Essay on the Coase Theorem

Andy Xu
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UC Berkeley

Coase's groundbreaking discovery consists of these parts: externalities, or social costs, are of a reciprocal nature; it is therefore incorrect to lay all blame on one party irrespective of the circumstances and use governmental regulation or penalties to try to affect behavior; a more effective market-oriented solution is to assign clear property rights, which, when transaction costs are low enough, guarantee the optimally efficient outcome. I will demonstrate that his insight is fundamentally correct and profound, but in practical implementation has been betrayed and compromised by other considerations he did not foresee.

Radio stations, should they use adjacent frequencies, will likely interfere with each other[1], imposing a liability on both. Clearly, something must be done to counter this interference if complete chaos over radio is to be avoided. The traditional solution was to prescribe uses of certain frequencies to certain stations by government fiat, but there is no way to tell under this scheme whether these frequencies have been put toward the most efficient use[2]. One can never be sure if the users of these frequencies are actually the ones who value it most, who could make the most out of it. It is impossible to tell if another station could attract more listeners, and they would have had no way of communicating their confidence and willingness to take over the frequencies. The government had neither the ability nor the incentives to take on this issue: laden with bureaucratic overhead, they cannot and would not look out for the next possible use that increases efficiency. Coase had a straightforward fix for the under-utilization: auction licenses to use bands of frequencies and allow for trading[3]. This meant that those who could extract the most value from

[1] ARPL, "Radio Frequency Interference (RFI)" http://www.arrl.org/radio-frequency-interference-rfi
[2] Steve Pociask, Mark Jamison, Roslyn Layton, Jessica Melugin, Tim Chapman, Zach Graves, Tom Struble, "Repurposing the C-Band to Benefit all Americans" https://www.rstreet.org/2019/10/29/repurposing-the-c-band-to-benefit-all-americans/
[3] Thomas W. Hazlett, David Porter, Vernon Smith, "Radio Spectrum and the Disruptive Clarity of Ronald Coase" https://www.clemson.edu/centers-institutes/iep/documents/Draft.Coase_.JLE_.TWH_.3.7.11.Z.pdf

this limited resource (who would be willing and able to pay the most to have it) would take over from those that could extract less value. Better yet, the clear delineation of rights meant that each station had a clear idea of the limits upon their use of radio frequencies, and interferences drastically reduced.

Proponents of the FCC's implementation of Coasean auctioning point to the large amounts of licenses sold and extraordinary sums of money paid as evidence of the policy's success[4]. Their logic is understandable: the amounts paid indicate the voracious demand for radio frequency rights, and to think that much of this value might be lost through ill-informed governmental allocation was terrifying for the efficiency-minded. Had a properly administered free market taken the place of governmental allocation, all this value could have been recuperated. While they weren't wrong about the colossal potential for inefficiency in the government allocation system[5], I argue that poor implementation of the Coasean mechanism by the FCC has brought about significant loss in social welfare as well, and this is merely one example of how Coasean rights, when approached incorrectly, can still be inefficient.

Both Cooter and Ulen[6], and Schlag's[7] interpretations of Coase are correct to recognize that the efficiency-centered policy approach would be to lower transaction costs and not interfere with the market. From this fundamental insight (rightly attributed to Coase), they have diverged to reach different conclusions on which policy directions the government shall pursue, but I focus on this insight and how it has been disappointingly absent in real-world situations, where governmental action is instead an impediment. I argue that neither commentator, perhaps not even Coase himself, had considered a crucial part of the lifecycle of rights: initial ownership. To get that wrong could be disastrous for its subsequent exchange via the market mechanism, as I will demonstrate with Coase's original example of radio frequencies.

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[4] FCC, "Auction Summary" https://www.fcc.gov/auctions-summary
[5] Will Rinehart, "Analyzing Plans To Reallocate C-Band for 5G Deployment" https://www.americanactionforum.org/insight/analyzing-plans-reallocate-c-band-5g-deployment/
[6] Robert Cooter, Thomas Ulen, "Law and Economics" http://www.econ.jku.at/t3/staff/winterebmer/teaching/law_economics/ss19/6th_edition.pdf
[7] Pierre Schlag, "An Appreciative Comment on Coase's The Problem of Social Cost: A View from the Left" https://scholar.law.colorado.edu/articles/1016/

