Eli Noam: The Fourth Way for spectrum

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In a previous column - "The Third Way for spectrum", March 13 2003 - I argued against the pure property rights system for the radio-magnetic frequencies that is advocated by some reformers, and also against the free-access commons approach advanced by others. My three fellow columnists - Richard Epstein, Thomas Hazlett, and Lawrence Lessig, all prominent and respected proponents of the two rival perspectives - disagreed learnedly with me and even more with each other.

The areas of commonality, however, permit a synthesis. No, they require it. This is not the subject of idle academic speculation, but one of collective head-scratching on both sides of the Atlantic and Pacific. All of us agree that an overhaul of the present system of allocating spectrum is a key task for the new economy. But what should take its place? As it turns out, the three approaches we advanced can coexist.

The Third Way for spectrum

Should the electromagnetic spectrum be auctioned off to the highest bidders or treated as common property, free for all to use? Eli Noam, Lawrence Lessig, Thomas Hazlett and Richard Epstein offer conflicting views. Go there

Lets start by recognising that most frequencies are used only intermittently by those who hold licences, whether private or governmental. Other frequencies are used intensely in some places but are quiet elsewhere, as any twisting of the radio dial demonstrates. Yet one could use these frequencies for low-power, low- range usage of, say, cellular phones. This would suggest that regulatory restrictions are in the way, and that much more multiple- usage of frequencies should take place.

A reformed spectrum system would therefore include the following rule. 1. The holders of frequency licences can use their spectrum for all purposes, and lease it to others. In some cases, a payment or auction might be required first. This should satisfy the property rights proponents.

This arrangement works best, however, where frequencies and users are clearly matched and transaction costs are low. It is similar to landowners charging an admission fee to their property. But it breaks down for aircraft flying over the land. It is simply not practical for thousands of aircraft owners to negotiate with millions of landowners for this right. Therefore, we do not let property rights to stand in the way of overflights.

It is similar with information streams transmitted over the air. In the past, the limited state of technology required that an information stream would occupy a specific frequency, and be protected from interfering use of the same frequency by others. But with todays technology, the information can be transmitted in little chunks over many slivers of frequencies and reassembled at the receiver end. This opens up entirely new ways of using spectrum. Instead of dedicating well-defined frequency bands to specific usage types, such as taxicab dispatch or walkie-talkies, and slicing up the bands to specific users, we can now program smart transmitters known as software defined radios to seek frequencies that are unused at that moment, transmit for a short period on them, and then move to another unoccupied frequency. Hence, the second requirement of the system establishes a right of way access to frequencies that lie fallow at certain times or locations. 2. Unused spectrum can be utilised without a licence, subject to limitations of transmission power and time. This would correspond to the commons approach, in which open access exists and where technology expands supply, at least for a while.

In technical terms this assures that the spectrum is used in a fairly balanced way, shifting traffic from congested frequency bands to others, and squeezing vastly more usage out of it.

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This leaves, however, the problems of how to compensate the legacy licence holder for the use of the right of way, and how to discourage a wasteful use of frequencies if access is open and there is no price to pay for it. Nothing would then stop every teenager from starting his or her own multi-channel TV transmitter (unless one would ration usage). The better alternative would be to add a further element to the system: 3. Unlicensed users must pay a usage fee. This fee, set by a spectrum agency which would be needed under any arrangement to police spectrum abuse - would be periodically adjusted to the demand. If demand is low relative to spectrum availability the price would be zero, thus creating the free commons, at least temporarily, in the growth phases of new spectrum applications, when they should be as unburdened as possible.

How might this fee be collected in practice? Low-power devices would not be included. But for those radiating a stronger signal, usage could be metered by a chip in the transmission equipment, and monthly totals transmitted to sites run by credit card companies, which would take care of the payment. The allocation of the collected revenues would be set according to the sampled usage of different frequency bands and distributed to the licence holders. Thus, private licence holders who do not fully utilise their frequency would benefit, as would governmental agencies that use their frequencies only intermittently but do not want to give them up in case of emergencies.

Nothing in this system would preclude a private or governmental licensee or property holder from creating a similar proprietary collection system, or a directly negotiated arrangement. But such a system is likely to cover only a few frequencies. The spectrum right of way system is the default after the privately negotiated arrangements. A good comparison, made by Charlie Firestone of the Aspen Institute, is that of copyright holders in music. They can negotiate for royalties directly with each radio station and piano lounge, or be part of a blanket licence set by a collective performing rights organisation, or have the government set a compulsory licence payment for play over the internet.

Which system will prevail? I suspect they all will. There are too many uses and circumstances for one size to fit all. We do not start with a clean slate. The extensive needs of government for spectrum use will always require a mixed system. Nor is there a need for uniformity, any more than exists for land use. Nor is it clear that government has the right to prevent the use of unused spectrum if this does not interfere with other users. The system of spectrum rights of way, property rights and usage charges would combine the best of both worlds and allow evolution in response to future technological and business developments.

Hopefully, our debate can reach further convergence to a mixed system. One can only hope that purism on either side will not prevail and help extend the present anachronistic system.

The writer is professor of economics and finance at Columbia University and director of its Columbia Institute for Tele- Information