

THE ECONOMIC CONTRIBUTION OF BROADBAND AND DIGITIZATION

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THE PURPOSE OF THIS STUDY IS TO ADVANCE THE ECONOMETRIC ANALYSIS OF THE IMPACT OF BROADBAND AND DIGITIZATION IN LATIN AMERICA GDP

- The methodologies used are based on a prior published study focused on the global impact of broadband and digitization on GDP
- Fixed broadband increases with economic development:
 - Higher income countries: 10 per cent increase in broadband penetration yields 1.4 per cent increase in GDP growth.
 - Middle income countries: 10 per cent increase in broadband penetration yields 0.5 per cent increase in GDP growth.
 - Low income countries: while the coefficient of fixed broadband impact was similar to the middle impact countries, it was not statistically significant
- The economic impact of mobile broadband is higher in countries with lower levels of development:
 - High income countries: no economic impact was detected
 - Middle income countries: An increase of 10 per cent in mobile broadband penetration yields an increase in 1.8 per cent in GDP
 - Low income countries: An increase of 10 per cent in mobile broadband penetration yields an increase in 2.0 per cent in GDP
- The economic impact of digitization increases with development:
 - OECD countries: An increase of 10 per cent in the Digital Ecosystem Development Index resulted in a 1.4 per cent growth in GDP per capita
 - Non-OECD countries: An increase of 10 per cent in the Digital Ecosystem Development Index yielded a 1.0 per cent growth in GDP per capita

ACCORDING TO GLOBAL RESULTS, DIFFERENT EFFECTS HAVE BEEN HYPOTHESIZED FOR NORTH AMERICA, AND LATIN AMERICA – THEY HAVE BEEN TESTED THROUGH ECONOMETRIC MODELS

- Impact of fixed broadband: High in North America, medium in Latin America and the Caribbean.
- Impact of mobile broadband: Medium in North America, high in Latin America and the Caribbean.
- Impact of digitization: High in North America, medium in Latin America and the Caribbean
- To test the hypotheses of broadband economic impact, a database was built for the following countries: Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Jamaica, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, United States of America, Uruguay, and Venezuela.
- The database contains time series for all the required variables between 2010 and 2017.
- The data sources are the International Telecommunications Union (ITU), the World Bank, and GSMA
- A structural model (3SLS) tested the economic contribution of mobile and fixed broadband using four equations: an aggregate production function modelling the economy and, subsequently, three functions: demand, supply and output.
- For digitization, the hypothesis is tested using an endogenous growth model, which links GDP to fixed stock of capital, labour force, and the digitization index as a proxy of technology progress.

