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## WIRELESS TAXES AND FEES: A Tragedy of the Anticommons

By Matthew Mitchell and Thomas Stratmann

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Combined federal, state, and local taxes on wireless services are about twice as high as the average retail sales tax. While the normative justification for above-average taxation of wireless service is weak, there is a compelling public-choice explanation: The mobile service tax base appears to suffer from a tragedy of the anticommons. That is, multiple parties have the power to block or partially block access to a resource, resulting in underutilization of the resource. In our context, numerous overlapping tax authorities seek to obtain revenues through wireless-service taxation, and this may lead to overexploitation of the tax base. The anticommons problem has two dimensions. First, the mobile-service tax base funds numerous distinct projects at each level of government. Second, the base is taxed by numerous overlapping levels of government. We use state-level data from three years to examine the possible economic, demographic, and political factors that might explain the variation in these rates. We find that wireless tax rates increase with the number of overlapping tax bases.

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## I. Introduction

According to standard microeconomic theory, taxes involve both direct and indirect costs. Consumers bear direct costs in the form of higher after-tax prices while producers bear direct costs in the form of lower pretax prices. Both consumers and producers bear indirect costs because taxation ensures that some mutually beneficial transactions do not take place. These indirect costs grow exponentially with the tax rate such that doubling the tax rate quadruples the indirect cost.[2]

Wireless telephone services are subject to a wide variety of taxes and fees. In addition to conventional sales and gross-receipts taxes, they are subject to federal excise taxes, federal and state Universal Service Fund fees, state 9-1-1 emergency service fees, poison control fees, police protection fees, fire protection fees, deaf relay service fees, telecommunications relay service fees, utility taxes, school district utility taxes, and other mobile phone-specific taxes.[3] The net result of these taxes and fees is a combined federal, state, and local tax rate on mobile service that averages 16.26 percent. State and local taxes on these services alone average 9.84 percent.[4] This is above the typical state and local sales-tax rate (7.42 percent) and exceeds the typical rate applied to beer (9.2 percent), a product with more apparent negative-externality characteristics.[5] Wireless taxes also vary considerably from region to region, with Nebraska customers paying a combined federal, state, and local rate of 23.69 percent and Oregon customers paying 6.86

[2] This is a standard result in microeconomic theory. See, for example, Thomas Nechyba, *Microeconomics: An Intuitive Approach* (Mason, OH: Cengage Learning Center, 2011), ch. 10. Economists refer to these indirect costs as the deadweight loss of taxation. While the revenue raised from taxation is equal to the direct costs that consumers and producers bear, the deadweight losses are in excess of this revenue.

[3] For an overview of the types of fees, see Scott Mackey, "A Growing Burden: Taxes and Fees on Wireless Service," *State Tax Notes*, 2011, 475–87. For a discussion of the efficiency of cell phone taxes, see Daniel M. Rothschild, "The Case against Taxing Cell Phone Subscribers," *Mercatus on Policy*, no. 92 (June 2011).

[4] This represents the average federal, state, and local rate weighted by population. The state and local rate excludes the District of Columbia. See Mackey, "A Growing Burden."

[5] The state and local sales tax rate is computed by Mackey; see Mackey, "A Growing Burden." The beer tax rate was calculated by Rothschild; see Rothschild, "The Case against Taxing Cell Phone Subscribers."

percent.[6] Following years of increases, the rates on these services had begun to fall in recent years, but in 2010, the rates rose again, reaching their highest level since 2005.[7]

These above-average rates of taxation are economically damaging. Jerry Hausman of MIT finds that wireless "taxes are a much greater drain on the economy than their direct costs. The taxes . . . cost the economy $2.65 billion more than the $4.79 billion they raise in tax revenues."[8] Glenn Woroch of the University of California-Berkeley estimates that the extra losses associated with taxation of wireless services cost consumers roughly $15.7 billion each year (some of which is offset by the revenue obtained from these taxes).[9]

In the next section, we review the possible rationales for these tax rates and find that the theoretical justification for above-average taxation of mobile service is weak. There is an explanation for the phenomenon, though: the tragedy of the anticommons.

Multiple owners can access resources held in common property, often subjecting such resources to overuse. This is the well-known tragedy of the commons. In the same way, when multiple parties have the power to exclude or partially exclude others from using a resource, the resource tends to be underutilized. This is known as the tragedy of the anticommons. Multiple constituencies at multiple levels of government can impose taxes on mobile-phone services. Consistent with the anticommons hypothesis, we find that when more parties have the right to impose a mobile-phone service tax, the overall rate of mobile-phone service taxation rises, leading to underutilization of the service. In Section III, we use cross-state variation in mobile tax rates to analyze patterns in the data that might explain them. We find strong support for the hypothesis that mobile-phone services are subject to the tragedy of the anticommons.

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[6] Mackey, "A Growing Burden."
[7] Ibid.
[8] Jerry Hausman, "Efficiency Effects on the U.S. Economy from Wireless Taxation," *National Tax Journal* 53, no. 3 (2000): 733.
[9] Glenn Woroch, *The 'Wireless Tax Premium' Harms American Consumers and Squanders the Potential of the Mobile Economy* (Washington, DC: Georgetown Center for Business and Public Policy, 2011).

## II. Is There a Theoretical Case for Above-Average Taxation of Mobile Service?

Public-finance scholars have long recognized tax neutrality as an important ideal: As a matter of equity, taxes should not discriminate between similar goods or similarly situated people.[10] Yet, as we have noted, mobile phones appear to be singled out for particularly heavy taxation.[11] We now review a number of possible rationales or explanations for above-average taxation and evaluate how each might apply to the case of mobile-phone services. We begin with normative rationales and find that most of the arguments on behalf of above-average taxation do not apply to this case. We then turn to positive public choice theory and find that a simple model of a tragedy of the anticommons fits the case well.

