Dynamic access pricing and incentives to invest in alternative infrastructures

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Abstract
We define a dynamic model to assess whether and when the ‘ladder of investment’ regulatory paradigm induces efficient competitive network investment. We find that a multi-period schedule where access charges rise over time can indeed achieve this goal. However, investment incentives are diluted by setting a sunset clause on regulation. We prove that, absent regulatory commitment, the time-dependent schedule may not be robust to late entry. Thus, to preserve investment by early entrants, access charges should depend both on time and the entry period. We illustrate how this alternative schedule complies with the non-discrimination obligation. Then, we show that the principles underlying this schedule can also be effective when entrants’ strategies differ over geographical areas, rather than over time. Finally, in view of the prospective deployment of next generation access networks, we discuss the potential conflict between promoting infrastructure competition consistent with the ladder paradigm, and ensuring the incumbent’s investment.

JEL classification: L13; L51; L96
Keywords: Ladder of investment; Dynamic access pricing; Regulatory commitment; Asymmetric regulation

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1. **Introduction**

According to the European New Regulatory Framework (NRF), the National Regulatory Authorities (NRAs) in member states shall promote competition in electronic communications markets by *inter alia* encouraging efficient investment in infrastructure\(^1\). Facility-based competition is expected to provide consumers with a large variety and a high quality of services, and with low prices. Since network investment exhibits economies of scale, then NRAs should aim at promoting infrastructure roll out by Other Licensed Operators (OLOs) only in those network segments where is both privately profitable and socially desirable. At the same time, NRAs should improve efficiency in potentially competitive markets by granting OLOs fair access to those incumbent’s facilities which are likely to remain in the next future enduring economic bottlenecks, such as wireline local access networks\(^2\).

The prevailing regulatory model in the European Union (EU) is well explained by the concept of the ladder of investment (ERG, 2006a). The basic principle of the ladder model is that competitive network investment is effectively supported when OLOs have a chain of (suitably regulated) complementary access products at their disposal. Once OLOs have gained a critical mass of users based on mandated wholesale access, they have sufficient revenue to gradually expand their network. In this framework, it is often suggested to introduce sunset clauses in the regulatory regime to signal OLOs that their business models should not be built on the unlimited availability of some access products\(^3\). Moreover, setting up a dynamic access price schedule where the wholesale access charge rises above cost over time is regarded as a potentially effective remedy to induce competitive network investment (ERG, 2006a).

In this paper, firstly we aim at verifying formally whether or not the ladder model does enable NRAs to promote efficient investment in

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\(^{2}\) The situation where a dominant firm controls the supply of an essential input, while there is prospective infrastructure competition in adjacent markets, is common to network industries such as electricity, railways, and gas (where the bottleneck input respectively is electricity transmission, railway track, and gas transportation).

\(^{3}\) Sunset clauses specify a period of time after which access to the incumbent’s network is no longer regulated.
alternative infrastructures. For this purpose, we consider a dynamic framework and define a two-period game of complete information where the OLO may provide quality-enhanced retail services in the second period, provided that in the first period he has both entered the market via resale and deployed his network. The OLO’s entry strategy depends on access conditions to the incumbent’s local network. We deal with inter-temporal effects both on the demand side (due to consumer switching costs) and on the supply side (related to the availability and pricing of wholesale access). We define a dynamic pricing rule prescribing that the regulated access charge rise over time with the credibility of infrastructure competition. We find that this rule is an essential tool to induce efficient competitive network investment. We also find that setting a sunset clause on wholesale access regulation is counter-productive, because dilutes investment incentives.

Secondly, we extend the basic model by allowing for further resale entry in the second period. The purpose is to test the effectiveness of a time-dependent access price schedule against the possibility of late entry. Ex ante incentives to invest are strengthened only if the NRA does not renege on its action ex post, so that the initial decision has commitment value. We identify some parameter constellations (related to the benefits and costs of network investment) under which this indeed occurs. However, if firms’ profits are not weighted high enough in the welfare function, then the NRA would be persuaded to enable late resale entry by reversing to a cost-oriented charge when the early OLO might have already sunk his network investment. It follows that, to preserve investment by the early entrant in the absence of commitment, the NRA should be allowed to define an alternative schedule where access charges depend both on time and the period of market entry. At any given time, this schedule entails charging different access prices to different OLOs that entered the market at different periods. However, following market entry, each OLO faces the same access price schedule.

