

Broadband in Schools: Good or Bad for Students' Performance?

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Broadband in Schools

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- Widening **access to information**
- Fostering **new learning methods** (more interaction and feedback)
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Little empirical evidence that broadband connectivity generates significant benefits.

Research Question

“How does **broadband *use*** affect students’ **performance?**”

- Is broadband use beneficial for student performance?
- What’s the magnitude of this effect?
- How does Broadband use affect different schools?

Methodology

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- Period: Academic years **2005-2009**
 - Broadband use started only from 2006. So 2005 provides us a data point before the broadband use. Similarly, 2009 provides us data point after the broadband became more prevalent.
 - Use of panel data allows us to control for school specific unobserved effects.

Methodology

Econometrics

Performance depends on Internet use, on socio-economical factors, as well as on unobserved effects

$$\Delta p_i = \omega \Delta I_i + \mathbf{X}_i \beta + u_i \quad (1)$$

In which Δ represents differences between 2005 and 2008 (or 2009).

Internet usage

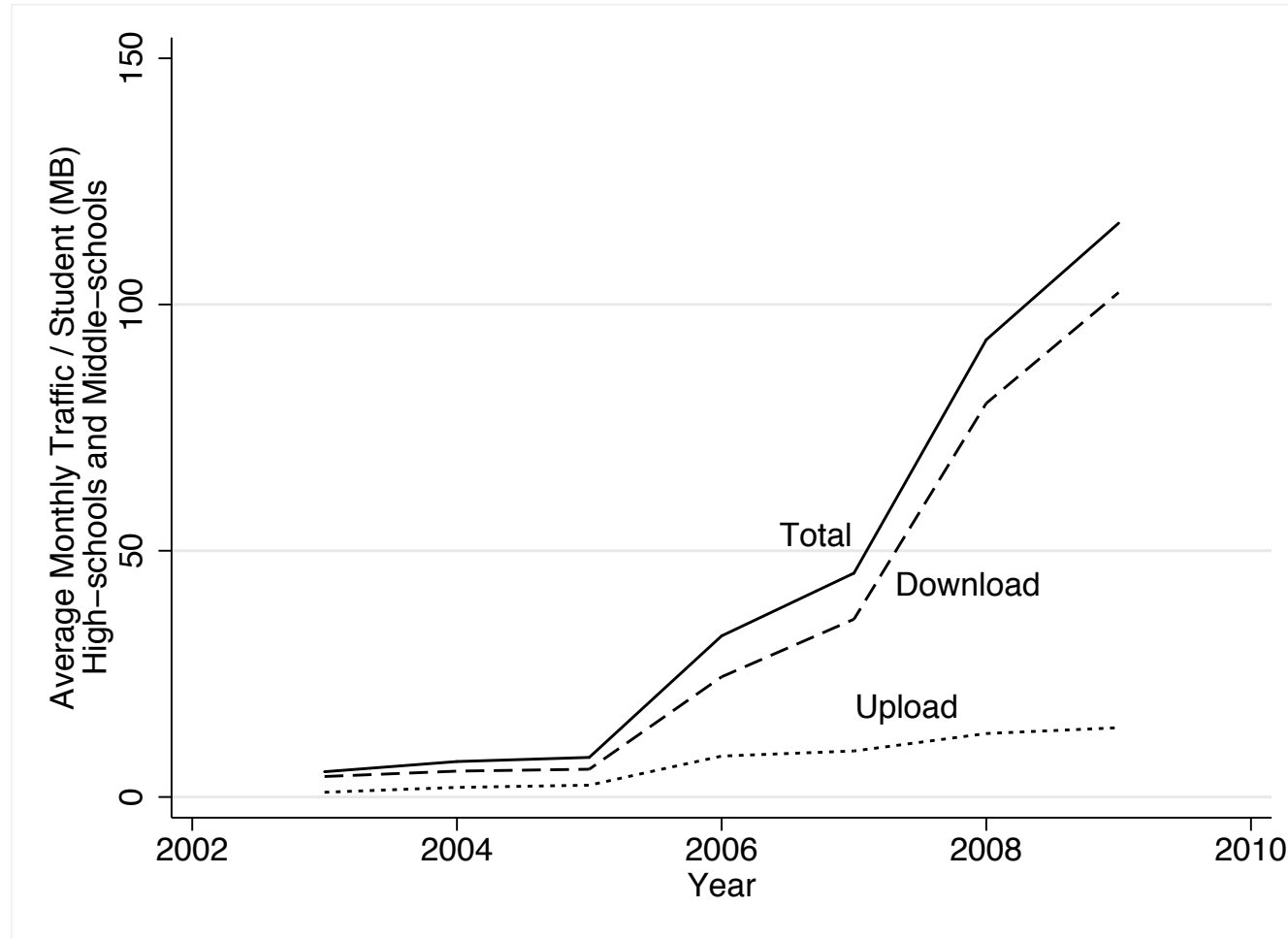
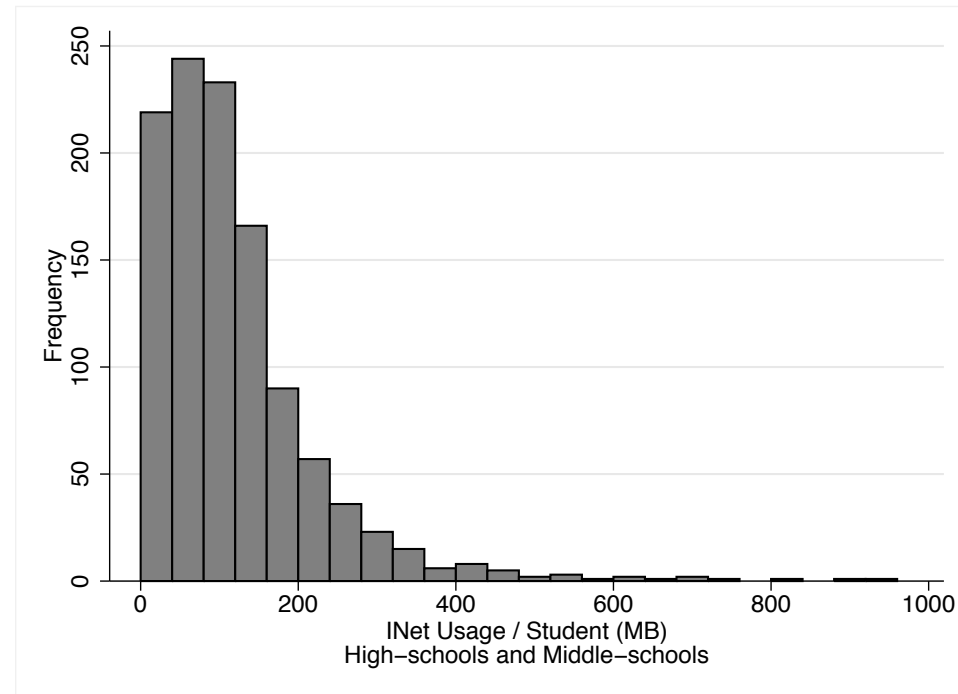


