**Nextel Communications, Inc.**
2001 Edmund Halley Drive, Reston, VA 20191

NEXTEL

December 4, 2002

Michael K. Powell, Chairman
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: *Ex Parte* Submission: USF Contribution Mechanism Federal-State Joint Board on Universal Service, CC Docket Nos. 96-45, 98-171, 90-571, 92-237, 99-200, 95-200, 95-116, 98-170 and NSD File No. L-00-72

Dear Chairman Powell:

Nextel Communications, Inc. (Nextel) has participated and observed as this Commission and the members of the Federal and State Joint Board on Universal Service deliberate on an important topic – ensuring a strong and predictable mechanism for funding of the federal Universal Service program. As a Commercial Mobile Radio Services (CMRS) provider whose mandatory contributions to the program's funding have more than quadrupled over the course of the last five years, Nextel is keenly interested in appropriate program reform that recognizes the competitive harm and consumer welfare loss that can accompany choices for reform that are not grounded in economics and sound public policy.

Plainly, the statutory goals for USF funding should be achieved at the lowest possible cost to consumers and telecommunications services providers. The current funding system does not achieve this goal. As explained herein and in the attached *ex parte*, up to this point, the Commission has taken the position that it is equitable and non-discriminatory, as well as competitively neutral, to assess mandatory contributions on all telecommunications carriers based on their end user interstate telecommunications revenues. Thus, broadband service providers must be a part of the pool of mandatory contributors to USF going forward. Leaving only some interstate service providers to pay into USF will distort competition and skew investment incentives based solely upon USF assessment avoidance.

In addition, important analysis remains to be completed in the next phase of this proceeding. Nextel has determined, as demonstrated in the attached material, that carriers with services that exhibit high elasticity of demand will suffer a substantially greater revenue loss for each increase in taxes, fees and assessments (TFAs) than would a carrier with relatively inelastic demand for its services that faces payment of the same TFAs.

Wireless services, for example, are very susceptible to changes in demand as the total price of the service increases with increasing TFAs. In contrast, very few customers of local wireline service disconnect service when TFAs increase. Nextel's attached analysis demonstrates that Commission decisions about how to fund USF, particularly the increasing demand for USF funding, have important implications for the economic welfare of carriers and their customers. Indeed, failure to take relative elasticity of consumer demand for services into account when allocating USF program burdens will create additional, unnecessary deadweight loss on the economy, on telecommunications service consumers and on the telecommunications industry that is struggling towards an incomplete economic recovery. This suggests that for purposes of minimizing their detrimental effect on the nation's overall economic welfare, TFAs generally should be increased more on those services for which demand would change comparatively less. This reality should be reflected in the Commission's USF contribution policy reforms. This approach is the right answer from an economic and public policy perspective and it is legally sustainable under Section 254(d).

Accordingly, Nextel advocates an assessment approach that reflects the elasticity of demand of different types of telecommunications services.[1] Implementing a program change that appropriately makes distinctions based upon relative elasticity of demand would not require a major overhaul of the existing revenue-based USF assessment approach. As many parties to this proceeding have demonstrated, courts already have determined that revenue-based assessments are consistent with Section 254(d)'s "equitable and non-discriminatory" requirement. The challenge will be to modify the revenue assessment methodology to minimize the economic welfare loss that is an inevitable part of USF and other social policy programs.

The other proxies that parties have offered as alternatives to interstate revenue-based assessments (such as lines, PSTN connections or working telephone numbers) at their core are a result-oriented shifting of relative funding burdens from one industry segment to another. The FCC must be very cautious about embracing new proxies that radically shift the USF funding burden from one industry segment to another, particularly those that fail to account for the potentially significant losses to economic welfare that result from using a shotgun method of raising taxes, fees and assessments on telecommunications service providers.

While Nextel raised the issue of demand elasticity in its comments and replies filed in this proceeding, Nextel recognizes that the issue has not gotten sufficient attention and likely would benefit from Commission analysis in the next phase of its contribution methodology

[1] Even the connection-based proposals in the record of this proceeding, which fail to satisfy the criteria of Section 254 for other reasons, do not treat all forms of service equally; instead they treat different types of services and service providers differently.

reform proceeding. Nevertheless, Nextel agrees with the comments and *ex parte* filings of many other parties that there is room for interim changes to the USF contribution mechanism that would address a number of the identified shortcomings of the existing mechanism.

