular, in Figure 2, passenger air transport, electricity, gas, post, and rail are considered besides the telecommunications sector). Nevertheless, the degree of telecommunications competition – here measured through the share of new entrants – tends to be abridged and grows slowly. Thus, notwithstanding the great effort exerted both by single countries and the European Commission in promoting a homogeneous competitive market for telecommunications, the picture revealed by the data seems to

suggest a different story. Behind the observed patterns, there might be more complex dynamics at work than those expected by policy-makers and regulators when they started the liberalization process.

*Figure 2.* The evolution of the European telecommunications' market (22 EU countries average), 1975-2007 period.




Note: liberalization is measured by subtracting the OECD's (2009) indicator of entry barriers from its maximum value (the liberalization index thus ranges from 0 – minimum liberalization – to 6 – maximum liberalization –). Privatization is measured by subtracting the OECD's (2009) indicator of public ownership from its maximum value (the privatization index thus ranges from 0 – minimum privatization – to 6 – maximum privatization –). Competition is measured as a weighted average of the market share of new entrants in the trunk telephony market, in the international telephony market, and in the mobile market, and it is obtained by subtracting the OECD's (2009) indicator of incumbent's share from its maximum value (the competition index we use thus ranges from 0 – minimum entrants' share – to 6 – maximum entrants' share –). The all sectors' average comprises six network industries: passenger air transport, telecommunications, electricity, gas, post, and rail. Source: authors' elaboration of OECD's (2009) data.

Sancho (2002) affirms that the outcome of policy and regulation making in telecommunications has been strongly influenced by national factors and institutional traits, so that the way in which liberalization worked in reality depends on the institutional context in which the reform is adopted. Tsatsou (2011), more explicitly, argues that the outcome of liberalization policies depends on the historical conditions of the process, and proposes that 'path dependency' might be a substantive feature of

European telecommunications liberalization. The concept of path dependency was introduced by David (1985) to indicate the phenomenon according to which an initial shock alters the course of the subsequent actions, making the process virtually impossible to reverse or to shift to an alternative path, once started. Specifically, in policy making, path dependency can be defined as the persistence of a certain initial form of institutional governance, as each successive step in the policy adoption increases the likelihood that the original policy choice will be repeated over-time (Bennett and Elman, 2006). The direct consequence of path dependency in a policy process is that the specific pattern of timing and the sequence through which the process is deployed may alter the capacity of policy-makers to design and to implement optimal solutions (Pierson, 2000).

In this paper, we investigate the relevance of path dependency phenomena in the liberalization process of European telecommunications, under two main facets. First, we study whether path dependency in telecommunications liberalization might have determined an irreversible process of entry barriers removal, locking-in policy choices to a delimited path along a direction of progressive liberalization. Second, we analyze whether the snowball progress of liberalization measures could have forced the adoption of the policies regardless of the creation of complementary institutions. In particular, we are interested in understanding whether the removal of entry barriers to market before the establishment of a regulatory authority might have reduced, in some countries, the positive impact of liberalizations on the telecommunications market structure.

We develop a systematic econometric analysis of these issues, using data on telecommunications reforms and national regulatory authorities, over the 1975-2007 period, covering 22 European countries. We employ the sector-relative methodology recently proposed by Rajan and Zingales (1998) in order to overcome the omitted variable bias, commonly present in empirical studies of regulatory reforms in

telecommunications (Bartle, 2002). Our econometric model provides then a rigorous estimation of the magnitude of the inter-temporal relationship that links the relative intensity of telecommunications liberalization actions to sectoral reforms adopted in the past. Furthermore, we estimate the impact of liberalizations on the telecommunications market structure, in the presence of institutional complementarities. We find empirically that the mere adoption of liberalizations alone is not sufficient to fully manifest the expected benefits of substantially liberalized markets, when independent regulatory authorities are not yet established. Thus, we conclude that institutional complementarities positively affect the success of the liberalization process. As path-dependent phenomena revealed to play a relevant role in the process of liberalization, it is crucial that policy makers explicitly take institutional complementarities into account, from the very beginning of the adoption of pro-market reforms.

The evolution of the telecommunications regulatory framework and market entry regulation has benefited from a large body of research encompassing economic, legal and political science studies (see, for example, Jordana (2002) for a thorough discussion on these aspects). However, despite such an extensive attention devoted by scholars, a quantitative analysis of how and to which extent the (partial) success of telecommunications liberalizations was affected by path dependency and by the resulting staggered institutional complementarities – between liberalization reforms and the empowerment of regulatory authorities – is still missing. This paper is aimed to fill this gap. Our econometric analysis constitutes – to the best of our knowledge – the first attempt to measure the non-ergodicity (i.e. dependence on the initial conditions) of the liberalization process in European telecommunications. In this respect, our study confirms empirically the existence of institutional constraints to the evolution of market liberalization, corroborating both legal and political science studies on the telecommunications industry (e.g., Sun and Pelkmans, 1995; Bartle,

2002; Schneider, 2002; Thatcher, 2002; Bauer, 2002, 2010; Van Cuilenburg and McQuail, 2003; Levi-Faur, 2003, 2006; Tsatsou, 2011) and, more generally, economic studies on pro-market policy sequencing (e.g., De Fraja, 1991, 1994; Newbery, 1991, 2004; Stiglitz, 1999; Wallsten, 2001, 2002, 2003; Li and Xu, 2004). Moreover, our results, by unveiling the limited efficacy on competition improvements of liberalization reforms in the absence of a national regulatory authority, provide useful insights into the restructuring of other sectors of the economy that still wait for substantial liberalization.