### *A. Negative Externality*

In some instances, those who are not willing parties to a trade may bear some of its costs. In these circumstances, an inefficiently large quantity of the good or service may be produced. Such cases are known as negative externalities; industrial pollution is the classic example. One potential solution to the problem of a negative externality is for the state to impose a Pigouvian tax (named after an early expounder of the idea, economist A. C. Pigou). According to the Pigouvian model, if the tax is set correctly, the externality will be internalized, producers will account for the full costs of their actions, and the efficient quantity of the good or service will be produced and sold.

In the case of mobile phones, there are no obvious externality problems. In fact, Congress has made access to broadband an explicit policy goal and mobile devices are an increasingly

[10] See, for example, Richard Musgrave, "Public Finance," in *The New Palgrave: A Dictionary of Economics, vol. 3*, ed. John Eatwell, Murray Milgate, and Peter Newman (USA: Palgrave-Macmillan, 1987): 1057-58. For an alternative theoretical justification for nondiscriminatory taxation, see James Buchanan and Geoffrey Brennan, *The Power to Tax: Analytical Foundation of a Fiscal Constitution* (Indianapolis, IN: Liberty Fund, 1980), ch. 4.

[11] For a general discussion of discriminatory excise taxation, see Thomas Stratmann and William Bruntrager, "Excise Taxes in the States" (working paper, Mercatus Center at George Mason University, Arlington, VA, 2011).

popular means of accessing broadband.[12] One possible externality argument may be that distracted drivers impose a cost on others when they talk on their mobile phones. In this case, though, a more direct way to internalize the externality is to fine those who use their phones while driving (as many states do).

### *B. Low Elasticity of Demand*

As noted above, the economic cost of a tax encompasses both the direct cost of paying the tax and the indirect cost of forgone exchange. The cost of forgone exchange is a function of the price sensitivity of consumers and producers. That is, when consumers or producers of a good are more sensitive to price changes, then a tax on that good will cause them to make fewer mutually beneficial exchanges and the economic cost of the tax will be large. For this reason, some economists advocate lower taxation of goods for which consumers are price sensitive and higher taxation of goods for which consumers are price insensitive.[13] Not everyone favors this departure from the norm of tax neutrality,[14] but setting aside the critiques, if the demand for mobile phone services were price insensitive, above-average taxation might be justified on this ground.

Consumer price sensitivity is measured by elasticity of demand, which states the percentage change in quantity demanded given a 1 percent increase in price. Because demand curves slope downward, a price increase causes consumers to decrease the quantity demanded. This means that the elasticity is always a negative number with increasingly negative values indicating greater consumer sensitivity to price. For example, estimates suggest that the price elasticity of demand for electricity is –0.13. Because, for many, electricity is a necessity, a 1

[12] See, for example, Federal Communications Commission, "National Broadband Plan," Broadband.gov, October 2011, http://www.broadband.gov/plan.
[13] Frank Ramsey, "A Contribution to the Theory of Taxation," *Economic Journal* 37 (1927): 47–61.
[14] See, for example, Buchanan and Brennan, *The Power to Tax*, ch. 4.

percent increase in prices causes people to decrease their quantity demanded by only 0.13 percent. Alternatively, the price elasticity of demand for tobacco, a luxury for many, is estimated to be in the range of –1.4, meaning that a 1 percent increase in price leads to a 1.4 percent reduction in quantity demanded.[15]

Demand elasticity estimates for mobile-phone service suggest that consumers are relatively price sensitive and that they have grown more so over the years. For example, Hausman estimates the price elasticity for mobile-phone service is –0.51, meaning that a 1 percent increase in the after-tax price causes consumers to reduce their quantity demanded by 0.51 percentage points.[16] Hausman describes this as "relatively high for telecommunications services."[17] Using more recent data, Hausman updated the estimate and found it to be even greater, –0.71, though not statistically significantly different from his earlier estimate.[18] Among the most recent estimates, Michael Ward of the University of Texas at Arlington and Glenn Woroch find the elasticity of demand to be –0.8,[19] while Ingraham and Sidak find it to be between –1.12 and –1.29.[20] Because early adopters tend to place higher value on the use of a new product or service, they tend to be less price sensitive than later adopters. It is not surprising, then, that successive estimates have found increasingly higher elasticities: More recent adopters place less value on the product and so tend to be more sensitive to price increases. Taken together, these studies suggest that the demand for mobile services is moderately to highly

[15] Steven Landsburg, *Price Theory & Applications*, 4th ed. (Cincinnati, OH: International Thomson Publishing, 1999): 110.
[16] Jerry Hausman, "Valuing the Effect of Regulation on New Services in Telecommunications," *Brookings Papers on Economic Activity, Microeconomics*, 1997.
[17] Jerry Hausman, "Efficiency Effects on the U.S. Economy From Wireless Taxation," (National Bureau of Economic Research [NBER] Working Paper Series no. 7281, Cambridge, MA, 1999), 7.
[18] Hausman, "Efficiency Effects on the U.S. Economy from Wireless Taxation."
[19] Michael Ward and Glenn Woroch, "The Effect of Prices on Fixed and Mobile Telephone Penetration: Using Price Subsidies as Natural Experiments," *Information Economics and Policy* 22, no. 1 (2010): 18–32.
[20] Allan Ingraham and Gregory Sidak, "Do States Tax Wireless Services Inefficiently? Evidence on the Price Elasticity of Demand," *Virginia Tech Review* 24, no. 2 (2004): 249–61.

elastic, that demand has grown more elastic over time, and that these elasticities do not justify above-average taxation of mobile-phone services.

