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Evaluation of the opportunity cost of the spectrum: Application to the digital dividend

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ABSTRACT

The transition to digital television transmission (DTT) creates an opportunity for revising the current allocation and use of the spectrum, and for enhancing its efficiency. The fairly large amount of spectrum that will be freed up in the analog TV switch-off is known as the digital dividend. Many EU countries have decided to partially allocate these frequencies, through market mechanisms, to mobile use, but a large fraction of the dividend is supposed to remain in the hands of broadcasters. An efficient management of the spectrum requires that the use of this resource should be supported through appropriate incentive policies. This paper presents a techno-analytical approach to evaluate the opportunity cost of using a spectrum portion within the digital dividends' bandwidths, for example around 800–900 MHz, for both DVB-T and UMTS services, specifically addressing the extraordinary rise in the use of mobile broadband in the European context. The methodology is then applied to Italy to derive a baseline for administered prices reflecting the cost of spectrum use. Results obtained are then compared with existing evidences from other studies and Countries' experiences.

1. Introduction

The all-digital evolution of the EU TV broadcasting system has sparked a lively debate on the allocation and economic value of the spectrum. This technological shift improves transmission capacity and spectrum efficiency, building the case for freeing valuable frequencies and reallocating unused space. The fairly large amount of spectrum that will be freed up in the analog TV switch-off is known as the digital dividend. This dividend corresponds to an average of 72 MHz, thus representing a huge quantity of spectrum in the valuable UHF band (790–862 MHz). A reallocation of this portion of spectrum to different uses (including mobile broadband) might generate a positive effect on the whole economic system; recent studies show that the estimated value of services based on this portion of spectrum is expected to significantly impact EU GDP growth.[1]

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[1] See inter alia the analysis by SCF Associates Ltd. (2007) and Analysis Mason, Hogan and Harton (2009) for further details. More specifically, the SCF (2007) study compares the benefits of allocating the digital dividend from digital TV to mobile use. This study shows that investment in wireless technologies could lead to significant productivity gains versus an allocation to TV broadcasting. Estimates indicate an impact of an additional 0.6% GDP growth per year for the EU economy by 2020 in the mobile scenario when compared with broadcast TV.

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The European Union expects the switch-off to be completed by the end of 2012,[2] while member countries are expected to reallocate and reassign the digital dividend by 2013 (EC, 2007, 2010). Many of those countries have already decided, or are planning, to assign or partially allocate these frequencies via market mechanism (auctions) to mobile operators, in order to reinforce the adoption of mobile broadband. In Germany, the spectrum auction for 358 MHz (with blocks in 800, 1800, 2100 and 2600 MHz) ended May 2010 resulted in 4.3 € Bln, with an average price per MHz of 12.2 € Mln. In the context of this auction, the blocks in the 800 MHz band were paid 3576 € Mln, that is approximately 59 € Mln per MHz.[3] More recently, the Swedish auction for spectrum in the 800 MHz band ended March 2011 raised 233 € Mln for approximately 60 MHz, a modest result with respect to Germany's, with a value of 4 € Mln per MHz.[4] The Italian government foresees revenues from 2 to 2.4 € Bln for approximately 70 MHz in the 780–860 MHz band. Spain expects to raise between 12 and 16 € Bln from the upcoming spectrum auctions. France, UK and Sweden are scheduled to set up their auction procedures by the end of 2011 and assign the digital dividend spectrum to mobile operators within 2012.

The significant value of the spectrum in the UHF band is a direct consequence of its physical characteristics: these frequencies allow for long-distance propagation and a deep penetration in objects and buildings, thus enabling on one hand the supply of reliable mobility services, on the other the use of few cells to grant coverage in wide areas.

In order to maximize the economic benefits that might derive from this portion of spectrum, it is therefore important that the mechanism of allocating and assigning this public resource be efficient, exploiting the full potential of an asset which can be dedicated to several different and high-value uses. In general, market mechanisms (auctions and trading) increase overall efficiency since the value of the spectrum is determined by market interaction (Cave, Doyle, & Webb, 2007).

