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The bad news is that the digital access divide is here to stay: Domestically installed bandwidths among 172 countries for 1986–2014

Martin Hilbert

University of California, Davis, Kerr Hall 369, Davis, CA, United States

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ABSTRACT

In contrary to the common argument that the digital access divide is quickly closing and that the focus should shift to skills and usage, this article shows that access to digital communication is a moving target unlikely to ever be solved. While the number of subscriptions reaches population saturation levels, the bandwidth divide continuous to be dynamic. The article measures the nationally installed bandwidth potential of 172 countries from 1986 to 2014. The overarching finding is that the divide in terms of bandwidth does not show any clear monotonic pattern. It fluctuates up and down over the decades as the result of an intricate interplay between incessant technological progress and diffusion of technology. The bandwidth divide between high- and low income countries has first increased and only decreased below historic levels very recently during 2012–2014. In general it shows that the bandwidth divide is linked to the income divide, which is notoriously persistent. The bandwidth distribution among all countries is undergoing a new process of global concentration, during which North America and Europe is being replaced by Asia as the new global leader. In 2014 only 3 countries host 50% of the globally installed bandwidth potential (10 countries almost 75%). The U.S. lost its global leadership in 2011, being replaced by China, which contributes more than twice as much national bandwidth potential in 2014 (29% versus 13%). Despite this bad news about the continuous persistence of the digital access divide among countries, exploratory analysis from a global perspective brings the good news that many more individual people seem to enjoy more equal access to global bandwidth. All of this showcases the urgency to systematically develop indicators to track the digital divide in terms of bandwidth.

1. Introduction

The article takes inventory of the evolution of the international telecommunication infrastructure in terms of the installed telecommunication bandwidth capacity between 1986 and 2014. This matters both because of the importance of digital technologies throughout the world and the continuous evolution of telecommunication. Telecommunication access solution have evolved significantly during the past three decades, consisting exclusively of fixed-line telephony in the late 1980s, and a plethora of access solution with diverse performance levels. Over the last decade, the literature has increasingly pointed to the importance of bandwidth and especially broadband metrics, which have shown to have important

E-mail address: hilbert@ucdavis.edu

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socio-economic benefits (Dutton, Gillett, McKnight, & Peltu, 2004; Koutroumpis, 2009; Prieger, 2013; Gruber, Hätönen, & Koutroumpis, 2014; Lee, Park, & Hwang, 2015). Quantifying the digital divide in terms of subscriptions might not be sufficient anymore, as not all subscriptions are equal. In light of this, the key question of this article is if technological progress has rendered traditional metrics of the digital divide obsolete.

1.1. From subscriptions to bandwidth

Traditionally the international digital divide is assessed in terms of telecommunication subscriptions (NTIA, 1995; OECD, 2001; ITU, 2015). On the international level, the most common go-to source are the statistics from United Nations' International Telecommunication Union (ITU, 2014). ITU has undertaken a sustained effort over several decades to collect this data from administrative registries of national telecommunication authorities in a harmonized manner. These same databases have shown that the number of mobile and fixed telecom subscriptions per person are increasingly reaching a certain level of global saturation, including 6.8 billion mobile phone subscriptions worldwide for 7.0 billion people in 2014.

Since there seems to be a certain limit in how many technological devices a person handles (Hilbert, 2014a), any analysis that uses the number of subscriptions as a proxy for the digital divide must come to the conclusion that the divide is closing over time. As early as the year 2000, this perspective has led to the impression that "the gaps are rapidly closing" (Compaine, 2001). Over the years, this view has become as engrained into the way of looking at the digital divide that is has become natural to assume a national "carrying capacity of Internet users" (e.g. Neokosmidis, Avaritsiotis, Ventoura, & Varoutas, 2015). Once this carrying capacity is reached (once everybody has reached the limit of how many subscriptions can be handled), saturation sets in and the divide can only close. As a result, new technological solutions might create new divides, but in terms of their numbers the divide will always be closing over time, as it has happened with computer access, mobile phones, or broadband adoption (e.g. Vicente & López, 2011; Loo & Ngan, 2012; Prieger, 2013).

