

Research Brief

Mobile broadband drives economic development

On average, a 10% increase in mobile broadband adoption causes an initial 0.8 percent increase in GDP. The economic effect gradually decreases over time. Based on our econometric results this implies that for the country with median average growth of mobile broadband penetration, the economic effect has disappeared six years after introduction.

Is mobile broadband important for economic development?

Throughout history, new technology has always been an important driver of productivity and economic development. In case of mobile broadband networks, the technology has spread rapidly, with connections increasing from approximately 27,000 in 2001 to 5.5 billion in 2018, according to GSMA.

There are those who have questioned that this expansion has contributed to global economic development, and instead suggested that the causal relationship may be the opposite.

Strong economic growth has made it easier for both the public and private sectors to invest in mobile broadband since 2001. However, that does not negate the likelihood that global economic development has been spurred by widespread and continuously growing access to mobile broadband. Therefore, this study investigates the possible connection between mobile broadband and economic growth using two different approaches.



How to measure the economic impact from mobile broadband

The model applied in this paper is based on the framework of the production function. The production function framework relates output to labor, capital, intermediate inputs, and total factor productivity (TFP). In this paper, output is measured as GDP.

The study is based on data for 135 countries (90 countries once controlling for capital labor and human capital) for the period 2002–2014. The data has been collected from various sources such as the Penn World Tables, the Conference Board and GSMA Wireless Intelligence Database.

Association shown between mobile broadband and GDP

The initial results show that there is an association between the mobile broadband variable and GDP in logarithmic form. The results are significant at the five percent level and remain robust when it includes variables measuring capital, human capital, labor, and the years since mobile broadband was introduced.

The association remains significant when the regression is estimated based on first differences, which is an additional method to control for country-specific effects. By introducing longer differences, the change in mobile broadband penetration is shown to also be associated with larger changes in log GDP. This indicates that there is also a lagged effect from mobile broadband penetration.

The basic regression model determines a correlation rather than a causal effect of mobile broadband introduction and penetration on GDP. In addition, this paper addresses the simultaneity by using an instrumental variable approach.

Formula for investigating correlation between mobile broadband and GDP

$$\ln \text{GDP}_{i,t} = \beta_0 + \beta_{\text{MB}} \ln \text{MB}_{i,t} + \beta_{\text{YI}} \text{YI}_{i,t} + \beta_{\text{K}} \ln \text{K}_{i,t} + \beta_{\text{L}} \ln \text{L}_{i,t} + \beta_{\text{HK}} \ln \text{HK}_{i,t} + (\alpha_i + \varepsilon_{i,t})$$

$\text{GDP}_{i,t}$ gross domestic product for country i at time t

$\text{MB}_{i,t}$ mobile broadband connections as percentage of total connections

$\text{K}_{i,t}$ capital input

$\text{L}_{i,t}$ labor input

$\text{HK}_{i,t}$ human capital input

$\text{YI}_{i,t}$ number of years since mobile broadband was introduced

α_i set of unobserved country specific effects

$\varepsilon_{i,t}$ error term



The number of mobile broadband connections are closely related to the number of mobile phone subscribers and internet users. Mobile broadband networks (primarily 3G and 4G) have been constructed along the existing base stations for mobile telephony by upgrading or modifying the pre-existing cellular infrastructure. Thus, the maximum penetration of mobile broadband could be modeled as a linear function of mobile phone subscriptions and fixed internet subscribers per 100 inhabitants before the build-out of mobile broadband. Mobile broadband penetration was modeled as a logistic form of S-shaped diffusion curve.

Results based on instrumental variables

While the first stage model predicts the diffusion of mobile broadband based on cell phone and internet penetration levels in 2002, the second stage model uses the fitted values of mobile broadband penetration from the first model to estimate the causal effect of mobile broadband on GDP.

The results imply that a 10 percent increase in the mobile penetration rate causes the level of GDP to increase by 0.8 percent, as shown in the table below. The size of this effect is substantial as 0.8 percent accounted for about 650 billion US dollars in 2017.

The effect of mobile broadband on log GDP

	Dependent variable: Log GDP	
	Basic regression	Controlling for years since MBB introduction
Log of predicted mobile broadband penetration (ln MB)	0.08 ***	0.12 ***
Years since mobile broadband introduction		-0.016 *
Log of labor (ln L)	0.71 ***	0.69 ***
Log of capital (ln K)	0.21	0.23 *
Log of human capital (ln HK)	0.83	0.93
Constant	7.07 ***	6.73 ***
Country fixed effects	Yes	Yes
Number of observations	1170	1170

*** indicate statistical significance at 1% level

* indicate statistical significance at 10% level



The results are robust when it includes the number of years since mobile broadband was introduced. However, the impact from “years since mobile broadband introduction” shows a negative value. This implies that the results are supportive of an introduction effect of mobile broadband, but the effect will eventually fade away as more years pass by since its introduction. Based on our econometric results this implies that for the country with median average growth of mobile broadband penetration, the economic effect has disappeared six years after introduction.

In summary, the results show that the extremely rapid diffusion of mobile broadband is driving positive macro-economic development in terms of GDP. This is important from a policy perspective because it proves that investments in mobile infrastructure are crucial to continue economic development.

Reference to full paper:

[Edquist, H, Goodridge, P, Haskel, J, Li, X and Lindquist, E \(2018\), How important are mobile broadband networks for global economic development?, Information Economics and Policy, vol. 45, pp. 16–29.](#)