For one, the Commission should adopt immediately a collect and remit format for payment of USF funds to the Commission's fund administrator. The administrator can be directed to calculate a reserve fund if there is concern that a collect and remit payment format might lead to a collections shortfall. Second, the Commission should eliminate unnecessary lags between the reporting of revenues and their collection. And, to ensure that all service providers are not gaming the amounts they pay for USF, the Commission should require a uniform pass-through of the assessment amount on each industry segment. This uniform assessment pass through would include a uniform program cost administration safe harbor. The real benefit of this uniformity is that it creates transparency for consumers, who can more easily determine the cost of service among carriers if the added cost of taxes, fees and assessments are reflected uniformly as line items.

Nextel urges that, under your leadership, the Commission take the next steps in USF reform mindful of the need to avoid creating additional, disproportionate economic welfare losses for carriers whose services are elastically demanded by consumers. Constant increases of the levels of taxes, fees and assessments on these carriers on the same basis as carriers that deliver services that exhibit little or no elasticity cannot continue without severe distortion of the competitive telecommunications market.

Respectfully submitted,

Lawrence Krevor /LP

Leonard J. Kennedy
Senior Vice President and General Counsel

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Vice President, Government Affairs

**NEXTEL COMMUNICATIONS, INC.**

cc: Kathleen Q. Abernathy, Commissioner
Michael J. Copps, Commissioner
Kevin J. Martin, Commissioner
Jonathan S. Adelstein, Commissioner

# Impact of Universal Service Reform on the Wireless Industry

**Presentation to the Federal Communications Commission**

**Washington, D.C.**

**4 December, 2002**

Sun Fire Group LLC
Alexandria, VA 22304

Reference: 1002

# Some economic principles for Universal Service Reform

- Statutory goals should be achieved at the lowest possible cost to consumers and telecommunications service providers
- The Commission's decision about which fees should be increased to subsidize universal service has important implications for economic welfare
- Not all price increases have the same effect on consumers and service providers
- All providers of interstate telecommunications services,including broadband service providers, should contribute to the USF
- For the purpose of minimizing the loss of economic welfare, universal service assessments should generally be increased more on services for which demand will change comparatively less

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## The economic welfare cost of increased fees, taxes and assessments affects the ability of a wireless operator to compete and raise necessary capital

- The business model of a mobile operator is inherently different:
  - Greater network investment (license fees, build out)
  - Greater levels of debt to fund network investment
  - Immature market (relative to local wireline)
  - Greater competition for new subscribers with very high subscriber acquisition costs
  - Greater price elasticity of demand
- Regulatory policies can distort and weaken competition by:
  - Unnecessarily raising wireless prices
  - Increasing costs of wireless network investment and operation
  - Discouraging new investment by reducing profitability and thus the ability to attract capital necessary for build out and introduction of new services

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## Regulatory mandates should account for the differences in business models -- the impact of complying with these mandates is greater for wireless operators

- USF contributions – although technically a "fee" -- have the same economic welfare impact as a tax
- CALEA, WNP, Number Pooling and E-911 location capabilities require significant capital expenditures (CapEx) to implement and recurring operational expenses (OpEx) to maintain
- In a competitive market, wireless carriers will
  - pass mandated USF fees through to their customers (typically a line item added to subscriber's bill)
  - attempt to recover added CapEx and OpEx to implement other requirements through additional assessments

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# The cost of mandated requirements is in addition to a wide range of federal, state and local taxes, fees and assessments which average about 14% -- and can range up to 25% -- of the consumer's wireless bill