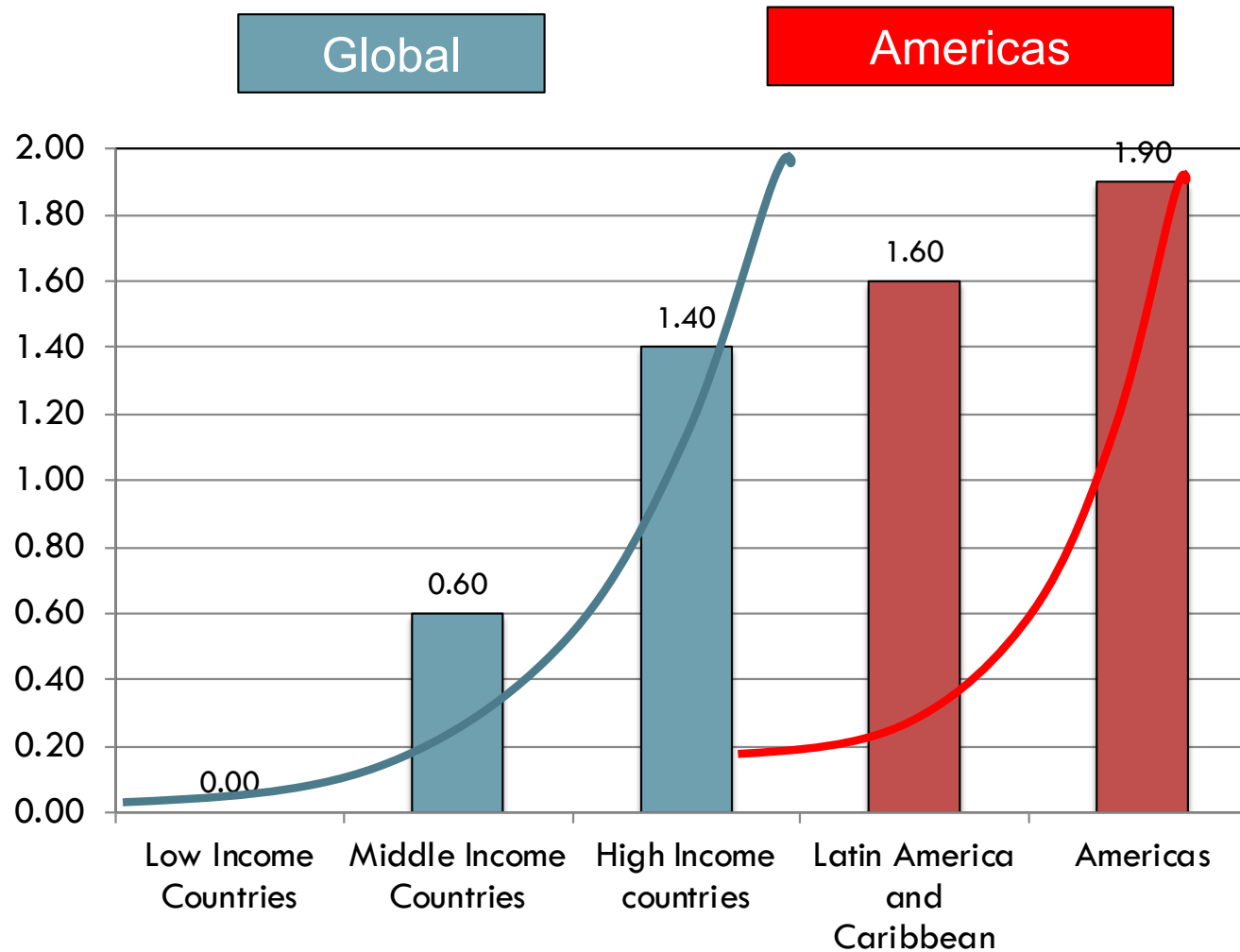
THE ECONOMIC IMPACT OF FIXED BROADBAND IS HIGHER IN THE AMERICAS SAMPLE THAN IN LATIN AMERICA

| GDP PER CAPITA (PPP) | AMERICAS | LATAM |
|--|--------------|--------------|
| GDP per capita (PPP) | | |
| Fixed Broadband Subscribers Penetration | 0.18797 *** | 0.15745 *** |
| Capital | 0.30414 *** | 0.31854 *** |
| Education | 0.00063 | 0.03039 |
| Fixed Broadband Subscribers Penetration | | |
| Fixed Telephone Subscribers | 0.16412 *** | 0.09390 |
| Rural Population | -0.05796 ** | -0.04654 * |
| GDP per capita | 0.81847 *** | 0.89943 *** |
| Fixed Broadband price | -0.30709 *** | -0.43283 *** |
| HHI Fixed Broadband | -0.04456 | -0.06636 * |
| Revenue Fixed Broadband | | |
| GDP per capita | 1.41969 *** | 1.07432 *** |
| Fixed Broadband price | 1.52376 *** | 1.67497 *** |
| HHI Fixed Broadband | -1.21225 *** | -1.02064 *** |
| Fixed Broadband Adoption Growth | | |
| Revenue Mobile Broadband | -0.40717 *** | -0.01968 |
| Observations | 784 | 688 |
| Number of countries | 18 | 16 |
| Country Fixed Effects | Yes | Yes |
| Year and quarter Fixed Effects | Yes | Yes |
| Years | 2005-2017 | 2005-2017 |
| R-Squared first model | 0.9905 | 0.9819 |

- According to the fixed broadband model, this technology has had a significant impact on the Americas during the last twelve years (2005-2017).
- In The Americas region, an increase of 10 per cent in fixed broadband penetration yields an increase in 1.9 per cent in GDP
- In The Latin American region, an increase of 10 per cent in fixed broadband penetration yields an increase in 1.6 per cent in GDP