Figure: Internet usage evolution 2003-2009: download, upload and total traffic per student

Internet usage across schools



In 2009 the average student used **117 MB per month**, which corresponds to:

- Watching **one hour of YouTube** video per month (at 260 Kbps);
- Exchanging **390 emails** (at 300 KB per email); or
- Loading **900 webpages** (at 130 KB per page).

Exam scores

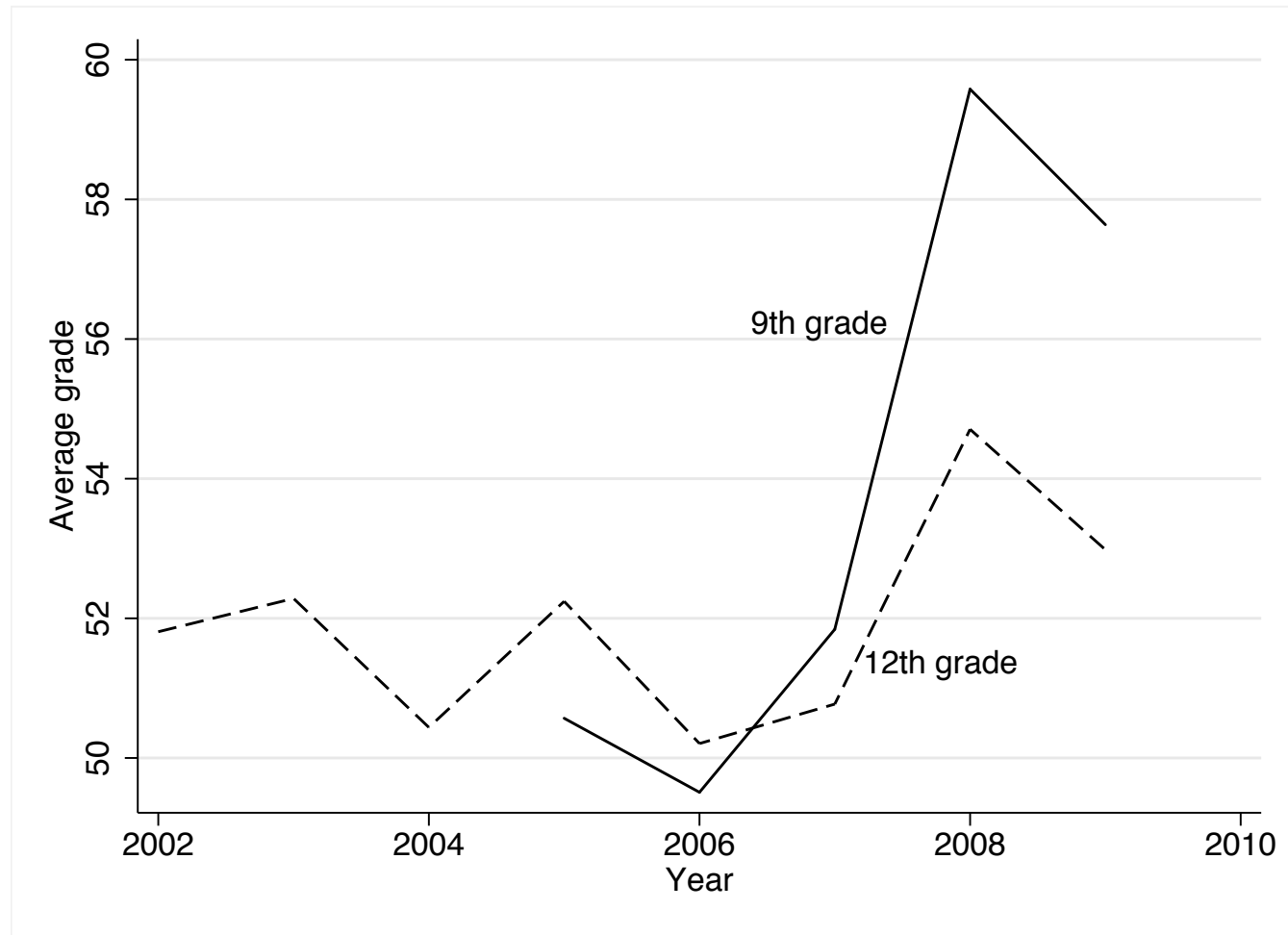


Figure: Exam score evolution 2002-2008: average exam score over time for 12th and 9th grades (0-100 scale)

Endogeneity

While school fixed effects should control for across school variations, we may still worry about unobserved *time-varying* effects that influence both exam scores and Internet use and might lead to inconsistent estimates.

- Examples: changes in **internal organization**, **technical savviness**, or **resources** available to a school

We may get a positive estimate on broadband use even if there is no causal effect.