### *C. Luxury Taxation*

Progressivity is another common justification for differential taxation. If mobile phones are luxury items—and if we accept progressivity as a worthy goal of taxation—it might make sense to tax mobile phone services at above-average rates. When they first hit the market a few decades ago, mobile phones were rather expensive and were considered by some to be luxury items. Today, however, poor households are almost twice as likely as others to rely exclusively on mobile phones for telecommunication.[21] Moreover, as is the case with all consumption taxes, the tax on mobile phones is regressive since low-income households dedicate a comparatively larger share of their income to pay for mobile-phone service. Thus, taxes on mobile phones are not supported on progressive grounds.

### *D. Rural Subsidies*

At both the federal and state level, Universal Service Fund (USF) fees constitute an important share of mobile phone taxation. These fees are designed to subsidize rural telephone access (both mobile and landline). It is not clear, however, how either efficiency or equity are enhanced by having mobile phone users in a particular state bear some of the cost of rural phone service. Moreover, mobile phones may be the most economical way to extend telephone service to rural areas, yet deployment of wireless service to these areas may be slowed by taxes that make deployment marginally less profitable.[22]

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[21] Stephen Blumberg and Julian Luke, *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey* (Hyattsville, MD: National Center for Health Statistics, 2010).
[22] Woroch, *The 'Wireless Tax Premium' Harms American Consumers and Squanders the Potential of the Mobile Economy*, 2.

*E. User Fees*

An above-average tax also might be justified on the grounds that it is a user fee. Some argue that those who benefit from a particular government service ought to pay for it and that a tax on the use of the service is the best way to charge the users. This is the rationale, for example, behind toll roads or entrance fees at National Parks. In many states, a portion of the mobile phone tax finances 9-1-1 call centers, which are accessed by mobile phone callers. These 9-1-1 fees, however, average just 1.6 percent across states, so alone they cannot account for the high taxation of mobile phone service.

*F. Public Choice and the Tragedy of the Anticommons*

Thus far, we have focused on normative rationales for above-average taxation of wireless service. It is possible, however, that there is no normative rationale for these rates. It may simply be the case that public choice processes have tended to produce above-average taxation even without any normative justification. This notion is supported by the fact that these rates seem to have emerged from a number of different sources and do not appear to be the product of a single policy-making entity. For example, consider the taxes a New York City resident pays for cellular service. These include:

- A federal USF fee of 5.05 percent,
- A state sales tax of 4 percent,
- A state excise tax of 2.5 percent,
- A state franchise tax of 0.38 percent,
- A state wireless 9-1-1 fee of 2.49 percent,
- A local wireless 9-1-1 fee of 0.62 percent,
- A New York City local utility gross receipts tax of 1.9 percent,

- A New York City Metropolitan Commuter Transportation District (MCTD) sales tax of 0.375 percent,
- A New York City MCTD excise tax of 0.6 percent,
- A New York City MCTD surcharge of 0.13 percent, and
- A New York City sales tax of 4.5 percent.[23]

This list shows that a New Yorker's cell service is taxed by several different overlapping levels of government: federal, state, county, city, and local districts. Most other tax bases—such as income, property, or general sales—are taxed by only one or two levels of government. Further, the list shows that mobile service is subject to multiple separate taxes at each level of government. The state of New York imposes four separate taxes on the service while the city imposes five. Some of these individual rates are small, but the cumulative effect is a tax rate in excess of 22 percent. Salt Lake City residents face seven separate taxes at the federal, state, and local level, and Sioux Falls, SD, residents face six separate taxes.

The pattern of cell phone taxation is characteristic of what Columbia Law School's Michael Heller has called a tragedy of the anticommons.[24] The tragedy of the commons refers to instances in which multiple parties have the ability to access a common resource. Each fails to account for the cost his use imposes on the others, and the resource tends to be overutilized.[25] Commercial fishing in common waters is a classic example. No single fisherman takes full account of the costs of his actions, so a fleet of independent commercial fishermen will tend to overfish the resource, sometimes driving species to the brink of extinction. In contrast, a tragedy of the anticommons arises when multiple parties have the ability—through taxation, regulation,

[23] Mackey, "A Growing Burden."
[24] Michael Heller, "The Tragedy of the Anticommons: Property in the Transition from Marx to Markets," *Harvard Law Review* 111 (1998): 621–88.
[25] Garrett Hardin, "The Tragedy of the Commons," *Science* 162 (1968): 124–48.

or other means—to exclude others from the use of a resource.[26] In contrast with the tragedy of the commons, a tragedy of the anticommons leads to underutilization of the resource.

Though the term is relatively new, the phenomenon has been recognized in historical examples. The Rhine River during the Middle Ages provides a classic example.[27] Under the Holy Roman Empire, river taxation was modest and trade flourished along the Rhine. Because only one entity—the Empire—had the power to tax trade along the river, the base was never taxed to the point that revenue diminished.[28] But once the Empire fell, local German barons erected a series of castles along the river and began exacting their own tolls. Acting independently, each baron failed to account for the fact that his taxes diminished the tax base on which other barons relied. In aggregate, the barons overtaxed trade along the Rhine and the river was underutilized as a trade route.

> The growing gauntlet of "robber baron" tollbooths made shipping impracticable. The river continued to flow, but boatmen would no longer bother making the journey. . . . For hundreds of years, everyone suffered—even the barons. The European economic pie shrank. Wealth disappeared. Too many tolls meant too little trade.[29]

Like the barons on the Rhine, several different coalitions tax mobile phone services. It is likely that the political coalition behind New York State's excise tax is distinct from the coalition that supports the state's 9-1-1 service tax, but because both of these coalitions are able to tax the same common resource, neither accounts for the costs that spill over onto the other. That is, the coalition behind the excise tax fails to account for the fact that its tax shrinks the 9-1-1 service tax base and vice versa.

