



The Internet as a general-purpose technology: Firm-level evidence from around the world



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HIGHLIGHTS

- We find evidence that Internet functions as a general-purpose technology.
- Firms have higher growth and productivity where Internet access is greater.
- The results are robust no matter the firm size and the level of technology.
- Small firms benefit more from Internet than large firms do.

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ABSTRACT

This paper uses firm-level data to assess whether telecom services are general-purpose technologies. We find that only Internet services are so: firm growth and productivity are substantially higher when Internet access is greater and when firms use the Internet more intensively; and it benefits firms of both high- and low-tech industries, firms of all sizes, and firms with and without exporting. Small firms benefit more from Internet than large firms do. In contrast, fixed-line and cellular services are not robustly related to firm performance.

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1. Introduction

Countries that invest in telecom services benefit in two ways. Firms in industries that produce telecommunications equipment and services benefit directly. Firms in other industries benefit indirectly if telecom services, and especially broadband Internet services, are general-purpose technologies (Basu and Fernald, 2008).

There are several reasons why telecom services might be general purpose technologies. First, firms will spend less on communications and will find inputs more efficiently with better telecommunications services (Hardy, 1980; Roller and Waverman,

2001). Moreover, with better telecom services, firms might find it easier to expand into new regions, letting them achieve economies of scale. Finally, improved access to telecommunications might reduce information costs, encouraging firms to create and share knowledge, and to organize more efficiently.

Studies using cross-country data have found countries with better-developed telecommunications services grow faster.² These studies, however, have mostly focused on fixed-line and cellular services. Because the Internet and broadband expanded only recently, fewer studies have looked at the association between Internet services and economic growth (Qiang, 2009). This is unsurprising; general-purpose technologies take time to affect economic performance (Basu and Fernald, 2008).

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² See, Hardy (1980), Roller and Waverman (2001) and Lee et al. (2011).

Table 1
Effect of telecommunications on firm performance.

Column	(1)	(2)
Dependent variable	Sales growth	Labor productivity (nat. log)
Observations	24,439	23,856
Number of countries	130	130
Sector dummies	Y	Y
Time dummies	Y	Y
Telecom variables		
Average web use	0.166*** (8.09)	0.007*** (7.21)
Fixed line Internet subscriptions per 100 people	0.521** (2.31)	0.058*** (5.14)
Fixed line subscriptions per 100 people	0.016 (0.09)	−0.017** (−2.26)
Cellular subscriptions per 100 people	−0.028 (−0.83)	−0.001 (−0.78)
Firm characteristics		
Initial sales (nat. log)	−4.922*** (−12.09)	
Age of firm (nat. log)	−1.143** (−2.18)	0.127*** (5.01)
% of firm that is foreign-owned	0.082*** (7.10)	0.006*** (11.04)
% of firm that is state-owned	0.074 (1.94)	0.001 (0.80)
Local averages		
% of firms with overdraft	7.154*** (4.16)	0.368*** (4.17)
% of firms using trade credit	2.629 (1.12)	0.311** (2.35)
Country controls		
GDP per capita (nat. log, PPP 2009 US\$)	−2.169 (−0.87)	0.337*** (3.05)
Population (nat. log)	−0.342 (−0.72)	−0.087** (−3.19)
Country is landlocked	1.360 (0.41)	−0.107 (−0.76)
Cost of laying off worker	0.017 (0.47)	−0.000 (−0.10)
Cost of exporting 20 ft container	−0.002 (−1.62)	0.000 (1.32)
Constant	63.972*** (3.76)	6.303*** (6.51)
R-squared	0.138	0.283

Note: *T*-statistics in parentheses. Standard errors are clustered at country level.

* Statistically significant at 10% significance level.

** Statistically significant at 5% significance level.

*** Statistically significant at 1% significance level.

We contribute to the literature on telecommunications and economic performance in two ways. First, we allow different telecom services—cellular, fixed-line, and the Internet—to affect firm performance differently. Second, rather than focusing on economic growth, we look at how access to telecommunications affects firm performance, and we examine whether telecom services are general purpose technologies by investigating whether firm performance in countries with better telecom access is better in large segments of the economy.

2. Empirical results

We use worldwide firm-level data from the World Bank's Enterprise Surveys (WBES). The surveys have been completed in over 100 developing countries since 2006. We exclude retail and service firms because detailed information on firm performance is only collected for manufacturing firms.³

We estimate the following regressions:

$$y_{ijct} = \alpha + \beta_{TC} TEL_{ct} + \beta_{TI} TEL_{ijct} + \beta_F F_{ijct} + \beta_{BC} BE_{ct} + \beta_{BI} BE_{ijct} + \gamma_t + \mu_j + u_{ijct}.$$

Subscripts *i*, *j*, *c*, and *t* represent firm, industry, country, and year. The dependent variables (y_{ijct}) are log labor productivity and sales growth. All regressions include year (γ_t) and sector dummies (μ_j). Some regressions include country-year dummies. To avoid overstating precision, we cluster the standard errors at the country level.

The key independent variables are the country- and firm-level variables representing access to telecom services, TEL_c and TEL_{ijc} . The three country-level variables are fixed line density, mobile phone density, and Internet density (subscriptions per 100 people). We omit these variables when we include country-year dummies. The final telecom variable is the percent of similar firms in the same city with a business website. We include this rather than a variable indicating the firm has its own website because website use might be endogenous to firm performance.⁴ In contrast, one firm is unlikely to change the local business environment, especially given that most WBES firms are small or medium-sized. To further reduce endogeneity concerns, we omit the firm's own response when calculating the average.

³ The data are available at <http://www.enterprisesurveys.org/methodology>.

⁴ Many studies use a similar approach (Xu, 2011).

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