Though, as Coase observed, it is the federal government that defined and delineated the property rights surrounding radio frequency usage, this does not imply that the FCC should own such rights from the get-go, i.e. before auctioning. In fact, I argue that governmental appropriation of what never was its throttles telecommunications innovation by imposing an unnecessary, undue and unjust burden on telecom companies and ultimately consumers. FCC and the Federal Government treat license auctions as a source of revenue. This is effectively tantamount to taxation, for the enormous costs incurred by telecom corporations[8] in acquiring such licenses are passed largely on to consumers[9] [10] and squeezed out of their profits[11], and their shareholders' pocketbooks. This taxation, however, is uncalled for. Radio frequencies are an aspect of nature, governed by the laws of physics and cannot be said, as a matter of ethics, to belong to any entity. To tax the use of radio frequencies is no different than taxing sunlight (which is an electromagnetic wave just like radio frequencies[12]), or taxing Higgs-Boson fluctuations[13] by our existence. The sunlight tax is, in fact, extremely analogous to the radio frequency tax because both would be borne by consumers. Even though the latter is levied on corporations, the oligopolistic nature of the carrier market and the inflexible demand for internet by users all but ensure that they pay for it[14]. Not to mention, the FCC was not even the proper vehicle for taxation of the federal government as a constitutional arrangement[15].

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[8] FCC, "Auction Summary" https://www.fcc.gov/auctions-summary
[9] Jeffrey Perloff, "Microeconomics: Theory and Applications with Calculus", Pearson, Year 2008.
[10] T-Mobile, "Together We are Unstoppable" https://s24.q4cdn.com/400059132/files/doc_financials/2020/ar/TMUS-2020-Annual-Report.pdf
[11] AT&T, "We Create Connection" https://investors.att.com/~/media/Files/A/ATT-IR-V2/financial-reports/annual-reports/2020/complete-2020-annual-report.pdf
[12] Wikipedia, "Light" https://en.wikipedia.org/wiki/Light
[13] Wikipedia, "Higgs Boson" https://en.wikipedia.org/wiki/Higgs_boson
[14] Mike Dano, "C-band auction maps and charts: Who won what, where and how much" https://www.lightreading.com/5g/c-band-auction-maps-and-charts-who-won-what-where-and-how-much/d/d-id/767682
[15] Wikipedia, "United States Department of the Treasury" https://en.wikipedia.org/wiki/United_States_Department_of_the_Treasury

More importantly, current practices by the FCC regarding allocation of radio frequencies, partly driven by revenue generation[16], warps the Coasean vision of market-powered efficiency. The FCC has been known to hold onto certain frequencies claiming that they ought to be reserved for a later generation of technology; they use hunger marketing to artificially drive up prices; and the permanent nature of license grants enables a federally-condoned monopoly reminiscent of royal grants. Such behavior is not only anti-competitive and oligopolizes telecom operators[17], the billions of dollars paid to the FCC and henceforth swallowed by the government could have been put by telecom corporations towards research and development of superior technologies. This tax is especially odious considering that the telecom industry is one with drastically diminishing marginal costs[18], meaning that taxation depressing supply will have an exorbitant effect on consumer surplus[19]. This deadweight loss is exacerbated by peculiarities within the telecom industry. The industry increasingly focuses on mobile devices and the internet, areas in which the network effect[20] is most pronounced and returns to scale are exponential. As a result, the supply curve is not only downward curving but also extraordinarily steep. If anything, such an industry should be subsidized and companies encouraged to drastically scale up[21]. With current practices, research is throttled, consumer welfare is undermined, and the competitive lead in such a strategically important field has been surrendered to international competitors[22]. Pertinently for our economic analysis, the hundreds of billions paid to the FCC should not be celebrated as the fruits of efficient market transactions but rather lamented as value lost through hobbling governmental extortion.

To make a comparison to America's own past success with democratization of ownership rights, consider the settlement of the American west. Much of the land acquired by the federal government through the Louisiana Purchase was then promptly sold on the open market, with no intention of

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[16] Thomas W. Hazlett, David Porter, Vernon Smith, "Radio Spectrum and the Disruptive Clarity of Ronald Coase" https://www.clemson.edu/centers-institutes/iep/documents/Draft.Coase_.JLE_.TWH_.3.7.11.Z.pdf
[17] Dano, *id.*
[18] W. Hazlett, Porter, Smith, *id.*
[19] Alfred Marshall, "Principles of Economics", Great Minds Series, Year 1890.
[20] Wikipedia, "Network Effect" https://en.wikipedia.org/wiki/Network_effect
[21] Natasha Kwatiah, "The Marshallian Welfare Economics" https://www.economicsdiscussion.net/welfare-economics/the-marshallian-welfare-economics-with-diagram/18909
[22] Global Times, "China's 5G development" https://www.globaltimes.cn/page/202105/1223790.shtml

profiting from such sales but rather the objective was to populate the western territories[23]. The American people began to efficiently utilize the natural resources, because unlike with the modern FCC, the federal government did not charge exorbitant prices for property it actually *owned*. If it hadn't been the enlightened release of federal land into private use, Chicago, Las Vegas, and Seattle would all be empty fields today.