A COMPARISON OF THE RETURNS TO SCALE EFFECT FOR THE GLOBAL SAMPLE AND FOR THE AMERICAS REGION CAN BE VISUALIZED

ECONOMIC IMPACT OF FIXED BROADBAND, 2017 (GLOBAL MODEL COMPARED TO THE AMERICAS REGION MODEL)



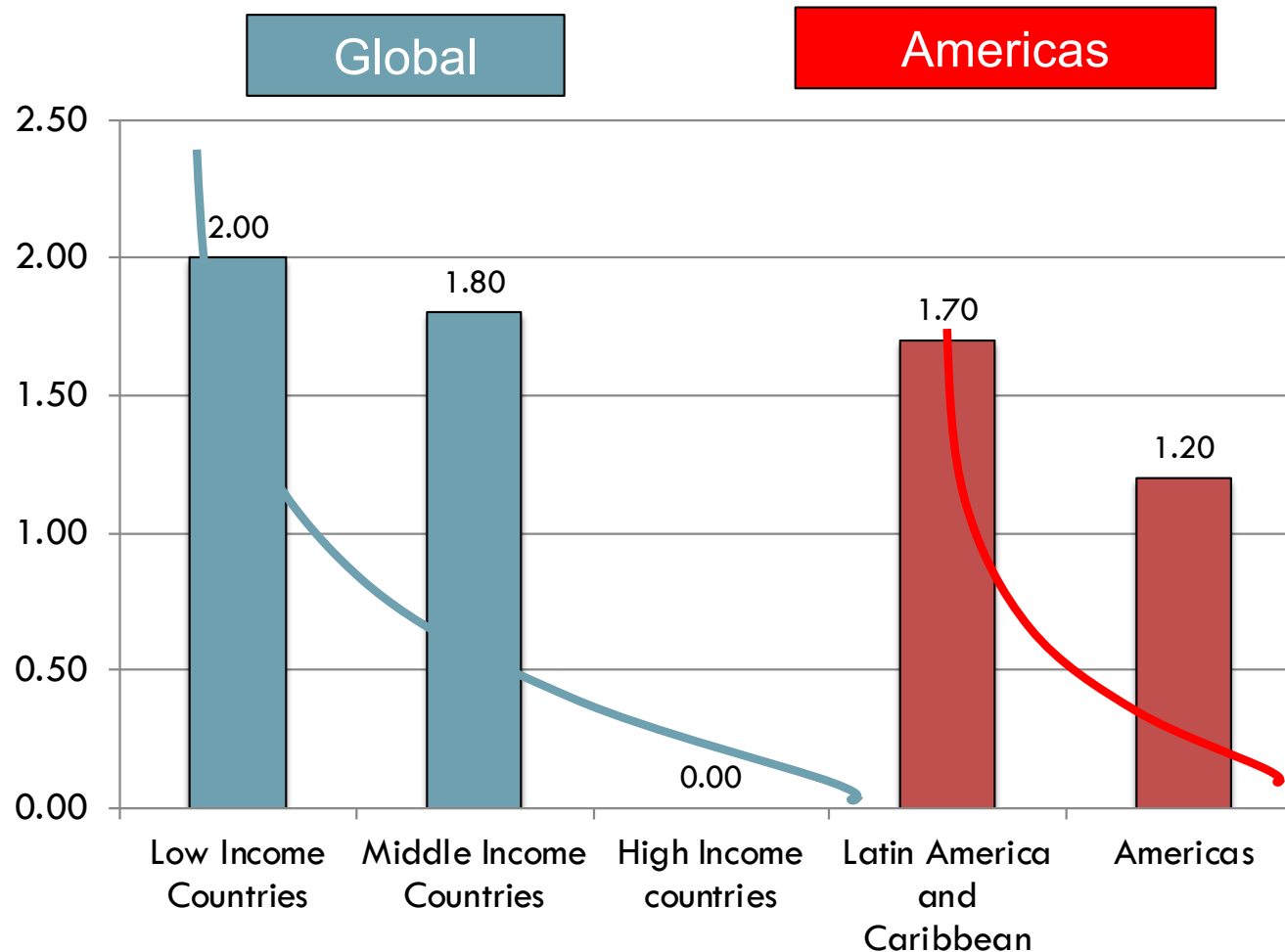
THE ECONOMIC IMPACT OF MOBILE BROADBAND IS HIGHER FOR LATINA AMERICA THAN IN THE WHOLE AMERICAS SAMPLE

