

# The Economic Promise of Wireless Spectrum

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## Introduction

A founding principle of The Hamilton Project’s economic strategy is that long-term prosperity is best achieved by fostering economic growth and broad participation in that growth in a changing global economy. One important way to fulfill the goals of this strategy is to encourage the efficient use of our nation’s resources to maximize economic growth and to foster innovation. In this policy memo, The Hamilton Project considers the economic challenge of more-efficient assignment of wireless spectrum, which is critical to our modern information economy, as well as to national security, defense, and first responders.

Access to wireless spectrum is an essential input for individuals, the wireless industry, and the U.S. economy as a whole. Wireless devices—such as television, cell phones, Wi-Fi networks, car radios, GPS devices, and energy grid controls—use electromagnetic signals in the radio frequency range. This range is known as wireless (or radio) spectrum. The use of wireless systems is also critical to public-sector priorities. Providing public goods like national defense and public safety requires the effective use of wireless spectrum. Military satellites rely on spectrum to send data, police depend on radio channels to communicate, educational institutions depend on wireless applications, and air traffic controllers use spectrum to track and manage aircraft.

Due to technological limits, today’s wireless devices can operate effectively using only a limited range of frequencies. Technological limits also constrain the amount of spectrum available for use at any one time. This gives rise to the classic economics problem of how to efficiently provide a scarce good, which in this context refers to the rights to operate radio systems. An important goal of policy should be to facilitate the allocation and reallocation of wireless spectrum to realize the massive economic value of usable spectrum.

## Spectrum Background

In the United States, spectrum operating rights were initially allocated to uses and users by the federal government (the Federal Communications Commission [FCC] for private users and the Commerce Department’s National Telecommunications and Information Administration for public users) under what has been described as a “command-and-control” approach. Assignees received permission to operate at a specified frequency and a specified power level, and perhaps in a specified direction. This administrative system was put into place in 1927, when spectrum uses were far more limited than they are today (Faulhaber and Farber 2002). And yet certain critical features of the system remain essentially unchanged.

Economists have long argued for a market-based approach to allocating spectrum, in the spirit of the argument made by Nobel laureate Ronald Coase in his seminal 1959 paper. Coase's solution to the allocation problem was to create sufficient property rights in spectrum so that they could be sold to private owners who would then be free to buy, sell and lease spectrum rights (Coase 1959). Prices would be set by the market, in accordance with the demand and supply for spectrum, and in particular, for more or less valuable frequencies.

The FCC has gradually allocated more spectrum rights for flexible use; since 1993 it has been using auctions to award most new spectrum licenses. Still, there is much scope for continued improvements in the allocation and administration of spectrum policy.

## Policy Challenges

There are four policy challenges hampering the economic potential of wireless spectrum:

- 1. Inefficient allocation of spectrum operating rights.** The first and most basic economic issue is how to maximize the utilization of wireless spectrum by those who have the right to use it. Under the status quo, vast portions of the wireless spectrum are licensed to entities that allow it to sit unused or underutilized. Some economists characterize spectrum as an infinitely renewable resource because spectrum use today does not diminish its value in the future. As a result, any portion of spectrum left idle can be classified as wasted or inefficiently used. There is opportunity to improve spectrum allocation by ensuring that the rights to use wireless spectrum belong to those who will use it most productively.
- 2. Underinvestment in high-quality signal transmission and reception technology.** Transmissions in a neighboring band can reduce service quality. This creates a situation where signal strength is a "negative externality" since one spectrum operator's signal is another operator's interference. Poor receivers also impose a negative externality on those operating in a neighboring band because they force neighbors to operate at low power in order to avoid causing harmful interference. High-quality receivers can compensate for strong signals in an adjacent band; better receivers allow spectrum operators to use wireless spectrum more intensively and derive more economic value from each megahertz of wireless spectrum. In general, the current system of spectrum regulation does not incentivize users or device manufacturers to invest in high-quality receivers, leading to less intensive utilization of spectrum.
- 3. Reconciliation of government spectrum uses and private-sector demand.** A third challenge for spectrum policy is how to realize the economic value of spectrum operation for private firms and consumers without compromising key government priorities. Many government agencies hold rights to operate wireless systems, but do not make full use of their spectrum rights allocation. Recent technological developments, however, have rendered possible the "dynamic sharing" of wireless spectrum between commercial users and government users that hold spectrum rights. Technology now enables the federal government to provide spectrum use rights to private users when federal users do not need them, allowing commercial users to use otherwise idle spectrum rights without jeopardizing government priorities.  
  