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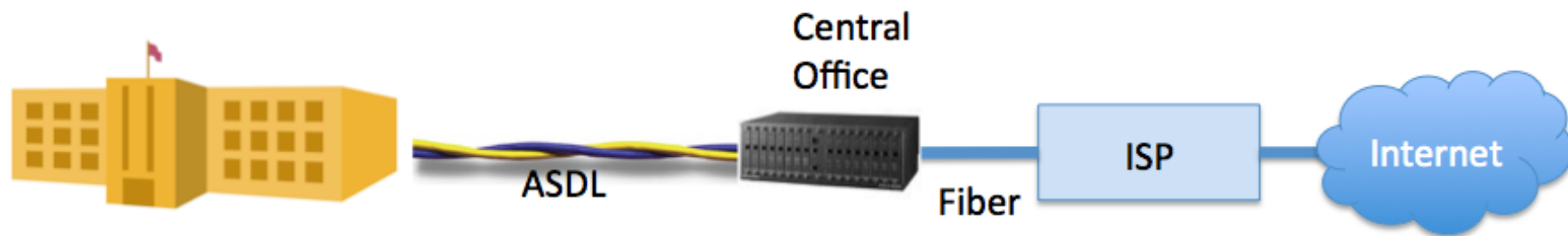
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Solution: Instrumental Variable (IV)

- 1 Correlated with change in Internet usage
- 2 Not correlated with the unobserved effect

