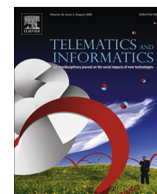




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Broadband penetration and economic growth: Do policies matter? ☆

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ABSTRACT

Although a significant body of literature has examined the interlinkage between broadband penetration and economic growth, the linkage between broadband policies and broadband penetration has been less studied in the literature. In addition, the role of 3G/4G services has also received limited attention. To address this issue, we combine the staggered timing of the implementation of broadband and 3G/4G services across countries and examine its impact on broadband penetration. Relatedly, we also examine the impact of broadband penetration on economic growth and the possible growth drivers. We find that while broadband policies improve fixed broadband penetration, 3G/4G services improve mobile broadband penetration; the magnitude of the latter being nearly three-times that of the former. Besides, we also uncover a positive effect of broadband penetration on economic growth, primarily working through a reduction in broadband prices and well as greater innovation and entrepreneurial activity.

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1. Introduction

The past decade or so has witnessed a significant amount of attention, in both the academic literature as well as in policy circles, towards understanding the impact of broadband.¹ The reason for this focus is not too far to seek. It is increasingly recognized that the beneficial effects of broadband can permeate multiple sectors of the economy such as energy, water, transport and industry. Second, by expanding the frontiers of traditional jobs as also creating new jobs and IT-driven opportunities, broadband is also a harbinger of social transformation (Gelvanovska et al., 2014). Third, reliable and reasonably priced broadband Internet access is a key driver of foreign direct investment (FDI) decisions.

Several studies have persuasively documented that broadband plays a key role in not only driving economic growth, but is also an enabler of social transformation (Crandall et al., 2007; Thompson and Garbacz, 2008; Czernich et al., 2009; Qiang et al., 2009). Using cross country data, Clarke and Wallsten (2006) show that a 1 percent increase in internet users is associated with a 4.3 percent boost in exports. Using data from international print and online media, Acemoglu et al. (2014) show that the valuation of firms connected to the incumbent regime in Egypt were roughly 1 percent lower on the days of protest.

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¹ Broadband can be characterized by high-speed, always on internet connectivity (Gelvanovska et al., 2014). Unless stated otherwise, broadband penetration refers to both fixed as well as mobile broadband.

According to the [Ericson Mobility Report \(2016\)](#), from just 750 million mobile subscriptions worldwide in 2000, this number has reached 7.1 billion in 2014 and expected to touch 9 billion by 2021, accounting for nearly 90% of the world population.

In tandem with these global advancements, the experience of the economies of the Arab world has been quite remarkable. According to the Broadband Commission ([International Telecommunication Union, 2012a,b, 2016a,b](#)), broadband subscription in the Arab states jumped from 8 million in 2011 to 185 million in 2016, registering a compound growth rate of nearly 90% as compared to a global growth rate of 44% during the same period. The cumulative average growth rate in this region is the second highest across major regions globally, next only to Africa ([Fig. 1](#)). The total value added generated by the mobile ecosystem was US \$ 47 billion or, 1.6% of combined GDP in 2014 ([GSMA Arab Economy, 2015](#)).

Notwithstanding this penetration, the growth masks the wide divergence across countries, with certain countries exhibiting penetration rates in excess of 100%, whereas in others, these numbers being much lower. Even the number of websites hosted in the MENA region is a tiny fraction of the global total ([Gelvanovska et al., 2014](#)). At the same time, several countries have enunciated National Broadband Policies (NBPs) and launched 3G/4G services in order to fast-track the use of ICT for economic and broader societal goals. These two contrasting set of developments raise the question as to how far the enunciation of NBPs and launch 3G/4G services in these countries played a role in fostering broadband penetration.