The remaining of the paper proceeds as follows. In Section 2 we discuss how the evolution of European telecommunications liberalization can be interpreted as a path dependent process, and unveil econometrically the non-ergodic structure of the reforms sequence. In Section 3 we propose a statistical model for estimating the joint effect of telecommunications liberalization and regulatory authorities on the market structure, and show the impact of institutional complementarities on the observed competition levels. Section 4 concludes.

## 2. THE PATH DEPENDENT NATURE OF TELECOMMUNICATIONS LIBERALIZATION

### 2.1. DEFINING PATH DEPENDENCY IN EUROPEAN TELECOMMUNICATIONS LIBERALIZATION

In its broader definition, path dependency refers to the causal relevance of preceding stages in a temporal sequence (Pierson, 2000). The literature on path dependency identifies four properties that can make a process path dependent (David, 1985; Arthur, 1989, 1994; Liebowitz and Margolis, 1995): high fixed costs in the process start-up (when setup costs are high, economic actors have an incentive in identifying and dealing with a single option), learning effects (when to proceed along a determined

process increases the actors' knowledge of that process, then to continue on the same path leads to higher returns), coordination effects (when a certain action entails positive network externalities, economic actors are encouraged to adopt the same option over time), and adaptive expectations (when expectations have a self-fulfilling nature, individuals or organizations tend to reinforce they beliefs on the option they have chosen). These elements generate locking-in, self-reinforcement, and increasing returns, i.e. path dependency. In his notable 1990's book, North has affirmed that the analysis of path dependency – conceived to explain the dynamics of technological development – can be applied to institutions as well. Pierson (2000), more recently, has linked the concept of path dependence to the study of politics and public policies. Here, we argue that all the four elements defining a path dependent process can be detected in the European telecommunications liberalization.

*(i) Fixed costs.* High fixed costs in the start-up of the telecommunications liberalization process are of a political nature, and can be reconducted to the strong opposition to liberalizations led by trade unions representing PTO employees. In some European countries, workers' representatives feared that liberalizations could generate short-term negative adjustments and unemployment in the PTO's work-force, as a consequence of the restructuring of the former legal monopoly (see, for instance, Witte (1989) and Prévot (1989)).

*(ii) Learning.* An increasing accumulation of knowledge by policy-makers has characterized the deployment of telecommunications liberalization since its beginning, as both industrial economists and regulators, after the launch of the liberalization programs, progressively enhanced their understanding of the existing inefficiencies in the sector, of the directions of technological developments, and of the regulatory solutions potentially welfare improving. Thus, policy-makers quickly became highly specialized in the industry regulation (Davies, 1994; Brock, 1994; Hulsink, 1999).

*(iii) Coordination effects.* In the 1990s business actors tended to expand and reorganize their economic activities, adapting their productive structure to the increased supply of telecommunications services made possible by the market liberalization. Thatcher (2002) reports that a growing pressure for liberalization was motivated by the difficulties that PTOs experienced, between the 1980s and 1990s, in expanding the supply sufficiently rapidly for coping with an increasing demand. In the last few years, public institutions and administrations as well took advantage of high-quality telecommunications services made available by liberalization, as the early experiences of e-government, e-health and e-education became widespread instruments for interacting with citizens (Jaeger and Thompson, 2003).

*(iv) Adaptive expectation.* A key feature of the telecommunications liberalization process refers to the adaptive expectations that have sustained policy-makers efforts. European policy attitudes were strongly influenced by the policy strategies adopted in the USA, and this contributed to the generation of a neo-liberal approach to electronic communications regulation, also limiting the emergence and the elaboration of possible alternative policy models for governing the evolution of the telecommunications market in Europe (Bauer, 2002). After the liberalization process was launched, the common view was that to maintain restrictions to competition would have resulted in a disadvantage for the relatively less liberalized countries.

### 2.2. THE EMPIRICAL EVIDENCE OF PATH DEPENDENCY

From an empirical point of view, the direct evidence of path dependency is a statistically significant causal effect linking past and current liberalization initiatives. We thus perform an econometric analysis using panel regression techniques, in order to estimate the magnitude and the statistical relevance of the coefficient expressing the inter-temporal relationship between the policy interventions. To this purpose, we use data over the 1975-2007 period and covering 22 countries.[1] Notice that our sample

period includes the entire liberalization wave observed in European countries in the last three decades until 2007.