A more contemporary comparison would be with the telecom industry in China. The pace of 5G rollout in China is undoubtedly the fastest among major economies[24], and the reason in large part is due to the government offering up radio frequency usage to various companies free of charge[25]. The Chinese telecom corporations didn't need to hand over $80 billion[26] first; they could just get on with building infrastructure. China was able to successfully exploit the multiplicative benefits of telecom innovation via spillover externalities into the entire tech industry (site of the 21st century arms race). Social media companies, search engines, smartphone makers and even self-driving cars among many others are all beneficiaries. The meteoric rise of companies like Huawei, Alibaba, and Tencent[27] were all propelled by access to an artificially suppressed cost of telecommunications. While China's state-owned telecom industry is a questionable model for long-term growth[28], there is no doubt that their rapid overtake of the 5G game has not been hampered by a duplicitous tax on basic physics.

To rectify this tragedy and actually implement Coase's prescriptions for efficient allocation of radio frequencies, I propose this mechanism: First we redefine radio frequency rights: there is no reason to prescribe to companies that this frequency band must be used for 3G, that for 4G, and so on. Let the market figure out the efficient distribution of communication protocols; Coase wouldn't expect Washington bureaucrats to outperform the market and neither do I. Also, though I am

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[23] John Van Atta, "Securing the West" Johns Hopkins University Press, Year 2014.
[24] Global Times, *id.*
[25] Sean Kinney, "Rounding up 5G spectrum allocations in China" https://www.rcrwireless.com/20190603/5g/5g-spectrum-allocations-china
[26] FCC, "WIRELESS TELECOMMUNICATIONS BUREAU GRANTS AUCTION 107 LICENSES" https://docs.fcc.gov/public/attachments/DA-21-839A1.pdf
[27] John Lee, "The rise of China's tech sector: The making of an internet empire" https://www.lowyinstitute.org/the-interpreter/rise-china-s-tech-sector-making-internet-empire
[28] Ronald Coase, Ning Wang, "How China Became Capitalist", Palgrave MacMillan, 2017

ignorant of the physics behind this, frequency bands shall be cut such that ownership of one band does not significantly increase the value of neighboring bands to its owner, avoiding the holdout problem. This shall be done by independent physicists; the FCC is shown to be unreliable in the face of ulterior motives. With the definition of frequency rights thus improved, they shall continue to be auctioned. The frequency rights shall be traded openly on the open market, much like property deeds today. However, they shall expire at the earliest of these three:

1. A pre-specified amount (say, 1 million trillion bits) has been transmitted at the frequency,
2. A set amount of time(e.g. 10 years),
3. The bankruptcy of the owner.

At expiration, the rights shall be promptly auctioned off again.

The first two are designed to prevent any purchaser from holding onto a frequency indefinitely, possibly using it for inefficient ends. Instead, every now and then some frequency deed will expire and the market will re-evaluate what is its most efficient use for the upcoming period of time. Also, the full spectrum of radio frequencies shall be opened for auction instead of FCC partitioning and slowly releasing meager amounts (yet another inefficient oversight). The market will soon scramble to put the valuable ones to productive uses.

To reflect that radio frequencies belong to whoever uses them instead of the federal government exclusively, as well as to unfetter telecom innovation, the full auction price will be paid back to the purchaser gradually as they use the frequencies to transmit data. For example, if Company A paid 80 billion for the right to 100 million trillion bits of data, then for each trillion bits of data it carried, the FCC pays it back $800 of rebate. The “auction price” is, in effect, a mere collateral to ensure the band does not go to waste.

When the FCC gave out C-band frequencies to satellite carriers years ago, it did not foresee that today it would have to repurpose that same band for 5G uses[29]. It now falls to 5G operators, the next purchaser of these frequencies, to reclaim them from their current uses, incurring significant

[29] Rachel Jewett, “Satellite Operators Agree to Clear C-Band on FCC’s Timeline” https://www.satellitetoday.com/5g/2020/06/01/satellite-operators-agree-to-clear-c-band-on-fccs-timeline/

costs again. If we had used a collateral-based free market trading scheme, the satellite operators, who would have failed to meet their purchased quota, would gladly hand over the frequencies to 5G operators, who could transmit that much data and recoup the collateral. This whole situation could have been avoided if only the FCC, instead of dictating the purposes of frequencies, left such allocations to free market trading, like Coase would have instructed.