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[26] For a lengthy discussion, see Michael Heller, *The Gridlock Economy: How Too Much Ownership Wrecks Markets, Stops Innovation, and Costs Lives* (New York: Basic Books, 2008). For a formal model, see James Buchanan and Yong Yoon, "Symmetric Tragedies: Commons and Anticommons," *Journal of Law and Economics* 43, no. 1 (2000): 1–13.

[27] Roy Gardner, Noel Gaston, and Robert T. Masson, "Tolling the Rhine in 1254: Complementary Monopoly Revisited" (working paper, August 2002), http://www.econ.ucsb.edu/~tedb/Courses/Ec100C/Readings/gardnerTollingtheRhine.pdf.

[28] In other words, the Empire was careful not to set taxes above the revenue-maximizing rate, which would be at the apex of the Laffer Curve.

[29] Heller, *The Gridlock Economy*, 3.

As a number of economists have emphasized, the anticommons problem is exacerbated when multiple levels of government are able to tax the same tax base.[30] The political coalitions behind each tax are necessarily distinct. As we have noted, this is exactly the case with mobile phone service. According to Sobel of the University of West Virginia:

> The presence of this intergovernmental revenue externality results in a common pool problem and the resulting outcome is that tax rates are higher than would be optimal. This not only implies a higher deadweight loss of taxation, but also an inefficiency bias in government spending as each level of government systematically underestimates the cost of taxation.[31]

In the case of New York, the city has no incentive to account for the fact that its sales tax shrinks the federal USF tax base and vice versa.

## III. An Empirical Analysis of Mobile Phone Taxes

In 2010, the federal government imposed a USF fee on mobile services that amounted to 5.05 percent. State and local governments imposed additional taxes and fees ranging from a low of 1.81 percentage points in Oregon to a high of 18.64 percentage points in Nebraska.[32] In every state but Alaska, the rates have changed over the course of the last several years. In an effort to gain a better understanding of the factors that influence mobile phone taxation, we use this variation in rates across time and place. This allows us to identify certain factors that are correlated with higher taxation of mobile phone service.

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[30] Marilyn Flowers, "Shared Tax Sources in a Leviathan Model of Federalism," *Public Finance Quarterly* 16 (1988): 67–77; Jean-Luc Migue, "Public Choice in a Federal System," *Public Choice* 90 (1997): 234–54; Russell Sobel, "Optimal Taxation in a Federal System of Governments," *Southern Economic Journal* 64, no. 2 (1997): 468–85; and Matthias Wrede, "Tragedy of the Fiscal Common? Fiscal Stock Externalities in a Leviathan Model of Federalism," *Public Choice* 101 (1999): 177–93.

[31] Sobel, "Optimal Taxation in a Federal System of Governments," 483. Other public choice theories might be applicable as well. For example, the byzantine maze of taxes and fees may be confusing to mobile subscribers. This means that they may suffer from what is known as fiscal illusion, a condition that prevails when voters are not fully aware of the costs of a tax. For an overview, see Vito Tanzi, "Inflationary Expectations, Economic Activity, Taxes, and Interest Rates," *American Economic Review* 70, no. 1 (1980): 12–21.

[32] Mackey, "A Growing Burden."

*A. Data Description and Methodology*

In a series of papers, Scott Mackey has assembled federal, state, and local mobile phone tax rates for each of the 50 states covering the years 2004, 2007, and 2010.[33] Because the federal rate is the same for all states in any particular year, we ignore the federal portion of the tax and focus on the combined state and local mobile tax rate in each state in each of the three years. Mackey calculated this figure by averaging the rates in each state's most populous city and capital city.

Table 1 describes the variables and sources used in our analysis and table 2 reports the summary statistics.[34]

We estimate two ordinary least squares (OLS) specifications. One specification pools all three years and includes regional fixed effects, $\boldsymbol{\Upsilon_R}$. In our alternative specification, we estimate separate regressions for each year. The regression with regional effects is

$$(1)\quad (Mobile\ Rate)_{st} = \alpha + \beta(\#\ Overlapping\ Tax\ Bases)_{st} + \delta(Subscribers)_{s,t} + \theta(Carriers)_{st} + \gamma(Dem\ Control)_{s,t} + \boldsymbol{\Phi}(\boldsymbol{Demographic\ Controls})_{st} + \boldsymbol{\Upsilon_R} + \boldsymbol{\Gamma}_t + \varepsilon_{st}$$

where $\varepsilon_{st}$ is a random disturbance term. In our regional specifications we cluster all standard errors by state. Next, we describe what variables we include in our specifications.

[33] Scott Mackey, "A Growing Burden: Taxes and Fees on Wireless Service," *State Tax Notes*, 2011: 475–87; Scott Mackey, "Excessive Taxes and Fees on Wireless Service: Recent Trends," *State Tax Notes*, 2008: 519–31; and Scott Mackey, "The Excessive State and Local Tax Burden on Wireless Telecommunications Service," *State Tax Notes*, 2004: 181–94.

[34] When it is available, we use data from all 50 states. Because our analysis focuses on overlapping tax jurisdictions and because the federal, state, and city governments of the District of Columbia are more or less one and the same, we do not include the District in our analysis.