For the construction of the econometric model we calculate a set of variables using the indicator of entry barriers to market provided by OECD (2009), that is based on the *OECD Regulatory Indicators Questionnaire*, and that collects information on the ranking of explicit policy settings at an industry level (see Conway and Nicoletti (2006)). Specifically, the OECD's (2009) entry barriers indicator measures for each country and sector the strictness of the legal conditions of entry, which can be considered as a proxy for sectoral liberalization. To estimate the relationship between liberalizations and privatizations, we also use the OECD's (2009) indicator of public ownership, which expresses the extent of public ownership in the companies operating in each sector. Elaborating on these two original indicators (the entry barriers and public ownership indicators), we obtain – as described in Table 1 – the following set of variables: an index of liberalization level (*LIB_LEVEL*) and privatization level (*PRIV_LEVEL*), calculated by subtracting respectively the entry barriers indicator (*ENTRY_BARR*) and the public ownership indicator (*PUBLIC_OWN*) to their the maximum value; an index of liberalization and privatization intensity (*LIB_INTENSITY* and *PRIV_INTENSITY*), calculated as the one-year difference of, respectively, *LIB_LEVEL* and *PRIV_LEVEL*; a measure of the sector-relative liberalization and privatization intensity in telecommunications (*RELATIVE_LIB_INTENSITY_in_TLC* and *RELATIVE_PRIV_INTENSITY_in_TLC*) with respect to the average intensity of liberalizations and privatizations in all the network industries for which comparable data are available (i.e. telecommunications, post, rail, passenger air transport, electricity, and gas); analogously, a measure of the sector-relative liberalization and privatization level in telecommunications (*RELATIVE_LIB_LEVEL_in_TLC* and *RELATIVE_PRIV_LEVEL_in_TLC*) with respect to the average level of liberalizations and

privatizations in all the network industries; and finally a variable which expresses the relative liberalization intensity in telecommunications with respect to the average liberalization intensity in telecommunications across all the European countries (*TLC_LIB_INTENSITY_RELATIVE_to_EU*).

*Table 1.* Definition of the variables used in the econometric analysis of path dependency.

| **Variable name** | **Definition of the variable** | **Sources of variation** | **Source of the data** |
|---|---|---|---|
| $ENTRY\_BARR_{i,s,t}$ | Strictness of the legal conditions of entry (from 1 = minimum strictness to 6 = maximum strictness) | $i$ = Austria, … , UK<br>$s$ = Tlc, AirTr, Post, Rail, Gas, Elctr<br>$t$ = 1975, … , 2007 | *OECD Regulatory Indicators Questionnaire* – OECD (2009) |
| $PUBLIC\_OWN_{i,s,t}$ | Extent of public ownership in the companies operating in the industry (from 1 = minimum public ownership to 6 = maximum public ownership) | $i$ = Austria, … , UK<br>$s$ = Tlc, AirTr, Post, Rail, Gas, Elctr<br>$t$ = 1975, … , 2007 | *OECD Regulatory Indicators Questionnaire* – OECD (2009) |
| $LIB\_LEVEL_{i,s,t}$ | $6 - ENTRY\_BARR_{i,s,t}$ | $i$ = Austria, … , UK<br>$s$ = Tlc, AirTr, Post, Rail, Gas, Elctr<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $PRIV\_LEVEL_{i,s,t}$ | $6 - PUBLIC\_OWN_{i,s,t}$ | $i$ = Austria, … , UK<br>$s$ = Tlc, AirTr, Post, Rail, Gas, Elctr<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $LIB\_INTENSITY_{i,s,t}$ | $LIB\_LEVEL_{i,s,t} - LIB\_LEVEL_{i,s,t-1}$ | $i$ = Austria, … , UK<br>$s$ = Tlc, AirTr, Post, Rail, Gas, Elctr<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $PRIV\_INTENSITY_{i,s,t}$ | $PRIV\_LEVEL_{i,s,t} - PRIV\_LEVEL_{i,s,t-1}$ | $i$ = Austria, … , UK<br>$s$ = Tlc, AirTr, Post, Rail, Gas, Elctr<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $RELATIVE\_LIB\_INTENSITY\_in\_TLC_{i,t}$ | $LIB\_INTENSITY_{i,Tlc,t} - LIB\_INTENSITY_{i,(AVERAGED\ OVER\ ALL\ SECTORS),t}$ | $i$ = Austria, … , UK<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $RELATIVE\_\ LIB\_LEVEL\_in\_TLC_{i,t}$ | $LIB\_LEVEL_{i,Tlc,t} - LIB\_LEVEL_{i,(AVERAGED\ OVER\ ALL\ SECTORS),t}$ | $i$ = Austria, … , UK<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $RELATIVE\_PRIV\_INTENSITY\_in\_TLC_{i,t}$ | $PRIV\_INTENSITY_{i,Tlc,t} - PRIV\_INTENSITY_{i,(AVERAGED\ OVER\ ALL\ SECTORS),t}$ | $i$ = Austria, … , UK<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $RELATIVE\_\ PRIV\_LEVEL\_in\_TLC_{i,t}$ | $PRIV\_LEVEL_{i,Tlc,t} - PRIV\_LEVEL_{i,(AVERAGED\ OVER\ ALL\ SECTORS),t}$ | $i$ = Austria, … , UK<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |
| $TLC\_LIB\_INTENSITY\_RELATIVE\_to\_EU_{i,t}$ | $LIB\_INTENSITY_{i,Tlc,t} - LIB\_INTENSITY_{(AVERAGED\ OVER\ ALL\ COUNTRIES),Tlc,t}$ | $i$ = Austria, … , UK<br>$t$ = 1975, … , 2007 | Authors' elaboration on OECD's (2009) data |