| GDP PER CAPITA (PPP) | AMERICAS | LATAM |
|--|--------------|--------------|
| GDP per capita (PPP) | | |
| Mobile Broadband Unique Subscribers Penetration | 0.11556 *** | 0.17329 *** |
| Capital | 0.02984 | 0.03075 |
| Education | 0.62879 *** | 0.63360 *** |
| Mobile Broadband Unique Subscribers Penetration | | |
| Mobile Unique Subscribers Penetration | 1.81434 *** | 1.94950 *** |
| Rural Population | -0.11386 *** | -0.07061 *** |
| GDP per capita | -0.12194 * | -0.23404 *** |
| Mobile Broadband price | -0.09555 * | -0.58092 *** |
| HHI Mobile Broadband | -1.02608 *** | -0.85911 *** |
| Revenue Mobile Broadband | | |
| GDP per capita | 2.32425 *** | 1.46456 *** |
| Mobile Broadband price | -0.79913 *** | -3.89924 *** |
| HHI Mobile Broadband | -3.55965 *** | -2.47734 *** |
| Mobile Broadband Adoption Growth | | |
| Revenue Fixed Broadband | -0.36353 *** | -0.17906 ** |
| Observations | 565 | 501 |
| Number of countries | 18 | 16 |
| Country Fixed Effects | Yes | Yes |
| Year and quarter Fixed Effects | Yes | Yes |
| Years | 2010-2017 | 2010-2017 |
| R-Squared first model | 0.9767 | 0.9412 |

- According to the mobile broadband model, this technology has had a significant impact on the Americas during the last seven years (2010-2017).
- In The Americas region, an increase of 10 per cent in mobile broadband penetration yields an increase in 1.2 per cent in GDP
- In The Latin American region, an increase of 10 per cent in mobile broadband penetration yields an increase in 1.7 per cent in GDP

THESE RESULTS CONFIRMS THE EFFECT OF MOBILE BROADBAND, DIMINSIHNG ITS ECONOMIC IMPACT IN HIGH PENETRATION COUNTRIES

ECONOMIC IMPACT OF MOBILE BROADBAND, 2017 (GLOBAL MODEL COMPARED TO THE AMERICAS REGION MODEL)