**Table 1: Description of Variables**

| Variable | Description | Data Structure |
|---|---|---|
| State and Local Mobile Tax Rate | Average of combined state and local mobile phone service tax rate in the state's most populous city and capital city. | Panel |
| Number of Overlapping Tax Bases | The number of separate taxes that are applied by city, county, state, and other authorities to the mobile phone service tax base. | Panel |
| Dem Control Scale | A variable that takes the value 0.25 if Democrats control one house of the legislature, 0.5 if they control both houses or the governorship, 0.75 if they control the governorship and one house, and 1 if they control all of the legislature and the governorship. | Panel; 2010 data are from 2009 |
| Percent Mobile Phone Subscribers | Number of mobile phone subscribers, divided by the state's population. | Panel |
| Carriers | Number of mobile phone carriers in the state. | Panel |
| Percent Female | Percentage of the population that is female. | Panel; 2010 data are from 2009 |
| Percent over 65 | Percentage of the population aged 65 and older. | Panel; 2010 data are from 2009 |
| Population Density | Persons per square mile | Panel |
| Log Pop | Log of the population. | Panel |
| Real Per-Capita Income | Real per-capita income in 2009 dollars. | Panel |

Notes: Tax Rates and number of overlapping tax bases: Scott Mackey, "A Growing Burden: Taxes and Fees on Wireless Service," *State Tax Notes*, 2011: 475–87; Scott Mackey, "Excessive Taxes and Fees on Wireless Service: Recent Trends," *State Tax Notes*, 2008: 519–31; and Scott Mackey, "The Excessive State and Local Tax Burden on Wireless Telecommunications Service," *State Tax Notes*, 2004: 181–94. Dem. Control Scale, Percent Female, Percent Over 65, Population Density, and Population: U.S. Census Bureau, "2012 Statistical Abstract," (Washington, DC: U.S. Census Bureau, 2012). Percent Mobile Phone Subscribers and Number of Carriers: Federal Communications Commission, "Local Telephone Competition," Washington, DC, 2004, 2008, and 2011; and U.S. Census Bureau, "2012 Statistical Abstract." Real Per-Capita Income: Bureau of Economic Analysis, "National Economic Accounts," 2011, http://www.bea.gov/national/index.htm#gdp (for income information); Bureau of Labor Statistics, "Consumer Price Index," 2011, http://www.bls.gov/cpi/data.htm (for deflators); and U.S. Census Bureau, "2012 Statistical Abstract" (for population information).

**Table 2: Descriptive Statistics**

| Variable Name | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| State and Local Mobile Tax Rate | 150 | 0.09 | 0.04 | 0.01 | 0.19 |
| Number of Overlapping Tax Bases | 150 | 3.71 | 1.76 | 1.00 | 11.00 |
| Dem Control Scale | 147 | 0.51 | 0.35 | 0.00 | 1.00 |
| Percent Mobile Phone Subscribers | 147 | 0.73 | 0.15 | 0.40 | 0.99 |
| Carriers | 147 | 10.91 | 7.01 | 4.00 | 71.00 |
| Percent Female | 150 | 0.51 | 0.01 | 0.48 | 0.54 |
| Percent over 65 | 150 | 0.12 | 0.02 | 0.06 | 0.16 |
| Population Density | 150 | 191.18 | 256.58 | 1.14 | 1195.50 |
| Log Pop | 150 | 15.12 | 1.02 | 13.13 | 17.43 |
| Real Per-Capita Income | 150 | 38549 | 5683 | 28722 | 59356 |

To test the theory that these taxes are the result of a tragedy of the anticommons, we count the number of separate taxes for which mobile services are a tax base in each state in each year. For example, the value for New York State in 2010 is 11, reflecting the fact that a New Yorker's mobile phone service is subject to 11 separate taxes, each of which benefits a separate interest group. Other things being equal, we expect that as the number of overlapping tax bases increases, the tragedy of the anticommons will increase, and the combined rate will rise.

That the total tax rate is not strictly increasing in the number of taxes is readily apparent. It is possible to have many small taxes adding to a smaller total tax rate than a few large separate taxes.

On the theory that partisan politics may also explain some of the variation in these rates, we include a variable that accounts for the degree of Democratic control in each state's government. This variable takes the value 0.25 if Democrats control one house of the legislature, 0.5 if they control both houses or the governorship, 0.75 if they control the governorship and one house, and 1 if they control all political branches of the state's government.[35] Assuming that members of the Democratic Party have a preference for higher taxes and higher spending, we

[35] When this variable is tested we exclude NE as its legislature is nonpartisan. We also examined the impact of separate dummy variables for Democratic and Republican control. The results did not change significantly.

predict that the mobile phone tax rate will be higher in states in which Democrats control a larger portion of the government.

To the extent that mobile phone carriers bear the cost of the tax through lower before-tax prices, the carriers have an incentive to oppose them. To account for carrier opposition to the taxes, we include the number of cell phone carriers in operation in each state in each year.

It is not obvious if a greater number of carriers will find it easier or more difficult to oppose these rates. On the one hand, Becker's pressure groups model suggests that as the number of carriers increases, resistance to these taxes may also increase: If more carriers bear the cost of the tax, the pressure to lower it will be greater.[36] On the other hand, Olson offers a reason to reject this intuition.[37] He notes that within an interest group, collective action (i.e., organized lobbying) is a public good, so any one member of the group has a strong incentive to free-ride on the collective action of his fellow group members. Furthermore, he notes that the incentive to free-ride grows stronger as the size of the group expands. In other words, as the number of cell phone carriers increases, each carrier has a stronger incentive to free-ride on the lobbying efforts of fellow carriers. In short, there is reason to suspect that the number of carriers might influence the tax rate, so we include a variable measuring the number of carriers in our specification. But the nature of the effect is ambiguous, and we have no strong priors about the sign on this coefficient.

To the extent that cell phone taxes are paid by cell phone subscribers, the subscribers also have an interest in opposing them. According to the Becker pressure-group model, as the share of citizens with a mobile phone subscription increases, the rate will decrease. On the other hand,

[36] Gary Becker, "A Theory of Competition Among Pressure Groups for Political Influence" *The Quarterly Journal of Economics*, 98, no. 3 (1983): 371-400.
[37] Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (USA: President and Fellows of Harvard College, 1965 [1971]).

if Olsonian collective-action problems dominate, then a larger share of citizens with a subscription may find it harder to organize in opposition to the taxes and the rate may rise. We include this variable in the full specification without having priors about the expected sign since the effect of the number of subscribers is ambiguous.