In our econometric model, we use, on the one side, *RELATIVE_LIB_INTENSITY_in_TLC* as the dependent variable, and, on the other, its lagged values, the relative liberalization and privatization level and privatization intensity in telecommunications with respect to the industries' average (one-year lagged), and the relative liberalization intensity in telecommunications with respect to the European average (again, one-year lagged) as the regressors. In a more intuitive way, the sector-relative specification of the variables used in the model allows us to answer the question: were the decisions to liberalize telecommunications rather than the other sectors in a given year affected by the relative intensity with which telecommunications were liberalized in the past? As usual when dealing with cross-country cross-sector analysis, omitted variables bias is likely to occur, because accounting for all the relevant country and industry characteristics is virtually impossible (this is a common problem in most studies on regulatory reforms in telecommunications (Bartle, 2002)). As a consequence, a traditional cross-country methodology would make it difficult to interpret observed correlations in a causal sense. In a successful paper, Rajan and Zingales (1998) propose a new methodology able to overcome this difficulty, which consists in making predictions about the relative differences between industries within country in the dependent variable, conditional on explanatory sector-relative regressors that vary with both country and time. This is the methodology we use here. The basic econometric specification of our model can be written as follows: $RELATIVE\_LIB\_INTENSITY\_in\_TLC_{i,t} = \beta_0 + \mathbf{\beta X}_{i,t} + c_i + u_t + \varepsilon_{i,t}$, where **X** is the vector of control variables. We perform the panel regression using a fixed-effects method, in which *c* and *u* soak up the heterogeneity due to unobservable country and time factors (they capture, respectively, time-invariant country fixed effects and country-invariant time fixed effects), and where the remaining variability in the data (not explained by fixed effects and covariates) is absorbed by the idiosyncratic

disturbances $\varepsilon$ that change across countries ($i$) and years ($t$). In a fixed effects estimation, precisely, a 'within transformation' is performed, according to which the (generic) constant term is estimated as an average of the unobserved components. Estimation results are collected in Table 2.

*Table 2.* Estimation results: path dependency in telecommunications liberalization.

| | **Basic model** | **2-year lag structure** | **3-year lag structure** | **4-year lag structure** |
|---|---|---|---|---|
| **Dep.Var.:** *RELATIVE_LIB_INTENSITY_in_TLC*$_{i,t}$ | Coeff. (Std.Err.) | Coeff. (Std.Err.) | Coeff. (Std.Err.) | Coeff. (Std.Err.) |
| *RELATIVE_LIB_INTENSITY_in_TLC*$_{i,t-1}$ | 0.275 ** (0.112) | 0.271 ** (0.113) | 0.288 ** (0.116) | 0.295 ** (0.118) |
| *RELATIVE_LIB_INTENSITY_in_TLC*$_{i,t-2}$ | | 0.079 ** (0.035) | 0.094 ** (0.038) | 0.102 ** (0.040) |
| *RELATIVE_LIB_INTENSITY_in_TLC*$_{i,t-3}$ | | | 0.088 ** (0.038) | 0.092 ** (0.041) |
| *RELATIVE_LIB_INTENSITY_in_TLC*$_{i,t-4}$ | | | | 0.039 (0.029) |
| *RELATIVE_LIB_LEVEL_in_TLC*$_{i,t-1}$ | -0.242 *** (0.035) | -0.265 *** (0.041) | -0.294 *** (0.046) | -0.307 *** (0.050) |
| *RELATIVE_PRIV_INTENSITY_in_TLC*$_{i,t-1}$ | -0.055 (0.078) | -0.067 (0.078) | -0.082 (0.079) | -0.084 (0.081) |
| *RELATIVE_PRIV_LEVEL_in_TLC*$_{i,t-1}$ | 0.156 *** (0.037) | 0.167 *** (0.040) | 0.179 *** (0.042) | 0.181 *** (0.043) |
| *TLC_LIB_INTENSITY_RELATIVE_to_EU*$_{i,t-1}$ | -0.211 * (0.107) | -0.191 * (0.107) | -0.189 * (0.107) | -0.187 * (0.107) |
| Constant | 0.051 * (0.027) | 0.054 * (0.028) | 0.051 * (0.029) | 0.055 * (0.030) |
| No. observations | 560 | 539 | 518 | 497 |
| *F* | 12.05 | 10.05 | 8.52 | 7.48 |
| Prob. > *F* | 0.000 | 0.000 | 0.000 | 0.000 |
| R2 (within) | 0.128 | 0.135 | 0.144 | 0.147 |
| R2 (between) | 0.335 | 0.574 | 0.510 | 0.668 |
| R2 (overall) | 0.099 | 0.103 | 0.108 | 0.111 |

Note: * < 0.10, ** < 0.05, *** < 0.01 statistical significance. Robust variance estimates.