Indeed, improved coordination between public and private users is a very promising area of spectrum reform. For instance, the President's Council of Advisors on Science and Technology (PCAST) recommended the creation of "shared-use spectrum superhighways" that allow for extensive spectrum sharing between federal and private uses of allocated spectrum. The PCAST report forecasts that this type of sharing, combined with other recommended reforms, could "multiply the effective capacity of spectrum by a factor of 1,000" (PCAST 2012). Such prospects present a potential avenue for addressing current and future spectrum needs.
- 4. Moving beyond "Command-and-Control" to Licensed and Unlicensed Use of Spectrum.** A fourth challenge is to determine how to move beyond the command-and-control paradigm and establish the appropriate mix of licensed versus unlicensed spectrum use. Licensing grants the license holder the right to exclude others from operating in that frequency band. Unlicensed spectrum implies a commons model of property, where access to a spectrum frequency is not excludable and anyone can operate in that frequency band so long as the equipment they use meets FCC standards. Traditional users of unlicensed spectrum include cordless telephones and baby monitors. Newer technologies that take advantage of unlicensed spectrum include, for example, Wi-Fi, Bluetooth, and electricity meters. Whereas licensed regimes concentrate the economic benefits of the license in the hands of the license holder, the benefits of unlicensed regimes are diffuse and accrue to anyone who chooses to use unlicensed spectrum (Benkler 2012). Determining how much spectrum to allocate to unlicensed versus licensed property regimes will likely be an enduring spectrum policy debate with substantial economic stakes.

These challenges can be addressed—at least to some degree—with innovative, evidence-driven approaches to reform. In the following section, we highlight two Hamilton Project proposals that aim to increase the efficiency of the spectrum allocation by strengthening market-based incentives in the distribution of spectrum resources.

## Policy Innovations

In his Hamilton Project discussion paper, Philip J. Weiser (2008) proposed a series of reforms to the regulation of wireless spectrum. To advance this objective, his paper highlighted the importance of identifying blocks of unused spectrum and encouraging greater leasing arrangements to gain access to otherwise unused or underused blocks of spectrum. It also outlined two directions for regulatory reform that would catalyze more-efficient uses of spectrum by providing greater flexibility to spectrum license holders. First, it set out a conceptual framework for enabling spectrum now dedicated to TV broadcasting to be transferred to more-valuable uses (e.g., wireless broadband). Second, it explained how the FCC should be reformed to oversee spectrum use through an increased emphasis on after-the-fact oversight as opposed to its legacy of closely prescribed before-the-fact rules.

The Spectrum Act of the Middle Class Tax Relief and Job Creation Act of 2012 enacted several of Weiser’s proposed reforms. The Spectrum Act created incentives for TV broadcasters to release their spectrum for reallocation to more-valuable purposes, primarily wireless broadband. In addition, the Spectrum Act took steps to identify underutilized blocks of federal spectrum for repurposing and reallocation (Congressional Research Service 2013). These reforms ultimately led to a more efficient use of spectrum resources.

In a new Hamilton Project Discussion Paper, J. Pierre de Vries and Philip J. Weiser propose further reforms to move spectrum regulation away from its “command-and-control” regime to allow for a more-efficient allocation of spectrum resources. De Vries and Weiser propose three distinct but complementary lines of reform. The first would enhance property rights by establishing “harm claim thresholds” that both facilitate the trading of spectrum rights and incentivize investment in high-quality receiver technology. The second would make it easier for rights holders in different bands to negotiate and strike deals with each other through the use of “band agents” who have the authority to negotiate on behalf of many stakeholders. The third would revamp the adjudication process, decreasing the costs of dispute resolution between spectrum rights holders and increasing the predictability of judgments. While any one of these directions for reform would stand on its own, in total they would unlock value currently frozen by regulation.

## Conclusion

Wireless operations play a key role in the modern economy, a role that will only increase in importance as innovation delivers new wireless technology. The proliferation of wireless applications has called old regulatory paradigms into question. Fresh, new thinking on spectrum policy is required to foster innovation and support greater growth for our technologically dependent economy. With demand for wireless applications showing no signs of slowing its explosive upward trajectory, unlocking the full value of the wireless spectrum has never been a more pressing economic challenge.

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*The Hamilton Project* seeks to advance America's promise of opportunity, prosperity, and growth. We believe that today's increasingly competitive global economy demands public policy ideas commensurate with the challenges of the 21st Century. The Project's economic strategy reflects a judgment that long-term prosperity is best achieved by fostering economic growth and broad participation in that growth, by enhancing individual economic security, and by embracing a role for effective government in making needed public investments.

Our strategy calls for combining public investment, a secure social safety net, and fiscal discipline. In that framework, the Project puts forward innovative proposals from leading economic thinkers—based on credible evidence and experience, not ideology or doctrine—to introduce new and effective policy options into the national debate.

*The Project is named after Alexander Hamilton*, the nation's first treasury secretary, who laid the foundation for the modern American economy. Hamilton stood for sound fiscal policy, believed that broad-based opportunity for advancement would drive American economic growth, and recognized that "prudent aids and encouragements on the part of government" are necessary to enhance and guide market forces. The guiding principles of the Project remain consistent with these views.

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