However, a large fraction of the dividend will remain – at least in the medium term – in the hands of broadcasters. All over Europe approximately 2/3 of the digital dividend is supposed to be reassigned to broadcasting or other social uses.[5] TV broadcasting services have in fact been recognized as having a considerable social and public value for society as a whole. As emphasized by the European Broadcasting Union (EBU, 2006) in their position paper on the Radio Spectrum Policy Group opinion on the EU spectrum policy implications on the digital dividend have amply illustrated the various roles played by broadcasting, in terms of promotion of national culture and social cohesion, providing reliable, unbiased information and varied and balanced programming for all segments of the population, aspects which cannot be fully converted in economic terms. However, this does not mean that the freed spectrum in the digital dividend band that would be allocated to broadcasters might not be assigned and managed in such a way as to provide better economic incentives to its use.

In principle, one policy measure that could boost efficiency in spectrum use would be the decision to make these frequencies tradable and to potentially reassign them to other uses in the near future, as long as technology continues to evolve. Alternatively, it could also be reasonable to adopt specific regulatory instruments, such as spectrum fees, that provide incentives for an improved use of the spectrum: whenever a company is forced to pay a price for the use of an input (i.e. frequencies), it will adapt its production level in order to minimize total costs, setting aside any inputs that would otherwise be left unused or are less productive.

The fee to be paid for the spectral resource would therefore be a tool to rationalize the use of the spectrum. Moreover, this fee should be correlated to the underlying value of the spectrum in order to meet the needs both of the government, which would be able to return to its citizens the benefit derived from the use of a public resource, and of the market, which would efficiently assign the spectral resource to the user willing to pay the most (i.e., the one self-assessed as able to extract the highest revenues from that resource).

One way of guaranteeing a reasonably efficient use of the spectrum is the adoption of the so-called Administered Incentive Pricing method (hereinafter, AIP). Administered Incentive Prices, developed in the UK in the early nineties, are administered (regulated) fees imposed to every spectrum user, both private (TV and FM broadcast, PTP links, mobile phone) and public (defense, aviation, etc.), that reflect the opportunity cost of using a portion of the spectrum.[6] Their main objective is to force spectrum users to evaluate the resource they are using, so that they may choose to retain control only over such resources as they actually deem necessary, leaving those that are underused (and hence less profitable) in the hands of the Government or national authorities, which are then free to reassign such frequencies through market mechanisms and for different uses. Ten years after its first adoption in the UK (Ofcom, 2009), the AIP method seems to have fulfilled its promise, effectively leading spectrum users to carefully consider the value of the spectrum they currently employ. Thus, the use of Administered Incentive Prices might be viewed as an important complementary tool to promote an overall efficient use of the spectrum.

[2] Retrieved from http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/topics/reorg/dividend/index_en.htm.

[3] See the Die Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen (2010). Retrieved from http://www2.bundesnetzagentur.de/frequenzversteigerung2010/ergebnisse.html.

[4] This difference appears less relevant if it is evaluated in terms of MHz per Population. The 800 MHz spectrum auction in Sweden resulted in 0.41 Euro or equivalently 0.58 USD per MHz/POP, while in Germany the 800 MHz spectrum licenses garnered approximately 0.90 USD per MHz/POP. Retrieved from http://www.4gtrends.com/articles/26961/swedens-800-mhz-spectrum-auction-sees-lukewarm-res/.

[5] For example, in the US 24 MHz out of 108 Hz of the digital dividend band have been assigned to public security; similarly in Australia 20 MHz of the digital dividend spectrum have been assigned to police and emergency services.

[6] See Indepen, Aegis, & Warwick Business School, 2004, Indepen and Aegis (2005), and Cave et al. (2007) for more detail; see also Section 2 for an overview.