Efficiency Effects on the U.S. Economy from Wireless Taxation

Abstract - *This paper measures for the first time the economic efficiency effects of the taxation of wireless services, which are taxed by federal, state, and local governments at relatively high rates in the range of 14–25 percent. The paper concludes such taxes are a much greater drain on the economy than their direct costs. The taxes identified in this paper cost the economy $2.56 billion more than the $4.79 billion they raise in tax revenues. These taxes are raised from wireless consumers and thereby suppress demand for service, imposing an efficiency loss on the economy of $0.53 for every $1 currently raised in taxes. Prospective taxes will impose an efficiency loss of $0.72–$1.14 per additional dollar of tax revenue raised.*

INTRODUCTION

Federal, state, and local government authorities are now levying a wide range of taxes and fees on the use of cellular telephone, PCS, and ESMR services (jointly wireless services).[1] The sum effect of the FCC–imposed fees and other federal taxes is currently 4.52 percent (including the federal excise tax and the FCC's share of current universal service program funding).[2] Additional tax increases have been proposed by the FCC to fund other social programs in telecommunications.[3]

State and local taxes on wireless vary by jurisdiction, and commonly impose higher tax rates on wireless than on other businesses. Many localities charge a variety of direct and indirect fees to wireless providers. Most such taxes and fees are of recent origin. More such taxes and fees are currently being proposed. The subsequent analysis estimates the efficiency loss to the economy from these additional proposed taxes and fees.

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[1] PCS is a form of digital cellular telephone service. ESMR, enhanced specialized mobile radio, is a cellular–like service offered by Nextel and other companies. Throughout this paper I will combine these services into the single term wireless services. They are often referred to as CMRS (consumer mobile radio services) by the Federal Communications Commission (FCC).

[2] See Hausman (1998) and Hausman and Shelanski (1999) for a discussion of the FCC taxation program to provide internet subsidies for schools and libraries.

[3] The FCC is only allowed to assess "fees," not taxes. However, the FCC fees have the same economic effect as a tax.

Mobile wireless telephone is an example of a new product that has significantly affected how Americans live in a relatively short period of time.[4] Since their introduction in 1983, cellular telephones' adoption has grown at 25-35 percent per year such that at year end 1998 about 69 million wireless telephones were in use in the U.S. Thus, approximately 28 percent of all Americans use wireless telephones, and there are about 40 percent as many cellular telephones in the U.S. as regular (landline) telephones. The average cellular customer spends about $525 per year on cellular service. Thus, consumers and businesses have found cellular telephone to be a valuable addition to their lifestyles. However, federal, state, and local governments have seen wireless as a ready source of tax revenue while the FCC has used wireless to fund new subsidy programs for wireline telephone usage. No calculation has ever been done to estimate the cost to consumers and the U.S. economy that arises from the relatively high level of taxation. Indeed, since separate taxes are levied at all three levels of government, most government officials seem unaware of the cumulative tax rate levied on wireless. They each see their own tax rate as being "small" without realizing that the cumulative effect of the three levels of taxes levy a high cost on consumers and the economy.[5]

The effect of these federal taxes, and the many state and local taxes on wireless, is to raise costs to consumers, suppress demand, and impose efficiency losses on the economy. For example, the aggregate New York state tax of 20 percent imposes a cost of about $11.52 per month or $138 per year on the average wireless user. The combined federal and state tax burden on a wireless user in New York is 24.5 percent or $170 per year. Similar taxes on wireless users in California and Florida average about 21 percent. The resulting state tax obligation for the average wireless customer in these states exceeds $152 per year.[6] When federal taxes are included, the overall tax rate increases to 25.5 percent, and average consumers' tax bills increase to $185 per year.

Even in states where lower taxes are levied on wireless, the median state tax rate is 10 percent, and the tax payment for the average wireless customer is about $62. Including current federal taxes, the median tax rate is 14.5 percent and the yearly tax bill is about $91.

There are now over 69 million wireless subscribers—about 40 percent as many as there are landline telephones in the U.S.[7] The average monthly bill for cellular is about $43 per month. Mobile telephone is most often used by small businesses as a productivity tool and by consumers for personal safety reasons. Thus, taxation of wireless should be evaluated not as taxation of a luxury good, but in terms of its distortionary effect on consumer behavior and economic efficiency compared to

[4] Wireless has led to significant increases in consumer welfare. For estimate of these welfare gains see Hausman (1997) and (1999).