We econometrically find in the data strong evidence in favour of our path dependency argument affecting European telecommunications liberalizations. Specifically, our estimation reveals that the relative intensity with which liberalization

initiatives were adopted in telecommunications with respect to the other industries is positively affected in a statistically significant way by the past sectoral liberalization measures in telecommunications (i.e. the lagged values of *RELATIVE_LIB_INTENSITY_in_TLC*). According to our estimates, this inter-temporal sequence shows a three-year memory (non-ergodicity), since we obtain statistically significant parameters – with substantive magnitude – for the one-year, two-year, and three-year lagged telecommunications liberalization intensity variable. Moreover, the magnitude of these parameters tends to decrease in the number of lags. At a four-year lag, finally, the estimated coefficient turns out statistically insignificant. European telecommunications liberalization emerges therefore as a path dependent process, in which incremental policy adoption constitutes a defining feature.

As a secondary estimation result, we also find that the relative level of liberalization in telecommunications (i.e. *RELATIVE_LIB_LEVEL_in_TLC*) is shown to negatively affect the intensity of subsequent sectoral policies. This finding reveals how the effort exerted by policy-makers in the telecommunications liberalization tends to decrease when entry barriers to market are already largely removed. The data suggest furthermore that the relative intensity of liberalizations in telecommunications tends to be lower when entry barriers levels in a country's telecommunications market are relatively higher than the European average (i.e. the variable *TLC_LIB_INTENSITY_RELATIVE_to_EU* has a negative and statistically significant effect). This estimated relationship between national and European liberalizations confirms that liberalizations in telecommunications are linked across European countries, in such a way that each country reduces the intensity of its sectoral liberalization in telecommunications if the other nations are liberalizing relatively less. Mutual adjustments, joint decision-making, inter-governmental negotiations (Scharpf, 1997), as well as a multi-level governance design of competition policies (Marks, 1993;

Marks *et al.*, 1996), act as an alignment mechanism that prevents individual countries from the adoption of outlying patterns.

Finally, telecommunications liberalizations are shown to depend on the level of public ownership in the industry. More precisely, while one-year lagged privatization intensity (*RELATIVE_PRIV_INTENSITY_in_TLC*) is not statistically relevant, we find a positive and statistically significant parameter for the variable expressing the level of sector-relative privatization in telecommunications (i.e. *RELATIVE_PRIV_LEVEL_in_TLC*). This result suggests that the intensity of liberalization measures is likely to increase when the level of private ownership in the industry is relatively higher, i.e. policy-makers avoid maintaining relevant legal barriers at the entrance of a largely privatized industry (Belloc and Nicita, 2011, 2012a, 2012b).

## 3. INSTITUTIONAL COMPLEMENTARITIES IN PATH DEPENDENT LIBERALIZATIONS

### 3.1. COMPLEMENTARITIES BETWEEN LIBERALIZATION AND NRAS

Liberalization does not lead to competition automatically. The mere abolishment of exclusive rights and to formally allow free entry to the market do not ensure *per se* effective entry of new competitors. The incumbent, especially if it holds a vertically integrated monopoly position, enjoys a first-mover advantage over the (potential) entrants' ability to compete, and can consequently maintain its dominant position even after legal barriers to entry are eliminated. In this context, at least in the early stages of liberalization, regulation and ex-ante intervention can play a major role in governing the transition to effective competition (Gual and Jodar-Rosell, 2009). If the liberalization process follows a rapid and cumulative pace, then, the presence of such complementary institutions might become crucial even to the success of the entire reforms course. This is the issue of institutional complementarities in path dependent

policy making: i.e., the economic implications of path dependence are most powerful not at the level of the individual policy but at a larger level involving complementary configurations of other policy options (Katznelson, 1997; Hall and Soskice, 2001; Pierson, 2000). The concept of institutional complementarities indentifies the situation in which the presence of one policy raises the returns that can be obtained from the adoption of another (thus complementary) institution. While the notion of complementarity is generally used with reference to purely economic and productive activities (e.g., Milgrom and Roberts (1990)), its application to policy and institutional settings is now largely acknowledged (Aoki, 1994; Amable, 2000; Hall and Gingerich, 2004). Here, in particular, we focus on national regulatory authorities (NRAs). NRAs are one of the distinctive entities of what has been called the 'regulatory state' (Majone, 1997). They are governmental bodies with regulatory powers (and hence public authority), being however 'at arm's length' from the government (Verhoest *et al.*, 2004). The timely establishment of a regulatory authority is the first and most important condition for minimizing first-mover advantages of incumbents (Wallsten, 2003; Estache *et al.*, 2006). As a consequence the delays of several countries in creating NRAs might explain why the progressive market liberalization has registered only a partial success, in terms of competition levels, and heterogeneous results across countries.

