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How competition affects broadband speed

New empirical evidence for the EU27

The development of high-speed broadband is a widespread goal of digital policies around the world. Most Governments have accepted that competition is key to achieving this goal and like the European Commission they have mandated access to the incumbents' local networks. While this has fostered competition, there are growing concerns that it may have slowed the investment needed to upgrade networks, inhibited penetration and held back the development of a new generation of Internet services. Original research by Case Associates provides further insights into the impact of different forms of access and competition on broadband penetration rates and speeds across Europe.

Overview

There are three distinct types of competition - *direct competition* between independent networks; *facility-based intra-platform* competition where rivals share all or part of the incumbent's network; and s*ervice-based competition* where an entrant purchases the incumbent's wholesale capacity to carry its services. These types of competition may have different effects on network investment, penetration, quality, speed, reliability, and the range of services.

Recent research indicates that direct network competition tends to spur higher broadband penetration while service based competition does not. There has however been no research on how competition affects network quality. Here we examine the effect of competition on broadband penetration and Internet speeds using multiple regression analysis.

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Data and variables

Our analysis consists of two multiple regression equations of the determinants of broadband penetration and speed respectively using data for the EU27 over the period 2006 to 2011.

Broadband penetration is measured by the number of active broadband lines per 100 people. Data published by the European Commission shows that over the period 2006 to 2011 this increased from 14.1% to 25.6% across Europe, but with wide differences between Member States. Western and Northern Europe had high broadband penetration rates, while Southern and Eastern Europe lagged behind.

Network quality is a complex multidimensional concept. It encompasses download and upload speeds, latency, network functionality, reliability and other factors. Because cross-national data on many of these dimensions of broadband quality are unavailable, we focus on download and upload speeds. We have used publicly available data on user-initiated tests collected by Ookla (www.netindex.com/source-data/). These tests uniquely measure the bulk transfer capacity, i.e. the amount of data that a network can carry using a congestion aware protocol rather than the artificial advertised maximum speeds. In other words, it gives the throughput that the user would obtain across a certain network path at a given time. From this data we have constructed an index of relative performance.

To test for the impact of the different types of competition on broadband penetration and speed we use the Herfindahl–Hirschman Index (HHI). This is an index of industry concentration which ranges between 0 (very competitive) to 1 (monopoly). In our analysis we define three different HHIs to reflect the degree of competition between two access modes – the first between the DSL and non-DSL segments of the market; the second for wholesale (lines) between the incumbent and LLU entrants; the third retail line share between incumbent, and WBA and resale based entrants. To explain, if the incumbent is the sole supplier of DSL, the HHI would equal 1; as entry occurs the HHI decreases**.** An estimated negative coefficient for a HHI means somewhat confusingly that greater competition increases broadband penetration or speeds.

In addition several other explanatory variables have been included in the estimating equations – the per centage of the population urbanised, population density, the proportion of the population who have never used the Internet as a measure of ICT non-usage, and income. These seek to take account of the demand and supply factors likely to affect broadband penetration and/or speeds.

Main results

Our findings are reproduced in the table below together with statistical confidence limits.

Explanatory variables	Dependent variable: Penetration		Dependent variable: Speed index	
HHI Direct network	-0.099	**	-0.423	**
HHI Facilities-based	-0.120	***	-0.129	
HHI Service-based	0.081	***	0.419	**
% Urban population	0.000		0.005	**
Population density			0.000	***
ICT proxy	-0.491	***		
logGDP	0.021	*		
Constant	0.242	*	-0.271	
Adjusted R-sq	0.745		0.294	
Joint significance of competition variables	***		***	
Observations	157		105	
Notes	Random effects GLS regression Significance at *** 1%; ** 5%; * 10%			

In line with previous studies, we find that inter-platform competition increases broadband penetration, as does facilities-based competition. For example, if direct network competition in Italy and Greece were to increase from their current negligible levels to the EU27 average in 2011 (HHI = 0.62), penetration would increase by almost 4% all other things equal. On the other hand service-based competition (WBA and resale) decreases penetration – a 1% increase in HHI (i.e. less competition) increases broadband penetration by about 0.1%. This means that penetration would be higher if there were no WBA and resale. The results show that facilities-based competition has the largest estimated impact on the penetration rate and speed, but that all competition variables are statistically significant.

The broadband speed equation generates similar estimates with the competition variables jointly significant in explaining broadband speed. In particular, direct network competition increases broadband speed, service-based competition decreases network speed, while facility-based access increases speed but this not statistically significant.

These results may be due to several factors. Direct network can improve speed partially because Internet traffic is spread across several competing networks thus reducing network congestion. On the other hand an increase in resale and WBA increases the likelihood of congestion on the incumbent's network. Secondly, the presence of two separate networks gives ISPs more scope for vertical product differentiation including speed. ISPs operating on alternative platforms compete on quality as well as price, and are able to supply their customers with more valued services. This, on average, increases the speed provided in any given country, leading to a higher average speeds. On the other hand, WBA and resale limit the customization of services that the incumbent provides to entrants and hence service quality.

Our statistical analysis is better at explaining variations in broadband penetration than speeds as reflected in the lower r-squared (a standard measure of goodness of fit of a regression equation) for the latter. This may be due to a host of reasons - the smaller data set; a dependent variable which is somewhat biased; and the exclusion of other important explanatory variables. Nonetheless, a test for the joint significance of the competition variables shows that these are statistically significant at the 1% level, providing evidence that competitive conditions matter and have a direct effect on broadband speeds, all other things equal.

Conclusions

The competitive environment in the broadband market has been shaped by the regulation since liberalisation in the 1990s. In particular there has been an intense push to open up the incumbent's network to its rivals starting with service based access to mandatory access (ULL) to the network. Our research shows that increased service competition reduces penetration and speed, while direct network competition increases both.

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