[5] A recent report has discussed the high tax rates levied on telecommunications compared to other goods and services. The report points out that telecommunications, along with tobacco, alcohol, and gasoline, are the four most highly taxed industries in the U.S. See "Committee On State Taxation's 50–State Study and Report on Telecommunications Taxation," *Tax Notes*, Nov. 22, 1999, pp. 1377ff.

[6] For instance, a wireless user in California pays the following taxes: FCC taxes for the high cost fund, universal service and school and library internet subsidy, state, county and city sales taxes, taxes (fees) levied by the California Public Utilities Commission for universal service (3.2 percent), emergency telephone service (0.72 percent), high cost funds (3.14 percent), teleconnect fund (0.41 percent), hearing impaired fund (0.36 %), local utility taxes (7 percent), and the federal excise tax (3 percent).

[7] These are year end 1998 estimates from the Cellular Telephone Industry Association (CTIA) semi–annual surveys.

other revenue sources for government expenditure.[8]

Economists have well developed tools, used for more than 100 years, to assess the distortionary effect of a tax on consumer welfare and economic efficiency.[9] Taxes decrease the consumption of a good or service and, in this case, also lead to under–utilization of the infrastructure investment made by wireless providers. In this paper, I calculate the effect on deadweight loss and economic efficiency from the distortionary effect of taxation on wireless. The change in economic efficiency accounts for both harm to consumers, from the deadweight loss term, and harm to wireless providers who have invested tens of billions of dollars in their networks and who have paid over ten billion dollars to acquire their licenses, often from the federal government.[10]

I calculate the efficiency cost to the economy of raising the approximately $4.79 billion that is currently raised from wireless taxation to be about $2.56 billion (in addition to the $4.79 billion of tax revenue) or the efficiency loss to the economy for every $1 raised is about $0.53. Furthermore, for every additional dollar raised, the marginal efficiency loss to the economy varies between $0.72 to $1.14. This cost to the economy is high compared to other taxes used by the federal and state governments to raise revenues.[11] Three reasons exist for the high cost to the economy of this tax on mobile telephone services: (1) the price elasticity of wireless services is relatively high, (2) the taxation of wireless services is high, and (3) the price to marginal cost ratio of wireless services is high. Thus, the taxation of wireless imposes high efficiency costs on the U.S. economy.

Other commodities can be taxed to raise the same revenue without creating nearly so large deadweight losses or losses in economic efficiency (Hausman, 1995; 1998). Within telecommunications, a tax on monthly local landline access rates will create almost no deadweight loss or loss in economic efficiency since the price elasticity for local access has been estimated to be very near zero: –0.005 (Hausman et al., 1993; 1998). I conclude that taxation of wireless cannot be justified on income distribution grounds (e.g., the luxury good approach) nor can it be justified on economic efficiency grounds.[12] Government use of wireless as a taxation source to fund expenditure in other areas leads to high efficiency costs to the economy. One reason for increased government taxation of cellular may be that consumers see an overall decreasing price, despite increasing taxes, due to improved technology that decreases costs and increased competition.[13] Nevertheless, the lack of consumer complaints does not provide a valid reason for creating large efficiency losses on the economy, especially for a new and rapidly expanding technology such as cellular telephones.

[8] See Posner (1971) for an early discussion of taxation by regulation. Hausman (1998) estimates the distortionary effects of taxation of landline telephone services.

[9] See e.g., Auerbach (1985) and Hausman (1981).

[10] PCS providers bought their spectrum in auctions conducted by the federal government. The cellular spectrum and much of the ESMR spectrum was distributed free of charge by the federal government in an earlier period before auctions were used. But, in many instances, current licensees obtained their spectrum by buying it at market prices from the original licensees.

[11] This paper answers the question raised by Posner (1971) of the cost of subsidy programs arising from regulation and taxation of wireless telephone which I also considered in Hausman (1998) with respect to wireline telephone tax and subsidy programs.

[12] According to a 1997 survey of approximately 1,000 wireless users by Peter Hart Research Associates, the median (and modal) wireless user's family income was in the range of $30,000 to $50,000. Furthermore, wireless services do not create a market failure that requires a Pigouvian tax to correct.

[13] This possibility was raised by the discussant at the NBER conference.