Based on this impression, scholars have long moved on to work on the digital divide in terms of differential usage patterns, caused by differences in skills, culture and other demographics and social variables (Mossberger, Tolbert, & Stansbury, 2003; Warschauer, 2004; van Dijk, 2005; Vicente & López, 2011; Deursen & Dijk, 2014)). This sometimes referred to as the "second-level digital divide" (Hargittai, 2002; Büchi, Just, & Latzer, 2015). In more advanced countries, the dimension of physical access has become a question of technology maintenance to sustain the level of subscriptions and devices (Gonzalez, 2015).

However, the fact that the number of telecom subscriptions per person seems limited and will eventually reach saturation levels does not automatically imply that inequality in terms of access to digitalized information is reducing as well. This is because bandwidth is not uniformly distributed among subscriptions. Fig. 1a shows this distinction was not relevant only a few decades ago. The late 1980s exhibited a linear one-to-one relationship between subscriptions and bandwidth, as there was only fixed line telephony around, all with the same bandwidth. Today's digital infrastructure offers a myriad of different bandwidth options, which leads to an L-shaped non-linear relationship exhibit in Fig. 1b. The Figure shows that ICT diffusion seems to hit an invisible wall at around 2–3 subscriptions per person. However, the digital divide continues at this point, just along a new dimension: the bandwidth dimension.

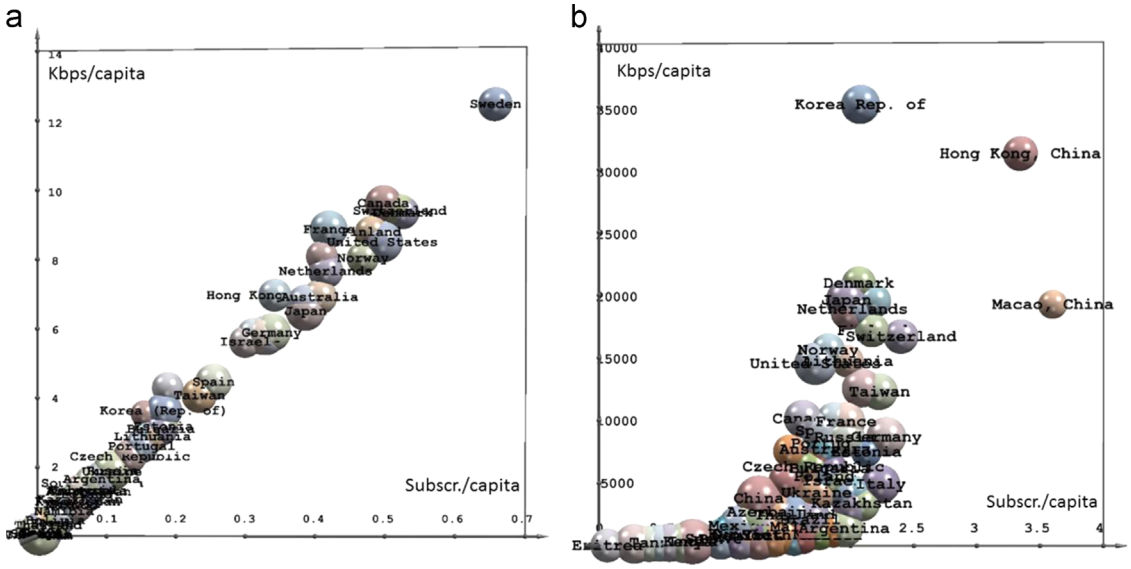

Fig. 1. Subscriptions per capita (fixed and mobile) vs. kbps per capita (voice and data in optimally compressed kbps of installed bandwidth potential). $N = 100$ countries. Size of bubbles: log population. (a) 1986 (b) 2013.