### *3.2.* ESTIMATING THE JOINT EFFECT OF LIBERALIZATION AND NRAS

In order, to investigate empirically institutional complementarities we estimate the joint effect of entry barriers removal and NRAs on market competition. We use data over the 1975-2007 period and that cover the 22 European countries considered in the econometric analysis presented in the previous Section. We combine, then, information on telecommunications liberalization and on the establishment of sectoral regulatory authorities, and construct an econometric model in which the annual variation in the

telecommunications market structure is the dependent variable. In particular, we measure the telecommunications market structure through a composite index which expresses a weighted average of the market share of new entrants in the trunk telephony market, in the international telephony market, and in the mobile market. This index (*COMPETITION*) is obtained by subtracting the OECD's (2009) indicator of incumbent's market share to its maximum value. In our econometric model we use the one-year differences of *COMPETITION* as the dependent variable (we call this first-differentiated variable *Δ_COMPETITION*). We consider several explanatory regressors: first, an index of liberalization intensity (*LIB_INTENSITY*) and privatization intensity (*PRIV_INTENSITY*), calculated as explained in Table 1, and referred to sector-specific reforms in the telecommunications industry; second, a dummy variable recording the presence of an independent regulatory authority for the telecommunications market (*NRA*); third, an interaction term between the liberalization intensity and the regulatory authority variable (*COMPLEMENTARITY_LIB_NRA*), obtained as the scalar product between *LIB_INTENSITY* and *NRA*; fourth, finally, a vector of control variables, including a government's political ideology index (*IDEOLOGY*), a legislature-specific indicator of political concentration (*POL_CONCENTRATION*), a dummy variable indicating when the party of the executive has an absolute majority in the houses that have lawmaking powers (*ALL_HOUSES*), a variable measuring the number of years left in the current term for the governing executive (*YEARS_LEFT*), a dummy variable that records the EU membership (*EU_MEMBER*), and an indicator of the degree of economic openness (*EC_OPEN*). Table 3 presents a description of these additional variables. The model to be estimated can be written as: $\Delta\_COMPETITION_{i,t} = \beta_0 + \boldsymbol{\beta}\mathbf{W}_{i,t} + c_i + u_t + \varepsilon_{i,t}$, where **W** is the vector of control variables. Also in this case, we perform a panel regression using a fixed-effects method, in which *c* and *u* soak up the heterogeneity due to unobservable country and time factors.

*Table 3.* Definition of the variables used in the econometric analysis of institutional complementarities.

| **Variable name** | **Definition of the variable** | **Sources of variation** | **Source of the data** |
|---|---|---|---|
| $COMPETITION_{i,t}$ | Weighted average of the market share of new entrants in the trunk telephony market, international telephony market, and mobile market (from 1 = minimum share to 6 = maximum share) | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 (Tlc sector only) | Authors' elaboration on OECD's (2009) data |
| $\Delta\_COMPETITION_{i,t}$ | $COMPETITION_{i,t} - COMPETITION_{i,t-1}$ | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 (Tlc sector only) | Authors' elaboration on OECD's (2009) data |
| $LIB\_INTENSITY_{i,t}$ | *See Table 1* | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 (Tlc sector only) | Authors' elaboration on OECD's (2009) data |
| $PRIV\_INTENSITY_{i,t}$ | *See Table 1* | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 (Tlc sector only) | Authors' elaboration on OECD's (2009) data |
| $NRA_{i,t}$ | Presence of national regulatory authority for the telecommunications sector | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 (Tlc sector only) | Authors' own calculation from Gilardi's (2002, 2005) data |
| $COMPLEMENTARITY\_LIB\_NRA_{i,t}$ | $LIB\_INTENSITY_{i,t} \times NRA_{i,t}$ | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 (Tlc sector only) | Authors' elaboration on OECD's (2009) and Gilardi's (2002, 2005) data |
| $IDEOLOGY_{i,t}$ | Index that takes the value 1 if the share of governing rightwing parties in terms of seats in the cabinet and in parliament is larger than 2/3, 2 if it is between 1/3 and 2/3, and 3 if the share of centre parties is 50% or if the left-wing and right-wing parties form a coalition government that is not dominated by one side or the other, (symmetrically) 4 and 5 if the left-wing parties dominate | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 | Potrafke (2010) |
| $POL\_CONCENTRATION_{i,t}$ | Sum of the squared seat shares of all parties in the governments | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 | World Bank (2008) |
| $ALL\_HOUSES_{i,t}$ | Dummy variable that equals 1 when the governing party has an absolute majority in the houses that have lawmaking powers | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 | World Bank (2008) |
| $YEARS\_LEFT_{i,t}$ | Number of years left in the current term | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 | World Bank (2008) |
| $EU\_MEMBER_{i,t}$ | Dummy variable that equals one when the country is a member of the EU, 0 otherwise | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 | Authors' own coding |
| $EC\_OPEN_{i,t}$ | Total trade (sum of import and export) as a percentage of GDP | $i$ = Austria, … , UK ; $t$ = 1975, … , 2007 | Armingeon *et al.* (2010) |