Lastly, we include a number of socioeconomic factors that might impact tax rates. These include the percentage of the state population that is female, the percentage aged 65 and over, the population density, the log of the total population, and the real per-capita income of the state population. These variables are common in cross-state fiscal policy regressions because they account for the demands on public services that ultimately drive many fiscal decisions.[38] Given the fact that most state cell phone taxes include universal service fees to subsidize the construction of rural telephone service, population density seems to be an especially important covariate.[39] All else being equal, we expect that as population density increases, the demand for rural landline subsidization is lower, leading to lower taxes.

In sum, we model the mobile phone service tax rate in state *s* in year *t* as a function of the number of overlapping tax bases, the degree of Democratic control in the state, the share of state citizens with mobile phone subscriptions, the number of mobile carriers in operation in the state, and a vector of demographic control variables. To account for unobserved regional effects, we also include a vector of regional control variables, $\boldsymbol{\Upsilon_R}$, where the regions are: New England, Great Lakes, Plains, Southeast, Southwest, Rocky Mountain, and the Far West (the Mid-Atlantic

[38] See, for example, Matthew Mitchell, "State Budget Gaps and State Budget Growth: Between a Rock and a Hard Place" (working paper 42, Mercatus Center at George Mason University, Arlington, VA, July 2010); Mark Crain, *Volatile States: Institutions, Policy, and the Performance of American State Economies* (Ann Arbor, MI: University of Michigan Press, 2003); Henning Bohn and Robert Iman, "Balanced Budget Rules and Public Deficits: Evidence from the U.S. States," *Carnegie-Rochester Conference Series on Public Policy* 45 (1996): 13–76; Thomas Gilligan and John Matsusaka, "Deviations from Constituent Interests: The Role of Legislative Structure and Political Parties in the States," *Economic Inquiry* 33 (1995): 383–401; James Poterba, "State Responses to Fiscal Crises: The Effects of Budgetary Institutions and Politics," *The Journal of Political Economy* 102 (1994): 799–821; and James Alt and Robert Lowry, "Divided Government, Fiscal Institutions, and Budget Deficits: Evidence from the States," *The American Political Science Review* 88, no. 4 (1994): 811–28.

[39] As a robustness check, we also tested an alternative variable that measures much the same thing: the percentage of the population living in an urban setting. The results did not change significantly.

region serves as the reference). To account for unobserved time effects, we include a vector of time effects, $\boldsymbol{\Gamma}_t$, for 2007 and 2010 (2004 serves as the reference).

*B. Empirical Results*

Table 3 reports the results of three separate regressions on the panel dataset. Column 1 shows the results of the full specification from equation 1. In column 2, we drop those variables for which we had the weakest prior expectation, and in column 3 we omit all variables except for Number of Overlapping Tax Bases and year fixed effects.[40] Table 4 reports the results of separate cross-sectional regressions on each of the three years in our panel. This allows us to analyze which years are driving the results in the full panel.

[40] A fixed effect model includes dummy variables to account for variation in the data that can be explained by year-specific factors or region-specific factors.

**Table 3: Regional Effects Regression Results**

| | Dependent Variable: State and Local Mobile Tax Rate | | |
|---|---|---|---|
| **Independent Variables** | **(1)** | **(2)** | **(3)** |
| Number of Overlapping Tax Bases | 0.0117*** | 0.0118*** | 0.0125*** |
| | (0.00232) | (0.00245) | (0.00175) |
| Dem Control Scale | 0.00165 | 0.00315 | |
| | (0.0127) | (0.0122) | |
| Percent Mobile Phone Subscribers | 0.0160 | 0.0179 | |
| | (0.0614) | (0.0612) | |
| Carriers | –0.000650** | –0.000600** | |
| | (0.000260) | (0.000239) | |
| Percent Female | –0.574** | | |
| | (0.278) | | |
| Percent over 65 | 0.303 | | |
| | (0.316) | | |
| Population Density | 1.62e–05 | 2.34e–05 | |
| | (2.66e–05) | (2.92e–05) | |
| Log Pop | 0.0113** | 0.00951* | |
| | (0.00508) | (0.00537) | |
| Real Per-Capita Income | –1.30e-07 | –1.62e-07 | |
| | (1.03e-06) | (1.04e-06) | |
| Constant | 0.125 | –0.113 | 0.0454*** |
| | (0.175) | (0.0815) | (0.00787) |
| Regional Effects | Yes | Yes | No |
| Year Effects | Yes | Yes | Yes |
| Observations | 144 | 144 | 150 |
| R-squared | 0.52 | 0.50 | 0.34 |

Notes:
Robust standard errors account for clustering at the state level and are in parentheses.
Due to missing data, the first two regressions do not include observations for VT, ND, and MT from the year 2004. Because NE's legislature is not partisan, it is omitted from the first two regressions as well.
* Indicates significance at the 10 percent level for a two-tailed test. ** Indicates significance at the 5 percent level. ***Indicates significance at the 1 percent level.