ESTIMATION OF ECONOMIC EFFICIENCY LOSSES

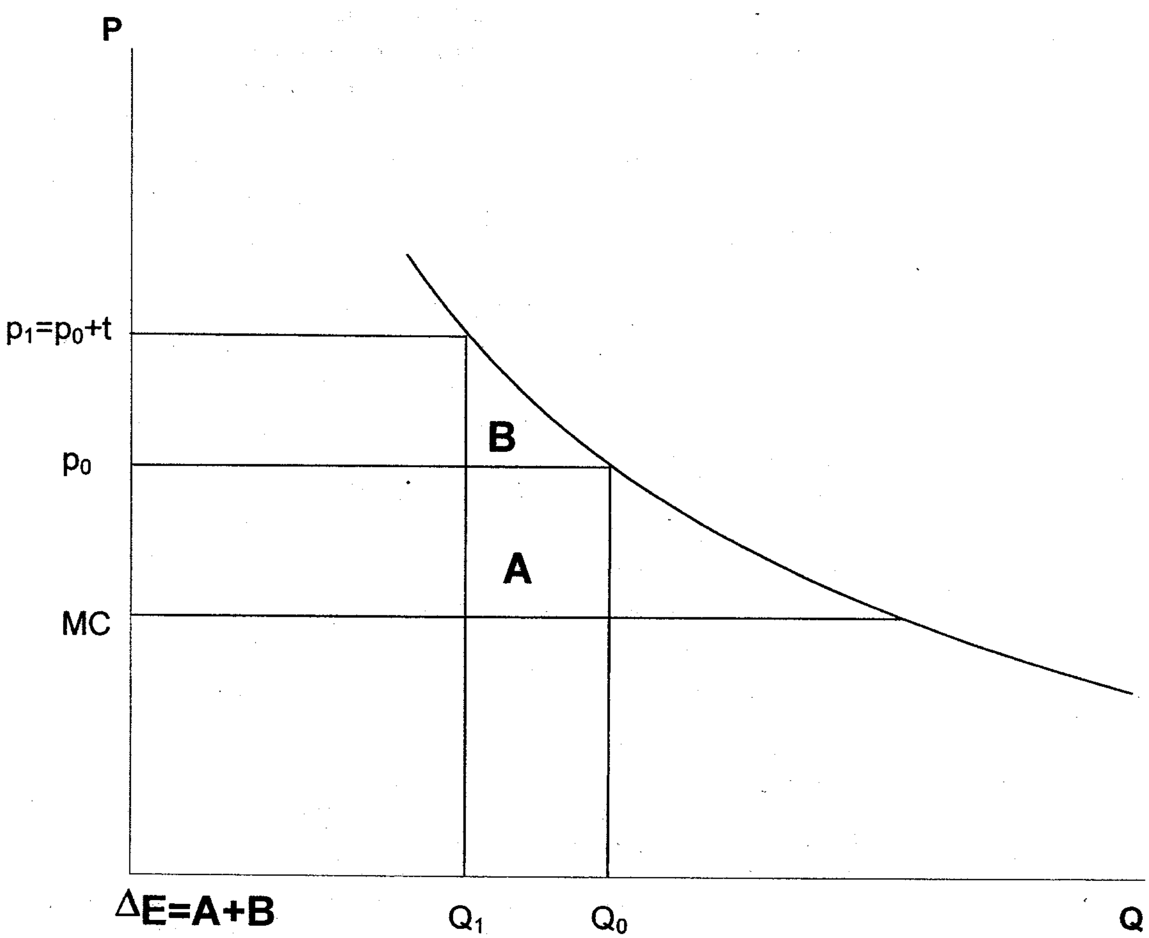
Taxes (and subsidies) distort economic activity. Taxes increase prices and thus lead to lower demand. This lower demand has two adverse affects on economic efficiency, which is defined (approximately) as the sum of producer surplus and consumer surplus.[14] To the extent that the industry is imperfectly competitive and price exceeds marginal cost to cover fixed costs, decreased demand reduces the amount of producer surplus, which is the product of quantity demanded times the difference between price and marginal cost. Decreased demand from higher prices also affects consumers adversely since consumer surplus decreases. Thus, the change in economic efficiency from the imposition of a tax is given approximately by the formula:

$$[1] \quad \Delta E \approx [-\Delta q_i(p_i - m_i) - .5\Delta p_i \Delta q_i]$$

$$\approx \left[\eta_i \frac{\Delta p_i}{p_i}(p_i q_i - m_i q_i) + .5\eta_i \left(\frac{\Delta p_i}{p_i}\right)^2 p_i q_i\right]$$

where the first term is the change in producer surplus and the second term is the change in consumer surplus, after the amount raised by the tax is subtracted off.[15] Figure 1 provides a graphical dem-

Figure 1. Economic Efficiency Loss from Taxation



[14] See e.g. Auerbach (1985) for a further discussion of how taxation creates efficiency losses to the economy.