Estimation results are collected in Table 4. The estimation results suggest very interesting relationships. On the one hand, the intensity of sectoral liberalizations (*LIB_INTENSITY*) taken in isolation seems to have a positive and statistically significant effect on the one-year variation of the telecommunications' market structure (*Δ_COMPETITION*); this is shown in the abridged model version I of Table 4. On the other hand, however, the liberalizations' effect disappears once we control for the presence of the regulatory authority (*NRA*), which in its turn results to have a positive and statistically significant impact on competition improvements (see model versions II and III in Table 4). Moreover, the variable measuring complementarity effects between the intensity of sectoral liberalization and the presence of NRAs (*COMPLEMENTARITY_LIB_NRA*) is associated to a positive and statistically significant parameter both in the abridged model version III, where control variables are not included, and in the full model version. This result unveils that, while sectoral liberalizations may play a positive effect on the telecommunications market competition, such effect is likely to be very low if independent regulatory authorities are not established.

The reason why liberalization measures in the absence of NRAs are likely to be ineffective lies in the fact that new entrants need to access network infrastructures usually owned by the incumbents. Thus, without the adoption of regulatory requirements designed to prevent abuses by the incumbent, the mere removal of legal entry barriers might be of a limited efficacy. The NRAs' activity therefore assumes a crucial role, setting ex-ante the rules for such negotiations.

*Table 4.* Estimation results: path dependency in telecommunications liberalization.

| **Dep.Var.:** $\Delta\_COMPETITION_{i,t}$ | **Abridged version I** Coeff. (Std.Err.) | **Abridged version II** Coeff. (Std.Err.) | **Abridged version III** Coeff. (Std.Err.) | **Full model** Coeff. (Std.Err.) |
|---|---|---|---|---|
| $LIB\_INTENSITY_{i,t-1}$ | 0.112 *** | | 0.007 | -0.006 |
| | (0.029) | | (0.022) | (0.025) |
| $NRA_{i,t-1}$ | | 0.221 *** | 0.174 *** | 0.125 ** |
| | | (0.028) | (0.026) | (0.054) |
| $COMPLEMENTARITY\_LIB\_NRA_{i,t-1}$ | | | 0.115 *** | 0.126 *** |
| | | | (0.039) | (0.041) |
| $PRIV\_INTENSITY_{i,t-1}$ | | | | -0.004 |
| | | | | (0.024) |
| $IDEOLOGY_{i,t-1}$ | | | | 0.017 |
| | | | | (0.013) |
| $POL\_CONCENTRATION_{i,t-1}$ | | | | -0.417 *** |
| | | | | (0.151) |
| $ALL\_HOUSES_{i,t-1}$ | | | | -0.011 |
| | | | | (0.044) |
| $YEARS\_LEFT_{i,t-1}$ | | | | -0.004 |
| | | | | (0.007) |
| $EU\_MEMBER_{i,t-1}$ | | | | 0.094 * |
| | | | | (0.053) |
| $EC\_OPEN_{i,t-1}$ | | | | -0.001 * |
| | | | | (0.000) |
| Constant | 0.089 *** | 0.019 *** | 0.021 *** | 0.193 * |
| | (0.011) | (0.006) | (0.006) | (0.099) |
| No. observations | 517 | 544 | 527 | 520 |
| $F$ | 14.06 | 61.07 | 24.79 | 10.20 |
| Prob. > $F$ | 0.000 | 0.000 | 0.000 | 0.000 |
| R2 (within) | 0.097 | 0.134 | 0.213 | 0.231 |
| R2 (between) | 0.001 | 0.141 | 0.087 | 0.242 |
| R2 (overall) | 0.097 | 0.126 | 0.205 | 0.211 |

Note: * < 0.10, ** < 0.05, *** < 0.01 statistical significance. Robust variance estimates.

Besides unveiling the active role of NRAs in creating a competitive environment, our estimates contribute to explain why the success of the liberalization process in telecommunications was only partial. While liberalizations proceeded with a path dependent and cumulative pace, this forcing the timing of the reforms adoption both within countries and at an European level, the establishment of national regulatory authorities was much more heterogeneous across European states. As we have discussed in the previous Section, pressures for removing the market entry barriers grew rapidly in the 1980s, and already in the early 1990s liberalization initiatives were undertaken by a large number of European countries. Differently, NRAs were created

later, in the period 1996-1998 (with few exceptions). This asynchronous adoption of liberalization reforms and regulatory authorities can be explained by the fact that in Europe the traditional control of monopolies by governments has restrained until recently the feeling that independent mechanisms of regulation could have been necessary (Geradin, 2000). Moreover, the reorganization of the telecommunications industry was to a certain extent an experimentation process, in which best institutional practices tended to be adopted at first by a few countries, and in which such practices spread across jurisdictions only after they have proved to be successful in the first mover states (McCahery *et al.*, 1996; Gual and Jodar-Rosell, 2009). As a result, competitive market structures in European telecommunications emerged, on average, with a slower pace than that at which liberalization initiatives were implemented.