**Table 4: Cross-Section Regression Results**

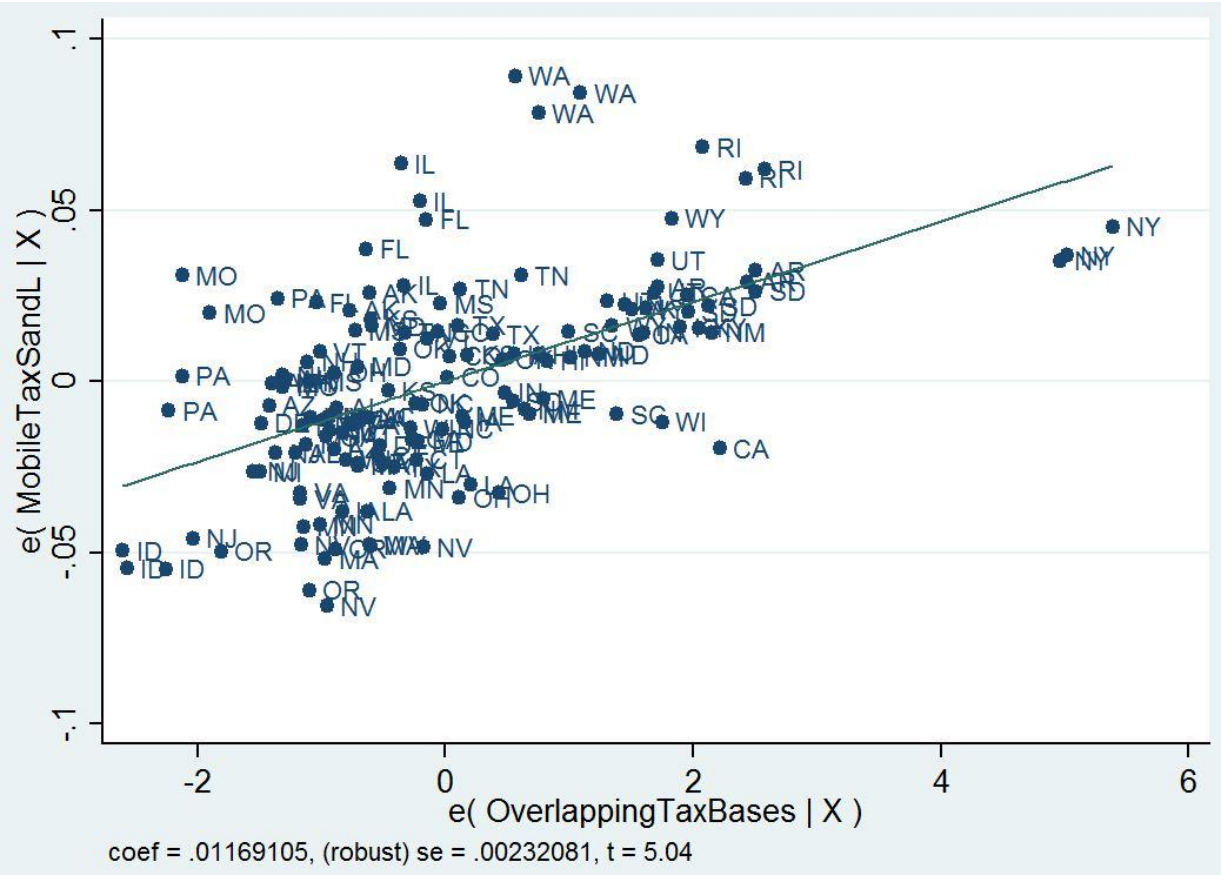
| | Dependent Variable: State and Local Mobile Tax Rate | | |
|---|---|---|---|
| **Independent Variables** | **(4)** | **(5)** | **(6)** |
| Number of Overlapping Tax Bases | 0.0164*** | 0.0116*** | 0.00921*** |
| | (0.00392) | (0.00289) | (0.00248) |
| Dem Control Scale | 0.0105 | 0.000200 | 0.00242 |
| | (0.0193) | (0.0189) | (0.0156) |
| Percent Mobile Phone Subscribers | 0.156 | –0.0220 | –0.0625 |
| | (0.119) | (0.0898) | (0.111) |
| Carriers | 2.24e–05 | –0.000940* | –0.000786* |
| | (0.00349) | (0.000489) | (0.000396) |
| Percent Female | –0.333 | –0.950* | –0.611 |
| | (0.785) | (0.512) | (0.618) |
| Percent over 65 | 0.385 | 0.260 | 0.207 |
| | (0.426) | (0.370) | (0.349) |
| Population Density | 1.02e–05 | 1.56e–05 | 1.79e–05 |
| | (4.36e–05) | (2.72e–05) | (2.93e–05) |
| Log Pop | 0.00741 | 0.0147** | 0.0107 |
| | (0.0141) | (0.00615) | (0.00643) |
| Real Per-Capita Income | –8.22e–07 | –3.33e–07 | 4.44e–07 |
| | (1.46e–06) | (1.11e–06) | (1.56e–06) |
| Constant | –0.0390 | 0.307 | 0.225 |
| | (0.408) | (0.260) | (0.339) |
| Observations | 46 | 49 | 49 |
| R-squared | 0.60 | 0.57 | 0.50 |

Notes:
Column 4 uses data from 2004, column 5 uses data from 2007, and column 6 uses data from 2010.
Due to missing data, the first two regressions do not include observations for VT, ND, and MT from the year 2004. Because NE's legislature is not partisan, it is omitted from the first two regressions as well.
Robust standard errors are in parentheses.
* Indicates significance at the 10 percent level for a two-tailed test. ** Indicates significance at the 5 percent level. ***Indicates significance at the 1 percent level.

In all of the specifications, the estimated coefficient on Number of Overlapping Tax Bases is positive and statistically significant. The estimates indicate that adding one more mobile tax base increases the combined state and local rate by about 1.2 percentage points. Given that the average rate is 9 percentage points and that the number of overlapping jurisdictions ranges between one and eleven, this is a substantial effect. We show this relationship in figure 1. This partial regression plot, taken from the estimates in table 3, column 1, shows the marginal effect (other factors being equal) of the number of tax bases on the combined state and local rate. These

results support the hypothesis that mobile phone taxation is subject to a tragedy of the anticommons.