[15] Thus, as discussed above, the possible distortion created by expenditure of the tax are not considered. All the quantities in the formulae are assumed to be Hicksian compensated quantities. See Hausman (1981) for computation of compensated quantities.

onstration of this relationship. Equation [1] demonstrates that taxes that cause prices to increase create losses in economic efficiency with the size of the efficiency loss depending on the price elasticity, η_i, the magnitude of the price increase, $(\Delta p_i/p_i)$, the revenue of the good or service being taxed, $p_i q_i$, and the marginal cost of production, m_i.

A more accurate method than equation [1] replaces the second term of equation [1] with a calculation of the exact deadweight loss to consumers based on the analysis of Hausman (1981a). Rather than using the Taylor expansion, I use the expenditure function based on the log–linear demand curve to calculate the compensating variation from the increase in taxes:

$$[2] \quad CV = \left\{ \frac{(1-\delta)}{(1+\alpha)} y^{-\delta} [p_1 x_1 - p_0 x_0] + y^{(1-\delta)} \right\}^{1/(1-\delta)} - y$$

where δ is the income elasticity (0.8) and α is the price elasticity. To calculate the deadweight loss to consumers, I subtract the compensated revenue raised R^* from the compensating variation calculated in equation [2]: $DWL = CV - R^*$. The DWL estimate replaces the second term in equation [1]. Hausman (1981a) demonstrates that this exact calculation can be considerably more accurate than the approximation contained in equation [1].

For mobile telephone I have estimated the price elasticity η_i to be –0.51, Hausman (1997), which is relatively high for telecommunications services.[16] The magnitude of the price increase $(\Delta p_i/p_i)$ depends on the tax rate in each state with the median tax rate 10 percent and the high tax rates in the range of 20–21 percent in California, New York, and Florida.[17] When current federal taxes are included the median tax rate is 14.5 percent and in the high tax states the overall rate is 24.2 to 25.5 percent. The revenue of wireless service $p_i q_i$ is about $525 per year, excluding taxes. Lastly the marginal cost of production for wireless, m_i, is relatively low, which is expected given the large fixed costs of wireless networks. I estimate the marginal cost to be about $0.05 per minute.[18] Thus, the expected result from equation [1] or equation [2] is relatively high efficiency costs to wireless taxation given the relatively high demand elasticity, the significant tax rates, and the low marginal cost of production.

Estimation of the Average Efficiency Loss from Wireless Taxation

Using equation [2], the cellular elasticity estimate considered above, and the fact that the marginal cost of wireless is about $0.05 per minute while the median tax rate is 14.5 percent,[19] I estimate that for average revenue raised by the tax on wireless:

$$[3] \quad \Delta E = 0.534 * TR$$

[16] The price elasticity for interstate long distance service exceeds (in magnitude) the cellular price elasticity, but the cellular price elasticity exceeds the elasticities for most other telecommunications services.

[17] In these calculations I put sales taxes in the "numeraire" price of other goods under the assumption that it is paid on purchases of other goods and services.

[18] To estimate this marginal cost I take the expected growth rate of a given cellular company and perturb the growth rate up or down by a small amount. I take the difference in the present value of costs and divide it by the levelized increase in output. Thus, the estimate takes account of more rapid expansion (e.g., cell splitting) by the cellular company as well an increase in its variable costs, which also include payment to local exchange companies and to interexchange carriers for the increased traffic. The main economic fact that price greatly exceeds marginal cost is not significantly affected by the exact details of the calculation. This relationship between price and marginal costs holds for almost all telecommunications services.