Some others relationships unveiled by our estimation deserve mention. First, executives' ideology (*IDEOLOGY*) is shown to have a statistically insignificant influence on competition improvements. Hence, while political ideology might affect the decision to adopt liberalization reforms (Belloc and Nicita, 2011), it is shown not to affect *per se* the post-reform competition level. Second, EU membership (*EU_MEMBER*) acts as a positive influence on the degree of actual competition in the market, being the EU a catalyst, or filter, for pro-market reforms (see, e.g., Clifton *et al.*, 2006). Third, also some institutional characteristics of governments may be relevant to market outcomes, as it is suggested, among others, by Rogowski and Kayser (2002) and Rogowski *et al.* (2008). In particular, the degree of political concentration (*POL_CONCENTRATION*) seems to have a negative effect on the new entrants market share; the absolute majority in the houses that have lawmaking powers (*ALL_HOUSES*) and the number of years left in the current term (*YEARS_LEFT*), instead, appear to have a non statistically significant influence. Fourth, finally, the degree of economy openness (*EC_OPEN*) is

associated to a negative and statistically significant, albeit small, parameter; this might suggest that the degree of economic openness encourages higher concentration levels in the market in response to tighter international competition.

## 4. CONCLUSIONS

The causal dynamics governing the deployment of policy processes and the consequences of the timing and pace of such processes should be one of the central concerns of both social scientists and policy-makers (Pierson, 2000). In this paper we have focused on the evolution of liberalizations in the European telecommunications sector. We have used data over the 1975-2007 period, covering 22 European countries, and performed an econometric analysis combining panel regression techniques with the sector-relative methodology proposed by Rajan and Zingales (1998). We have obtained interesting results concerning both the path dependency nature and the outcome of the telecommunications liberalization reforms. In particular, we have showed empirically the non-ergodicity of the liberalization process in European telecommunications, also controlling for the persistent linkages across policy domains (i.e. liberalization and privatization) and across EU countries. Then, we have estimated the impact of liberalizations on the market competition levels in the presence of institutional complementarities: we have so found empirically that liberalization reforms, whose adoption was forced within a path dependent and cumulative pace, were not sufficient for having a substantially competitive market when they have taken place before the establishment of an independent regulatory authority. Our results, hence, provide a contribution to the policy discussion on telecommunications issues with respect to the difficulties that governments might face in managing the timing of liberalization reforms, to the limited efficacy of liberalization measures in the absence of an NRA defining the regulatory framework, and to the lessons that can be derived for the other sectors of the economy that still wait for substantial liberalization.

It is surprising that rigorous econometric studies evaluating the impact of liberalization reforms on market outcomes are rather rare. To the best of our knowledge, the present paper is the first providing a quantitative estimate of the (joint) effect of liberalization and national regulatory authority on competition improvements in the telecommunications sector. Future empirical research might thus consider studying the institutional complementarities between liberalizations and regulatory controls comparing regulation decentralization (through national authorities) and international coordination (through European networks). On the one hand, decentralization raises the costs for telecommunications operators wishing to enlarge their business at a European level, because for example it might involve the multiplication of national procedures or might generate differences in the way NRAs implement EU directives. On the other hand, the establishment of European regulatory networks might lead to a capture of national regulatory agencies by the EC. Although it is relatively recent, the academic debate on the institutionalization of transnational regulatory governance in Europe is already lively and intense (see, e.g., Yesilkagit (2011), Maggetti and Gilardi (2011), and Levi-Faur (2011)). At the same time, however, the impact of European regulatory networks and of their interaction with national authorities on market dynamics is still unclear. In addition, competition authorities emerge as a further key regulatory institution, in a context in which competition principles are also internalized by the regulatory framework (this is the essence of the regulatory shift of 2002).[2] Institutional complementarities in telecommunications therefore assume a multi-institutional dimension that needs a deep and systematic exploration. We believe that the impact of liberalization reforms on competition improvements in this turbulent environment deserve a continuous quantitative assessment by empirical research.

**Address for correspondence:** Filippo Belloc, Viale Pindaro 42, 65127 Pescara (email: filippo.belloc@eui.eu). Antonio Nicita, Piazza San Francesco 7, 53100 Siena (email: nicita@unisi.it). Pier Luigi Parcu, Via Boccaccio 151, 50133 Firenze (email: pierluigi.parcu@eui.eu).

**Biographical notes:** Filippo Belloc is Assistant Professor of Public Economics at the Department of Economics, University "G. D'Annunzio" of Chieti-Pescara (Italy). Antonio Nicita is Associate Professor of Economic Policy at the Department of Economics and Statistics, University of Siena (Italy). Pier Luigi Parcu is Director of the Communications and Media area of the Florence School of Regulation at the EUI (Italy).

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## NOTES

[1] Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, UK. Notice, however, that in the estimation analysis we drop from the sample the Czech Republic's and Hungary's observations referring to the years of communist dictatorship and those Slovakia's observations that refer to the period before it was declared a sovereign state.

[2] See the *Framework Directive*, *Access Directive*, *Authorization Directive* and *Universal Service Directive*, numbered, respectively 2002/21, 2002/19, 2002/20 and 2002/22.

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