**Figure 1: Overlapping Tax Bases and Mobile Tax Rates**




The number of carriers in the state has a negative coefficient and is statistically significant. This is not consistent with Olson's collective-action hypothesis; carriers do not seem to be stymied by the free-rider problem. Instead, the addition of another carrier appears to increase pressure to lower rates, which is consistent with Becker's theory of pressure groups. The marginal effect, however, is small. According to our estimates, having one more carrier in the state decreases the mobile phone tax rate by less than one-tenth of one percentage point.

According to the cross-sectional regressions, the effect appears to be driven by the last two years in our panel.

The estimated coefficient on the percentage of females in the state is statistically significant at the 5 percent level in the full panel and at the 10 percent level in the 2007 cross section. The estimated coefficient is negative in both regressions, suggesting that having a larger share of women in the state tends to decrease the cell phone tax rate. The effect is relatively large: if the share of women increases by 1 percentage point (roughly 1 standard deviation), then the tax rate tends to fall by six-tenths of a percentage point. It is possible women depend on cell phones to a greater extent than men and therefore tend to oppose the imposition of these rates.

In most of the models, the estimated coefficient on the log of the population is statistically significant and positive. This indicates that states with larger populations have higher combined cell phone rates. Mulligan and Shleifer have found that more populous states tend to regulate more.[41] It is possible that a similar dynamic exists in the realm of taxation.

A number of variables one might expect to be statistically significant are not. For example, in none of our regressions did the degree of Democratic control exhibit a statistically significant effect on the rates. It appears that state-level partisan politics do not explain the variation in these rates. The percentage of residents with a mobile phone subscription also failed to be statistically significant. This suggests that mobile phone consumers are not an effective lobbying force against these taxes. It is also somewhat surprising that population density failed to predict the variation in these rates at a statistically significant level. This suggests that rates are

[41] Casey Mulligan and Casey Shleifer, "The Extent of the Market and the Supply of Regulation," *The Quarterly Journal of Economics* 120, no. 4 (2005): 1,445–73.

not primarily driven by a desire to subsidize rural phone service.[42] It is worth noting that neither income nor the share of the population aged 65 and older seem to explain these rates.

## IV. Conclusion

Mobile phone services seem to be singled out for particularly heavy taxation. The tax rates that apply to these services are significantly higher than those that apply to most goods. This above-average taxation is costly. Previous studies have found that these taxes cost consumers nearly $16 billion each year[43] and that they cost the economy billions of dollars more than they yield in revenue.[44]

There is no strong normative justification for picking cell phones for above-average taxation. Cell phones do not have obvious negative-externality characteristics, they are not luxury goods, their users are not insensitive to price changes, and most of the tax does not go to support user fees. In many places, a portion of the rates funds subsidies for rural telephone service, but it is not clear why that burden should fall on cell phone users, and it may slow the expansion of rural cell service.

One plausible explanation for these above-average rates is what is known as the tragedy of the anticommons. When numerous interests are allowed to tax a single base, each does so without regard to the effect of its tax on the others. The problem can lead to over-taxation of the resource and to underutilization of the good or service being taxed. The problem is exacerbated when numerous levels of government have access to the same tax base. Indeed, a cursory examination of a typical cell phone bill supports this hypothesis. The total tax bill is the sum of various and sundry smaller taxes and fees, each of which supports a separate policy interest such

[42] An alternative measure of this factor—the percentage of the population living in an urban setting—also failed to obtain statistical significance.
[43] Woroch, *The 'Wireless Tax Premium' Harms American Consumers and Squanders the Potential of the Mobile Economy*.
[44] Hausman, "Efficiency Effects on the U.S. Economy from Wireless Taxation."

as rural telephone service, 9-1-1 emergency service, or general-fund spending. Unlike other tax bases, such as retail sales, this base is also taxed by numerous levels of government including federal, state, county, city, and—in some cases—emergency districts.

We test this theory at the state level, exploiting the variation in cell phone taxes across states and years. We find that a simple count of the number of separate taxes that use cell service as their base is a statistically significant factor in explaining the overall rate. In our model, the addition of each base raises the average tax rate by about 1.2 percentage points. Since the average phone bill in our sample supports 3.7 separate taxes, and since some support as many as 11, this effect can be quite large.

However, this explanation opens the door to other questions. Why aren't more goods and services subject to the sort of tragedy of the anticommons that characterizes cell phone taxation? Why, for example, is it typical for retail purchases to be taxed only twice: once at the state level and once at the local level? And why don't more interest groups attempt to tax retail sales at the state level? Does historical accident play a role? Does it matter that cell phones are a relatively new invention or that they were quickly adopted by the public? Cross-industry comparisons or historical analyses may be a fruitful area for future research.

For policy makers, the tragedy of the anticommons is a complex problem. Because the total tax rate is derived from so many separate sources, the solution requires coordinating multiple interests across multiple levels of government. Like other common-pool problems, successfully addressing this issue may require an institutional solution. For example, states might consider enacting statutes prohibiting the imposition of multiple taxes on a single base. Because the problem is exacerbated by multiple, overlapping jurisdictions, federal action may also be

warranted. For example, legislation might prohibit federal taxation of goods that are also commonly taxed at the state and local level.[45]

[45] Sobel, "Optimal Taxation in a Federal System of Governments," suggests more ambitious reforms. One alternative is to eliminate the federal system of taxation altogether and to replace it with a system of state contributions to the federal government. This is the way revenue was raised under the Articles of Confederation. Alternatively, a state might be allowed to offset federal taxes on its citizens by sending revenue to the federal government ("raised in any way the state wants").