[19] This estimate of marginal cost includes customer acquisition cost, which is amortized over three years, which follows from an estimate of the average churn rate for new cellular customers.

where TR is total tax revenue raised. This calculation follows from dividing through equation [1] by the tax revenue raised, $t_i p_i q_i$ (i.e., the tax revenue term TR), and using wireless revenue and tax amounts collected from wireless by the federal, state, and local jurisdictions.

For the high tax states the efficiency loss increases on average for each dollar of tax revenue raised from wireless customers. For a 21 percent state tax rate used in California, Florida, and New York, the estimated efficiency loss increases to approximately $0.70 for each dollar of tax revenue raised, similar to the result in equation [2]. For lower tax rates, the estimated efficiency loss decreases accordingly.

The elasticity estimate that I used to calculate equation [2], reported in Hausman (1997), is –0.51. This estimate was based on data up through 1993. Using more recent data, I have estimated an elasticity of about –0.71, although the estimate, statistically, is not significantly different from the earlier estimate. An increased elasticity estimate might be expected given the rapid penetration of mobile telephone and the expected results that early adopters place a higher marginal valuation on their usage while later adopters are affected by decreasing prices. Thus, the higher penetration among residential users may be leading to a higher price elasticity, since these non–business users have a higher price elasticity.[20] While I would need to collect more data before changing the elasticity estimate, note from equation [1] that the estimated efficiency loss is homogeneous of degree one in the elasticity estimate. An approximately similar result holds for equation [2]. Thus if the higher elasticity estimate were used to estimate the average efficiency loss, the amount would increase from 0.534 for the median tax state to 0.743. The efficiency loss for the high tax states would also increase accordingly.

Estimation of the Marginal Efficiency Loss from Wireless Taxation

Perhaps a more relevant calculation is the marginal efficiency loss to the economy from changes to the tax rates. The FCC and state and local tax authorities apparently view wireless as a ready tax revenue source so that they have been increasing the tax rates over time. The FCC has increased tax rates to provide universal service for landline telephone users and to provide internet subsidies to schools and libraries.[21] These subsidies and the taxes (fees) to fund them are expected to continue to increase in the near future. The formula for the marginal efficiency loss of increased taxation is computed by taking the marginal change in equation [1] with respect to the tax rate, $\partial \Delta E / \partial t_i$, and dividing by the marginal change in tax revenue with respect to the tax rate, $\partial TR / \partial t_i$:

$$[4] \quad \left(\frac{\partial \Delta E / \partial t_i}{(\partial TR / \partial t_i)}\right) \approx \frac{\eta_i\left(1 - \frac{m_i}{p_i}\right) + \eta_i \frac{t_i}{p_i} + \left[\eta_i \frac{t_i m_i}{p_i^2} - .5\eta_i \frac{t_i^2}{p_i^2}\right]\frac{\partial p_i}{\partial t_i}}{1 - \eta_i \frac{t_i}{p_i}\frac{\partial p_i}{\partial t_i}}$$

[20] Under various competitive assumptions that businesses pass along the increased cost of inputs in their final product prices, the estimates in this paper would remain approximately the same. However, as I discuss subsequently, the pass through assumptions can be affected by oligopoly models of final product demand. So as not to unduly complicate the models, I assume unitary pass through of the wireless taxation to final product demand and assume that the same price elasticities hold for business and residential customers. Thus, business demand can be interpreted as a derived demand for wireless that arises from final product demand from consumers.

[21] Hausman (1998) and Hausman and Shelanski (1999) discuss the internet subsidy program for schools and libraries.

Using equation [4] together with the assumption that $\partial p_i / \partial t_i = 1$, along with the fact that $t_i / p_i = 0.1452$ for the median state when federal taxation is included, I estimate equation [4] to be 0.709.[22] When I calculate the marginal efficiency loss using the exact calculation based on equation [2], using the approach of equation [4] instead of the traditional approximation, I estimate the marginal efficiency loss to be 0.724. For all further calculations, I use the exact approach rather than the approximation of equation [4].

Thus, for increased taxation the efficiency loss to the economy is approximately $0.72 for each $1 of additional tax revenue. For states such as California and New York, with tax rates near 20 percent (which rise to 25 percent when current federal taxation is included), the marginal efficiency loss is about $0.93 for each $1 of tax revenue raised from wireless service. Thus, the marginal efficiency loss is quite high since for each dollar raised by an increase in wireless taxes, $0.72 to $0.93 of efficiency loss is created for the economy, beyond the tax revenue raised.[23]

Three reasons exist for this high amount of efficiency loss to the economy from wireless taxation, which can be seen by an examination of equations [1] and [3]: (1) the elasticity η_i is relatively high, (2) m_i / p_i is relatively low since gross margins are high in wireless, which is to be expected given the large fixed costs of wireless networks, and (3) t_i / p_i is relatively high in the range of 14–25 percent. To see how this efficiency loss compares with other taxes in the U.S. economy, I turn to a review of the literature.