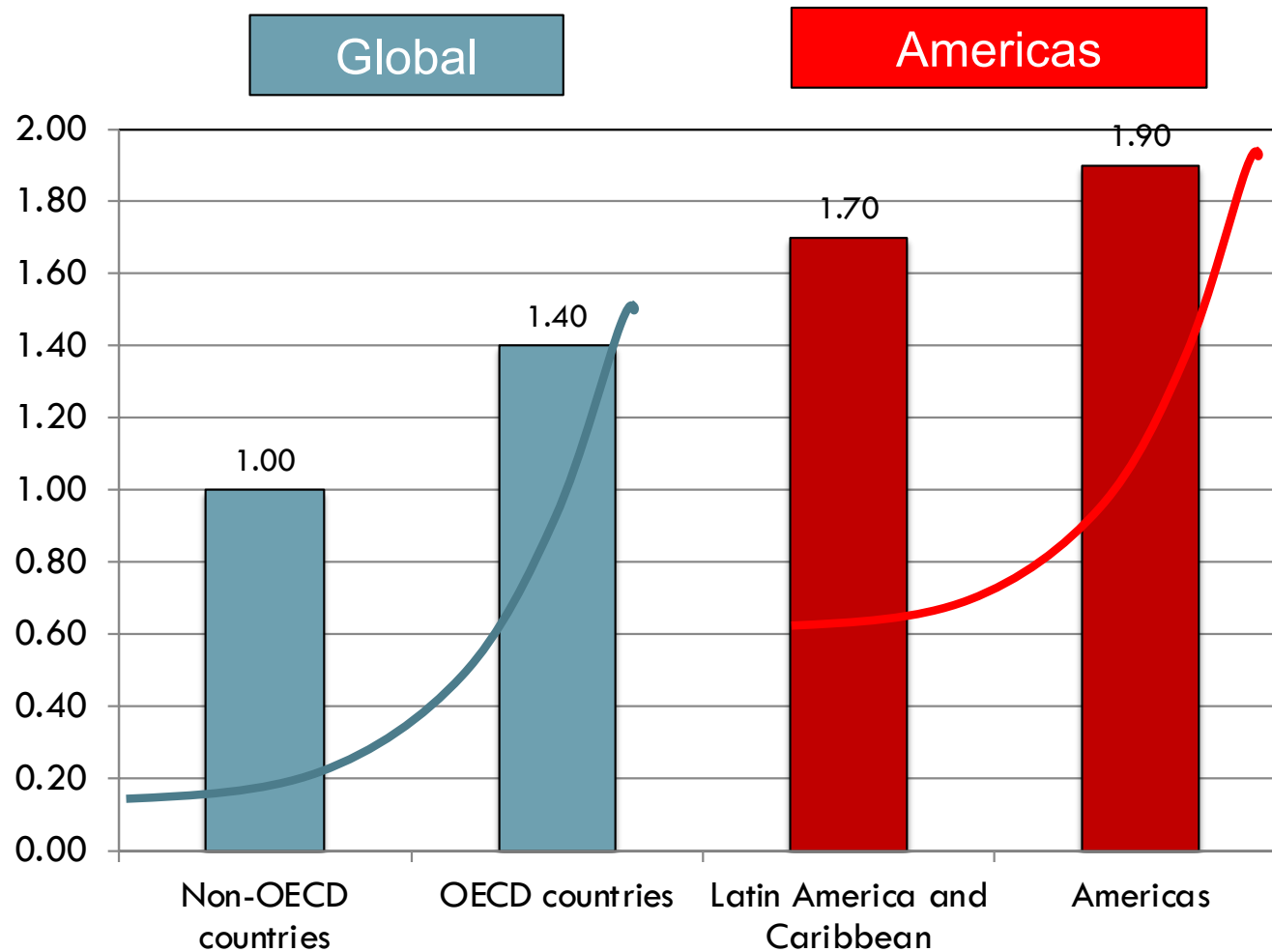
THE ECONOMIC IMPACT OF DIGITIZATION IS HIGHER IN THE AMERICAS THAN IN LATIN AMERICA, THEREBY CONFIRMING A RETURN TO SCALE

| Variables (Impact on GDP) | AMERICAS | LATAM |
|------------------------------|------------------------|------------------------|
| Previous GDP | 0.6721 *** (0.0586) | 0.6746 *** (0.0633) |
| Digitization | 0.1882 ** (0.0910) | 0.1662 * (0.0995) |
| Capital | -0.0261 (0.0990) | -0.0337 (0.1057) |
| Labour | -1.3788 ** (0.5305) | -1.2501 ** (0.5809) |
| Constant | 2.1224 *** (0.6702) | 2.1421 *** (0.7393) |
| Observations | 126 | 106 |
| Year fixed effects | Yes | Yes |

- According to the model, in the Americas an increase of 10 per cent in the Digital Ecosystem Development Index results in a 1.9 per cent growth in GDP per capita.
- In LATAM an increase of 10 per cent in the Digital Ecosystem Development Index results in a 1.7 per cent growth in GDP per capita.

THESE RESULTS ARE IN LINE WITH THE GLOBAL MODEL TESTING OECD AND NON-OECD COUNTRIES

ECONOMIC IMPACT OF DIGITIZATION: GLOBAL COMPARED TO THE AMERICAS REGION (2017)



THE EVIDENCE YIELDED BY THE ECONOMETRIC ANALYSIS CONFIRMS THE HYPOTHESES

| Hypothesis | 10% increase: Impact on GDP per capita growth | |
|---|---|---------------------------------|
| | Americas region (includes United States of America and Canada) | Latin America and the Caribbean |
| Economic impact of fixed broadband will be higher in the Americas region (which includes the United States of America and Canada) than in Latin America and the Caribbean (returns to scale effect). | 1.9 | 1.6 |
| Economic impact of mobile broadband will be higher in Latin America and the Caribbean than in the Americas region (which incl. the United States of America and Canada) (Saturation effect). | 1.2 | 1.7 |
| Economic impact of digital ecosystem will be higher in the Americas region (which includes the United States of America and Canada) than in Latin America and the Caribbean (returns to scale effect) | 1.9 | 1.7 |

The Americas

The economic contribution of broadband, digitization and ICT regulation

Econometric modelling for the Americas



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