To inform this debate, this paper studies the impact of national broadband policies (NBPs) on broadband penetration and relatedly, on economic growth. Although the focus is on both fixed and mobile broadband, for purposes of emphasis, we often focus more on the latter. As observed by the Broadband Commission ([International Telecommunication Union, 2016a,b](#)), these NBPs encompass both fixed (delivered via phone line or through service provider's network of cables) and mobile (delivered via SIM card by connecting to a network) broadband and focus mostly on the supply side with the aim for adoption of broadband, with emphasis on availability, affordability and quality. Contextually, we also explore whether 3G/4G mobile services had any influence on broadband (both fixed and mobile) penetration. As a result, our analysis is able to distinguish between policies *per se* (e.g., National Broadband Policies) and their implementation (e.g., launch of 3G/4G mobile services). This contrasts with previous research which focuses on either the impact of broadband penetration on economic growth ([Koutroumpis, 2009; Qiang et al., 2009; Katz, 2009](#)) or alternately, explores the relevance of regulatory developments ([Estache et al., 2006; Ezzat et al., 2015](#)).

The information base comprises of data on the relevant variables for a sample of 15 MENA countries covering the period 2001–2014. The research design exploits the exogenous variation in the staggered announcement of national broadband policies and launch of 3G/4G mobile services across countries and utilizes a difference-in-differences (DID) research design to isolate the impact. We find that the effect of broadband policies is manifest primarily in an improvement in fixed broadband penetration by 0.3% points, whereas the impact on mobile broadband penetration is limited. On the other hand, the launch of 3G/4G mobile services is found to raise mobile broadband penetration significantly, although these is not much impact on fixed broadband services. The key takeaway is that, policies and services taken together exert a discernible effect on both fixed and mobile broadband penetration.²

The cross-sectional heterogeneity also mitigates concerns about omitted variables. Economically, it is possible that the results are driven by other contemporaneous reforms, and not just those related to broadband. If that were the case, we would incorrectly attribute changes in broadband penetration to broadband policies. Under such a situation, exploiting the cross-sectional heterogeneity enables us to difference out such effects. Additionally, we can control for country effects as well as demand side considerations and as a result, are able to take into account possible changes in the regulatory and economic environment over time and across countries.

The MENA region offers a compelling laboratory to examine this issue in some detail. First, notwithstanding the improved broadband penetration primarily in the mobile space, there is marked unevenness across countries. To illustrate, mobile broadband penetration rate in countries such as Bahrain, Qatar and UAE is well in excess to 100%, whereas in others such as Jordan, Algeria and Lebanon, the penetration rates are much lower, in the range of 35–50%. Second, the growth of broadband can support the development of domestic information technologies and communications networking, enabling countries in the region to diversify away from primary commodities, which is particularly relevant in an era of weak oil prices. Third, high-quality broadband at a cost-effective rate can not only lower transaction costs, but also encourage the development of manufacturing activity in the region. Finally, broadband is also a key medium for social transformation, as was evidenced during the Arab Spring. Viewed from this standpoint, the growth of broadband can not only improve the overall standards of civil engagement, but also play an important role in preserving the culture of the region.

Several impediments presently constrain the full-fledged development of broadband and especially mobile broadband, in the region. First, access to internationally harmonized spectrum on reasonable terms, which is a pre-requisite for seamless broadband connectivity, is still a challenge. According to the [International Telecommunication Union \(2012a,b\)](#), as compared to a requirement of 1340–1960 MHz of spectrum by 2020 for mobile data traffic, the current availability in the MENA region is just 200 MHz. Second, several countries impose high taxes, comprising of a special tax over and above a general sales tax, on mobile services. Mobile services in Jordan for example, are subject to a specific tax of 24 percent in addition to a general sales tax. In Tunisia likewise, consumers pay a 5 percent *ad valorem* industry fee on mobile services. Finally, mobile operators are required to pay a significant proportion of their revenue - up to 2% of revenues in Morocco and 3% in Algeria - into Universal Service Funds (USF), impeding their inclination for increasing investment ([Gelvanovska et al., 2014; GSMA, 2016](#)).

² We employ the nomenclatures 3G, 3G/4G and 4G services, interchangeably.

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