PREVIOUS ESTIMATES OF THE EFFICIENCY LOSS FROM TAXATION IN THE U.S. ECONOMY

Rather than taxing telecommunications usage to fund the subsidy for universal service landline telephone subsidies and internet access subsidies for schools and libraries, Congress could have used general tax revenue. Similarly, states can levy taxes on incomes or expenditures (sales taxes) to fund their various social programs. While no generally agreed to number exists for the value of the marginal efficiency loss to the economy from increasing overall taxes, the range of estimates is reasonably close. In Table 1 I present estimates of marginal effects of additional taxes increases to $1.14 for the marginal dollar of tax revenue.

All of the estimates in Table 1 are below $0.405 of marginal efficiency loss per dollar of additional revenue raised. Thus, they are all significantly less than the $0.72 –$1.14 efficiency loss per additional dollar of tax revenue raised by the FCC and by the state and local authorities. Thus, considerably less expensive means to raise tax revenues, in terms of economic efficiency losses, exist for the federal government and for the states in terms of increasing income taxes or other broad–based taxes, rather than targeting the use of wireless services.

[22] If instead of the assumption that $\partial p_i / \partial t_i = 1$, I use a differentiated product oligopoly markup model assumption along with constant elasticity demand curves, the marginal efficiency loss could be higher than 0.52. Other oligopoly models, especially models based on linear demand curves, could find $\partial p_i / \partial t_i < 1$. For a further discussion of these matters see Hausman and Leonard (1999). However, the introduction of 4–5 new wireless competitors in addition to the two cellular incumbents in each market will lead to increased competition, leading to the conclusion that the entire tax will be passed on to customers. When I did a similar analysis for the introduction of the "E–rate" tax on long distance (Hausman, 1998), the chief economist at the FCC at that time claimed that the long distance companies might not pass on the increased tax to their customers. However, experience demonstrates that the long distance companies did pass on the entire tax, often using a separate line item on the bill to call customer attention to the tax.

[23] Since the numerator is homogeneous of degree one in the price elasticity and the denominator will decrease with a higher elasticity, the marginal efficiency loss would increase significantly if the higher elasticity of –0.71, which I discussed above, were used. Indeed the estimate of $0.724 increases to $1.14 for the marginal dollar of tax revenue.

TABLE 1
MARGINAL EFFICIENCY EFFECTS OF ADDITIONAL TAXES RAISED[1]

Study	Type of taxes	Marginal Effect
1. Ballard, Shoven, and Whalley (1985)	U.S. taxes	0.365
2. Browning (1987)	U.S. taxes	0.395
3. Bovenberg and Goulder (1996)	U.S. taxes	0.260
4. Hausman (1981b)	Income taxes	0.405

[1]Where a range of estimates is given in the original paper, I use the mid–point of the range. Feldstein (1999) has estimated significantly higher marginal efficiency losses from the income tax. Also, in dynamic models of efficiency losses from capital taxation, very large efficiency losses are sometime found, e.g., Judd (1987).

In terms of the FCC tax rate used for universal service subsidies, the marginal efficiency loss for the median state of $0.72 is significantly less than the marginal efficiency loss for the FCC tax on long distance service for the E–rate which Hausman (1988) estimates to be $1.25. Thus, to the extent that some of the universal subsidy is raised from wireless service, instead of all being raised from long distance service, a lower efficiency loss to the economy results. However, Hausman (1998) and Hausman and Shelanski (1999) discuss a far better method, which most economists agree with, to fund the universal service subsidy.

