



Relative and absolute components of leapfrogging in mobile phones by developing countries



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ABSTRACT

This paper suggests a novel way of measuring the important concept of leapfrogging in mobile phones. It argues that an adequate measure of leapfrogging needs to include absolute as well as relative components. The new measure is used to measure the performance of around 60 developing countries and offers an explanation of the results.

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1. The concept of leapfrogging

Leapfrogging has been described with particular clarity by [Hobday \(1995\)](#). Thus,

The diffusion of the information technology paradigm and the rapid growth of the electronics industry have led some observers to believe that some developing countries may be able to leapfrog older vintages of technology and begin to catch up with advanced countries. According to this view, some industrializing economies are less hampered by commitments to previous generations of technology. Developing nations may benefit from the windows of opportunity provided by the new paradigm, especially at the early stages of diffusion.

It follows from this conceptualization that it is developing countries with the least commitment to the older technological infrastructure that potentially have the most to gain from the transition to a new paradigm (a thesis advanced more generally by [Gerschenkron](#) in 1962). If there is thus a potentially negative relation between the gain from leapfrogging and the stage of a country's development, there is also widespread agreement that information technologies, especially mobile phones, offer historically unprecedented opportunities for leapfrogging in this sense. Such opportunities arise partly because of the limited penetration of fixed phones in relatively backward developing countries and partly because mobile phones are relatively affordable, require only limited skills and an undemanding infrastructure. In this context, it is worth noting that 'Africa was the first region in the world where mobile phones overtook the number of fixed line telephones, an excellent example of how Africa's problem – in this case lack of copper infrastructure – can assist it in innovating and leapfrogging technologies to deal with those issues' ([Wright](#)). Indeed, as I show in the next section, African countries excel when the measure of leapfrogging is a relative one, the ratio of mobile to fixed line phones. However, I also show there that once allowance is made for an absolute component, the prevalence of African countries all but disappears.

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2. Relative measures of leapfrogging

2.1. The ratio of mobile to fixed-line phones

Any viable measure of leapfrogging has to contain the ratio of mobile to fixed-line phones because it is the relationship between these magnitudes that defines the concept (as described above). In particular, the higher is the numerator relative to the denominator, the higher will be the (relative) amount of leapfrogging in mobile phones. Table 1 shows that Sub-Saharan Africa, with a ratio of 32.0, performs best according to this measure, followed by another very poor region, South Asia.

Not only were there indeed an exceptionally limited number of fixed-line phones in Sub-Saharan Africa in 2010 (1.4 per 100 people), but there has been a phenomenal rate of growth in mobile phones since 2005. Indeed, over the period from 2005 to 2010 growth in the latter increased from 12.0 to 44.9 (per 100 people).

Another relative measure of leapfrogging is based not on the ratio of mobiles to fixed lines at a point in time, but rather the movement of this ratio over time in developing as opposed to developed countries. Advanced in the seventies by Antonelli (1990), it focuses on the ratio between new and old forms of telephony at two different points in time as part of a process in which poor, latecomer countries catch-up to the levels already reached by developed countries (it is perhaps worth emphasizing here that the catch-up is again a ratio rather than an absolute amount).

2.2. Leapfrogging as catch-up

Table 2 depicts the process of leapfrogging as conceived by Antonelli over the period from 2000 to 2005 and it also shows that African countries can be successful in this process.

The African countries had a ratio of mobile to total phones in 2000 that was roughly equal to the same ratio for a sample of developed countries. By 2006, however, the share of mobile to total phones was in the developing countries nearly double that of the developed country sample. All that would have been required for leapfrogging in this sense was for developing countries to have the *same* ratio in the later period as the developed parts of the world.

I have already offered some reasons for the remarkable performance by mobile phones but it is also worth citing another explanation proposed by the World Bank. In particular, the performance of this technology is seen as reflecting in part the process by which it has been financed. 'Unlike most fixed-wire telephone systems, railroads, and electrical grids, mobile phone technology has been introduced into most developing countries by well-funded private entrepreneurs working within a relatively competitive environment. As a result, the creation of the necessary infrastructure for these systems has not been held back by the government financing and other constraints that slowed the diffusion of older technologies' (World Bank, 2008).

2.3. A criticism of relative measures

The discussion thus far has been concerned with ratios of mobile to fixed-line phones (or total phones) and in Antonelli's framework leapfrogging involves a comparison between ratios over time in developed as opposed to developing countries.

Table 1
Mobile subscriptions as a ratio of fixed line phones, 2010.

| Region | Ratio |
|------------------------------|-------|
| Sub-Saharan Africa | 32.0 |
| South Asia | 21.8 |
| Latin America and Caribbean | 5.4 |
| Middle-east and North Africa | 5.2 |
| Eastern Asia and the Pacific | 3.9 |

Source: World Bank, The Little Data Book on Information and Communication Technology, 2011.

Table 2
Leapfrogging in mobile phones.

| | Share of mobile phones in total phones, 2000 | Share of mobile phones in total phones, 2005 |
|-------------------------------------|--|--|
| <i>Selected African countries</i> | | |
| Kenya | 0.28 | 0.94 |
| Mali | 0.25 | 0.91 |
| Ghana | 0.39 | 0.89 |
| <i>Selected developed countries</i> | | |
| Canada | 0.20 | 0.47 |
| France | 0.46 | 0.57 |
| USA | 0.36 | 0.53 |

Source: Calculations based on World Bank, ICT at-a-glance tables; Antonelli (1990).

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