4 In the benchmark static framework, a high access price may provide the OLO with strong incentives to establish his own local network but, if the latter is not replicable, then it may hamper resale entry, and thus competition at all. Conversely, a low access price may disincentive efficient infrastructure investment.

5 In Section 4.6, we clarify that the proposed access pricing scheme does not increase the regulatory burden, and discuss how it can be implemented in practice.
Choosing different access prices for OLOs at different stages of their entry strategy gives rise to asymmetric regulation. This might be criticized on the ground that it would breach restrictions on non-discrimination, which apply both to dominant firms and to the NRA (see e.g. Cave, 2006). We argue that, in a setting where it is essential that the NRA define a multi-period access pricing scheme, it is also essential that the same dynamic access conditions be applied to any OLO, independent of his entry period. In this sense, the proposed policy does not infringe the non-discrimination obligation. On the other hand, it is charging at any time the same access price to OLOs at different stages of their network roll out that could be discriminatory. It is worth noting that asymmetric remedies to promote competition and improve dynamic efficiency have been dictated by several NRAs in various circumstances where objective cost differences are beyond the control of the operators concerned.

We point out that this line of reasoning can be extended to the geographical, rather than temporal, dimension of access product complementarity. Thus, we define an alternative model specification where OLOs’ investment opportunities differ over geographical areas, rather than over time. Consistent with our model, the European Regulators Group (ERG) allows NRAs to set access charges tailored to prospective competitive conditions in different areas (ERG, 2006a). Implementing this policy in practice complies with the broader interpretation of the non-discrimination obligation discussed above.

Finally, it is clear that regulated access charges may distort the incumbent’s incentive to invest in the local network upgrading. We briefly discuss the case where the incumbent may invest in quality, and remark that there may be a potential conflict between promoting facility-based competition according to the ladder model and remunerating the incumbent’s investment. Solving this conflict is particularly important if we consider that, following the surge of competitive network investment, several incumbents both within and outside the EU have announced, or undertaken the deployment of next generation access networks (NGANs).

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7 In Section 2 we discuss a number of such circumstances.
This paper is organized as follows. Section 2 provides evidence and hints about the ladder of investment. Section 3 analyzes the literature. Section 4 presents the whole dynamic model, explains the results and describes the geographic adaptation of the model. Section 5 discusses the case where the incumbent invests in quality. Section 6 contains some concluding remarks.

2. The ladder of investment paradigm: evidence and hints

The ladder of investment paradigm postulates that OLOs’ investment incentives are likely to change over time as they develop their customer base, so that the NRA may give them the possibility to take their investments in a step-by-step manner. By changing the incentive properties of regulation over time, the NRA can induce OLOs to ‘climb the ladder’ (ERG, 2006a). Deploying their networks makes OLOs increasingly able to differentiate services.

Recently collected data (updated at July 1, 2007) show that OLOs in the EU are gradually shifting towards more infrastructured modes of competition in the provision of broadband services (COCOM, 2007). Indeed, LLU has now become the most used single type of access (37% of DSL lines provided by OLOs to their customers are fully unbundled lines; a further 18.4% is provided by shared access). This entry strategy has been continuing to replace low-investment intensive alternatives, such as bitstream access (18.1%, down by 3.1 percentage points in the last year) and resale (25.9%, down by 6.3 points in the last year). Nonetheless, there is very limited replication of the incumbent’s local access network.

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*The lower the level of the traffic handover point in the network hierarchy, the more infrastructured and the more differentiated is the OLO. With bitstream access, the OLO rents from the incumbent a high-speed access link to the customer premises. Bitstream access differs from resale offers as these do not provide interconnection or transmission capacity. If the access network is not duplicable, then local loop unbundling (LLU) is the only alternative to indirect access. With LLU (shared access) the OLO takes control of the (high bandwidth portion of the) rented loop. LLU requires the OLO incurring the cost of installing his network equipment at local exchanges (e.g. DSLAMs), and connecting his backhaul network to co-location sites (with bitstream, the incumbent always provides DSLAMs). Since LLU enables the OLO to offer better services than the incumbent (which is precluded with resale and bitstream), then LLU is a form of facility-based entry. Empirical evidence confirms that LLU in Europe has been a complex and slow process that has surged only recently due to improved regulation.*

*Access network roll out in the EU has been targeted at business customers or urban areas. Some OLOs (such as Illiad in Paris) have planned fibre to the home.*