The alternative method that the FCC could use to raise the revenue for the universal service subsidy is to increase the Subscriber Line Charge (SLC). The SLC was established in 1984 and is a monthly fixed fee of $3.50 per residential line and $6.00 per business line. The FCC has not increased the SLC for residential households since 1984 despite approximately 56.9 percent inflation since that time period. The SLC is used in large part to fund the joint and common costs of the local exchange carriers networks as well as the cross subsidy for local exchange access (e.g., local telephone service). Note that in terms of the efficiency effects on the economy the SLC is very attractive, since the own price elasticity of local access with respect to its price is estimated to be –0.005 by Hausman et. al. (1993). Thus, the SLC acts similarly to a lump sum tax which has "first best" economic efficiency properties since it does not create an economic distortion; i.e., equation [4] is approximately zero since η_i is very near zero so that the numerator is approximately zero.

To calculate the efficiency effects of this increase in the SLC, I return to equation [4] but now compute the marginal change in economic efficiency for a change in the SLC. I first consider the second term in equation [4], which is the change in consumer surplus (after subtracting off tax revenue raised). Since the ratio $t_j/p_j = 0.123$ for the SLC approximately, the marginal change in consumer surplus is about .0006 using the assumption that $\partial p_j/\partial SLC = 1$. Thus, for each additional dollar of revenue raised, the efficiency loss is about 6/100 of a penny, i.e., nearly zero, as expected.

Now the first term has a rather surprising outcome. Local access services for residential customers are priced below marginal (incremental) cost in most states as a policy to subsidize universal service, to subsidize rural customers, and to subsidize middle class residential customers.[24] The ratio of m_j/p_j exceeds 1.0, and a national average is approximately 1.25. Thus, the first term equals –.0013 so that the sum of the initial two terms in equation [7] yields a change in economic efficiency from increasing the SLC of –.0007, actually an *increase* in economic efficiency

[24] I have been involved in regulatory proceedings in California where direct calculations demonstrate this fact. Also under FCC Section 251 proceedings in the past few years, residential local exchange services are typically demonstrated to be priced below the calculated TSLRIC. Little disagreement exists among most economists with respect to to this outcome.

because the subsidy is decreased. When the last two terms in equation [4] are estimated and the denominator is computed, I calculate the marginal efficiency loss to be .0006, or an efficiency loss of about $0.0006 for each $1.00 increase in the SLC. Thus, an increase in the SLC to fund the universal subsidy has only an extremely small efficiency effect, essentially equal to zero.

CONCLUSIONS

The FCC and state regulatory authorities typically do not take into account efficiency effects on the economy from their regulatory actions. Yet, these regulatory decisions can have large adverse effects on economic efficiency. In Hausman (1998), Hausman and Shelanski (1999), and in this paper, I find that the distortionary effects of taxation of telecommunications services is significantly higher than the distortionary effects created by income and sales tax revenue sources. Thus, the negative effect on the efficiency of the U.S. economy created by these regulatory and sales taxes merits careful consideration.

Unfortunately, the FCC and state and local entities largely ignore the negative efficiency effects of their various tax plans levied on wireless. Indeed, the FCC has increased the Internet component of the universal service subsidy to schools and libraries, which has lead to increased taxes. The FCC also plans to require local number portability for wireless, which has been estimated to lead to an additional 0.5–2.2 percent tax on wireless usage.[25] Additionally, the FCC has required implementation of an extraordinary expensive emergency (E911) plan for wireless, which is estimated to cost approximately $1.5 billion, or about 1.5–2 times the estimat-ed cost of the local number portability requirement.[26]

While the FCC programs will likely have consumer benefits, no economic analysis has been done with respect to a benefit–cost analysis to see whether the expected benefits outweigh the high efficiency costs to consumers and the U.S. economy.[27] The FCC and state and local authorities could estimate the costs to consumers and the economy when they implement tax and subsidy programs and only implement regulatory requirements that lead to commensurate benefits to consumers. This recommendation is particularly important given the finding of this study that the marginal efficiency loss of these taxes increases significantly as the overall tax rates increase.

Acknowledgments

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[25] The requirement was scheduled to go into effect in June 1999, but it has been delayed. The lower estimate is from Evolving Systems, "Wireless LNP: An Industry White Paper," Fall 1997. The higher estimate is from the Yankee Group, "Wireless Number Portability Costs," Exhibit 4a, March 1998.

[26] These quite expensive regulatory requirements have arisen by the extension of regulatory requirements from local landline providers to wireless. No economic analysis has been undertaken to decide whether the extension of landline regulation to wireless provides net consumer benefits.

[27] State and local taxing authorities have apparently seen wireless as a convenient funding source for unrelated purposes.

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