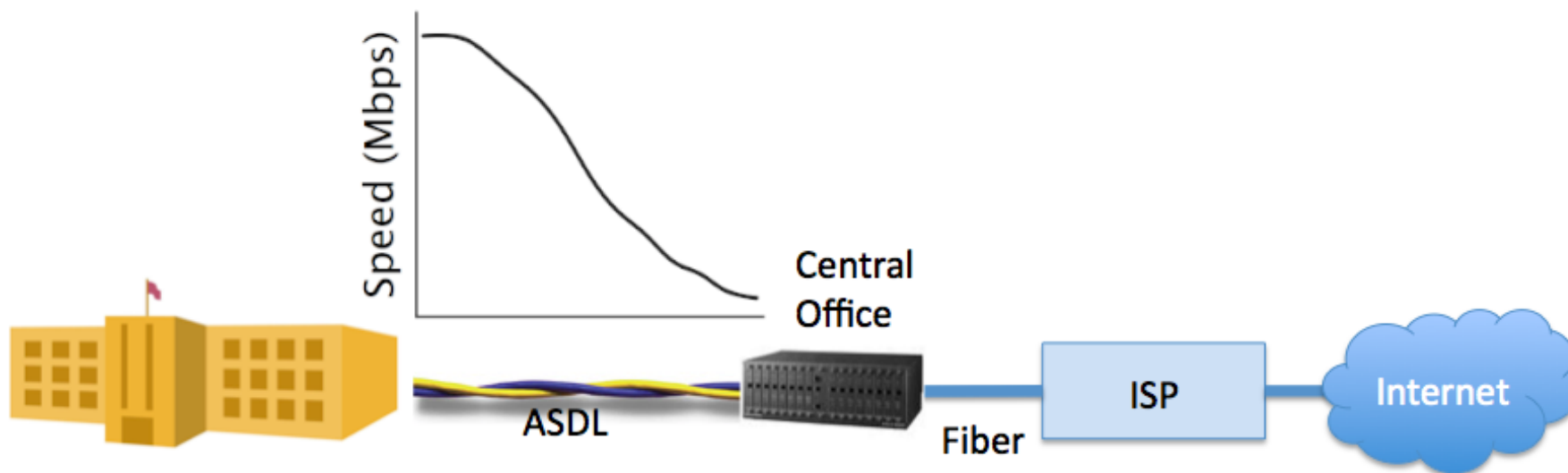
Methodology

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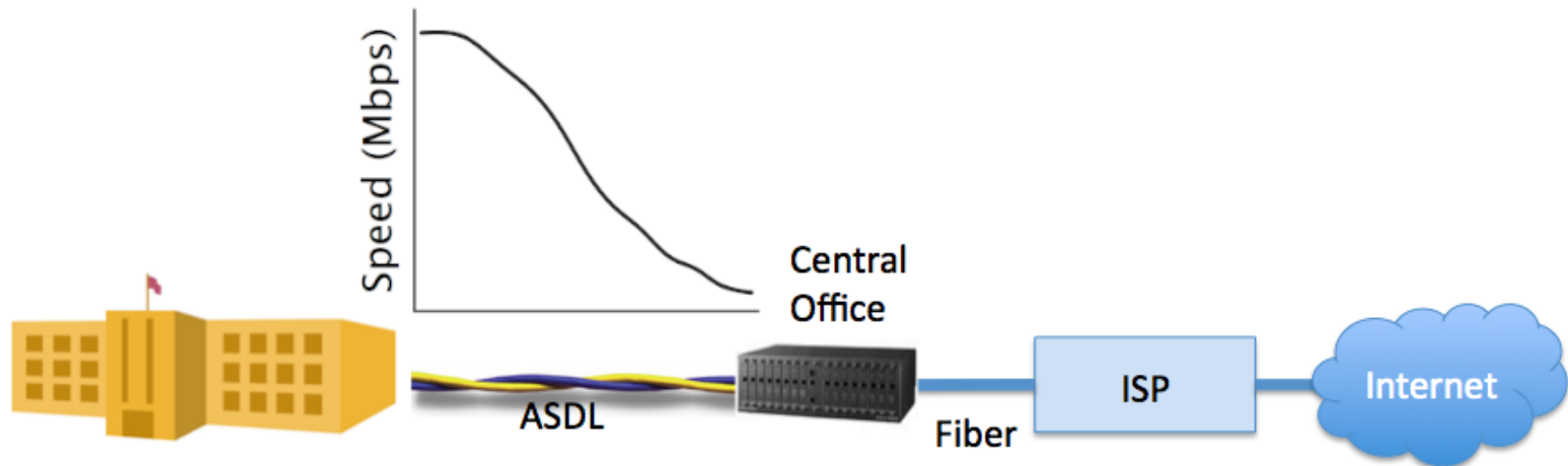
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Methodology

Instrumental Variable



Distance to the ISP's Central Office:

- 1 Correlated with change in Internet usage
- 2 Not correlated with "change in grade".

Results

Correcting for Endogeneity

- The IV specification yields a **negative coefficient** on broadband usage for the 2005-2008 period.
- For 2008, the average broadband use in schools of **51 GB/month** in 2008 leads to a decrease of **8.9%** in the average exam scores, i.e., a decrease of about **one standard deviation** in 2008 scores.
- This effect is still negative for the 2005-2009 period, though it becomes smaller in magnitude and statistically insignificant.

Boys and Girls Behave Differently

To explore the distraction effect in more detail, we use a survey conducted by ANACOM on the activities performed by students on the Internet (659 students; 10-12th):

Table: Participation in activities by gender (%).

Activity	Male	Female	Diff.
Search for Scientific Info	67.5	74.1	-6.6**
Email	93.1	89.5	3.7**
Chat	89.4	88.2	1.1
Radio	48.4	42.5	6.0*
TV	27.8	13.9	14.0***
Music	75.6	52.7	22.9***
Games	71.9	34.9	36.9***

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (t-tests eq. var.)

Boys report to engage in distracting activities **more** than girls

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Boys report to engage in distracting activities **more** than girls
 If our story is correct, boys are **more likely** to be adversely affected

Results

Boys and Girls Behave Differently

- For 2005-2008, the average broadband use in schools of **51 GB/month** in 2008 leads to a decrease of **12.1%** in the average exam scores of boys, i.e., an decrease of about **1.5 standard deviations** in 2008 scores. The adverse effect of Internet use is not statistically significant for girls.
- This effect reduces in magnitude and loses significance for both boys and girls in the 2005-2009 difference.

Results

Low Performance vs. High Performance Schools

We split our sample of schools in quartiles based on their 9th grade average exam score in 2005 and apply our IV setup separately for each group of schools.

- Broadband Internet use does not affect all schools in the same way:
 - Schools in the **lowest performance quartile** are **more negatively affected** by broadband in 2008

Schools might need a certain level of maturity to be able to effectively counter the disruptive effect that the introduction of broadband Internet into schools might entail.

Discussion & Policy Implications

Mere provisions of broadband pipes does not seem to generate tangible benefits