

## **EFFECTS OF HIGH-SPEED BROADBAND ON EDUCATIONAL ACHIEVEMENTS: Evidence from Italy**

The introduction of high-speed broadband in Italy had a small but significant positive effect on the educational achievements of school students. Information and communication technology (ICT) plays a relevant role in numeracy subjects but does not seem to be relevant for literacy.

These are among the findings of research by **Filippo Boeri**, to be presented at the annual congress of the European Economic Association in Manchester in August 2019. His study finds that the effects largely depend on parents' socio-economic background and students' prior performance.

Lower secondary school (grade 8) students with poor performance in previous education, might take advantage of the new learning devices available, thanks to the new infrastructure to reduce the achievement gap with their peers. But the evidence shows the benefit is limited to students with a rich cultural background. The productivity gain does not seem to characterise pupils with a poor background.

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Home computers have become an essential tool of modern education in the developed countries. According to the last OECD report on ICT and education, access to home computers is now nearly universal in most OECD countries.

Yet data still show significant disparities in the access to and quality of home computing. Over the last decade, several countries have invested substantial amounts of public funds to upgrade ICT with the aim of increasing available internet connection speed.

In spite of that, the impact of ICT speed on different social outcomes is still debated. A recent body of research has analysed the effects of access to high speed internet on learning outcomes, focusing on productivity gains and increase in time allocated to leisure activities.

This study analyses the impact of high-speed broadband on educational achievements, exploiting the 'National Ultra-Broadband Plan' (NUBP), a large infrastructural programme implemented by the Italian government between 2014 and 2020. The empirical strategy exploits three key features of the programme implementation.

First, the NUBP targets 'market failure areas', where no private operator is interested in investing. This makes it possible to bypass potentially confounding effects stemming from complementarity/substitutability between public and private intervention.

Second, the study exploits the exogeneity of the timing of the rollout of the broadband infrastructure. Since the projects aimed at ensuring 100% coverage of the Italian territory at 30 Mbps within three years, the timing was mainly dictated by technical considerations and other quasi-random factors. As a matter of fact, the NUBP was implemented progressively in adjacent territories, and within provinces the rollout order was hardly correlated with students' attainments.

Finally, the bias related to the possibly endogenous decision to connect are addressed focusing on potential treatment (that is, the availability of high-speed internet) rather than the actual broadband connection.

The analysis is conducted on a unique set of school and student level data. Exploiting the results of the INVALSI, the annual standardised assessment of the competencies of Italian students, the performance of the whole population of Italian students, their socio-economic background and other relevant individual characteristics are linked to quarterly broadband coverage data, measured at a very fine spatial scale.

Results suggest a small but significant positive effect of 30 Mbps broadband on educational achievements. ICT plays a relevant role in numeracy subjects but does not seem to be relevant for literacy.

The effect largely depends on the parental socio-economic background and prior performance. Lower secondary school (grade 8) students with poor performance in previous education, might take advantage of the new learning devices available, thanks to the new infrastructure to reduce the achievement gap with their peers.

But evidence shows the benefit is limited to students with a rich cultural background. On the other hand, the productivity gain does not seem to characterise pupils with a poor background.

Although more work is required to get a better understanding of the underlying mechanisms, the new empirical evidence may have relevant policy implications. ICT upgrading programmes can be beneficial for students but need to be accompanied by training programmes and other policies aimed at allowing disadvantaged students to access the benefits.

More generally, infrastructural policies, as well as other place-based policies, are likely to affect students' overall performance and inequalities in the educational attainment.

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