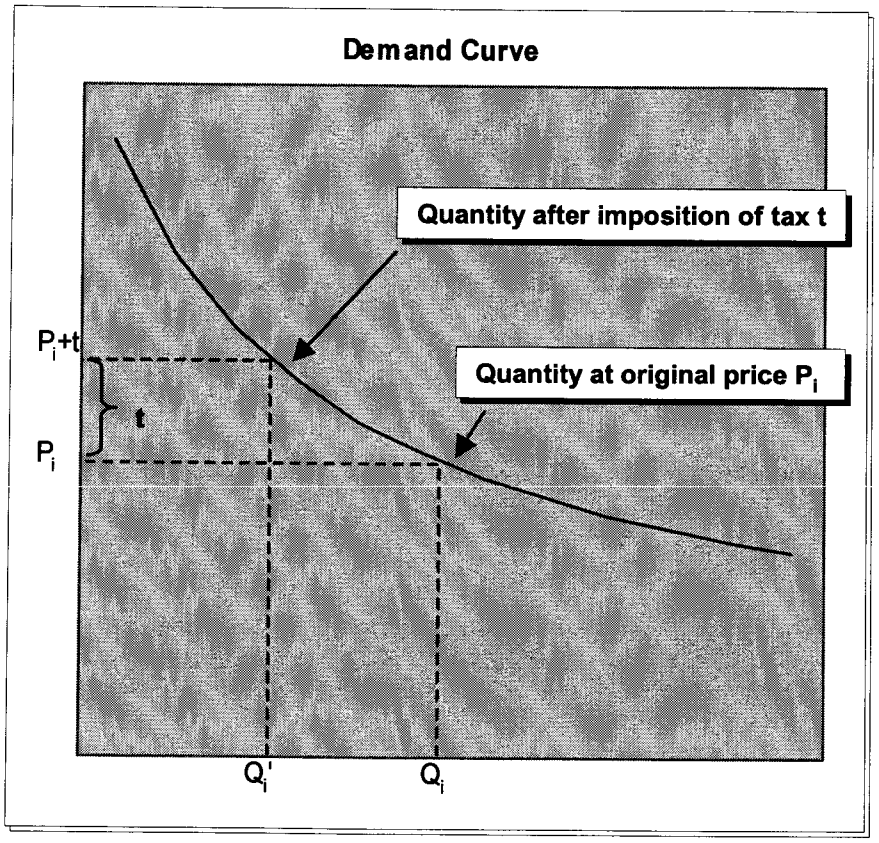
***Sample Nextel Statement for New York City***

| | | |
|---|---|---|
| Access and other charges | $71.00 | Average Revenue per User (3Q 2002) |
| Federal Excise Tax | $ 2.28 | |
| Federal TRS Charge | $ 0.05 | |
| Federal Universal Service Assessment | $ 0.86 | USF Assessment (wireless) = 1.2% |
| State Excise Tax | $ 1.78 | |
| State Gross Receipts Tax | $ 0.27 | |
| State Sales Tax | $ 2.93 | |
| County Excise Tax | $ 1.67 | |
| County Other Taxes/Fees | $ 0.42 | |
| County Regulatory Fees | $ 0.09 | |
| City Sales Tax | $ 3.11 | |
| Federal Cost Recovery Program | $ 1.55 | Recovery of costs to implement unfunded federal mandates (E-911, WNP, Number Pooling) |
| State 911 Taxes | $ 1.20 | |
| County 911 Taxes | $ 0.30 | |
| Total Unit Taxes, Fees and Assessments | $16.51 | Aggregate 23.3% "tax" (New York City) |
| Total Charges | $87.51 | |

## Unintended Consequence

**The unintended consequence of any tax, fee or assessment (TFA) is an increase in prices and reduction in overall demand for wireless services**

- Demand for wireless services is elastic -- an increase in price due to taxes or fees results in a decrease in consumer demand (e.g. reduced minutes)
- The firm does not benefit from the increase in price (the tax is a pass-through to the consumer) -- thus revenue is decreased




**Taxes, fees or assessments are the same from an economic viewpoint -- they increase prices, thus leading to lower demand**

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# TFAs impose high economic welfare costs on both producers (i.e. wireless operators) and consumers (wireless subscribers)

## Economic costs to the consumer are:

- ***Direct costs*** -- for every dollar of revenue raised, a dollar has to be taken away from a consumer or firm
  - in competitive markets, the TFA will be reflected in higher prices paid by consumers
- ***Deadweight loss*** -- costs for which there are no offsetting benefits (i.e. deadweight)
  - the imposition of a TFA distorts subscribers' consumption decisions, giving rise to efficiency losses over and above the direct losses of income that consumers suffer from bearing the TFA burden

## Economic costs to the producer are:

- ***Loss of marginal profit*** -- producer surplus declines as less output is sold and the firm receives the same revenue per unit (due to the tax)
  - the imposition of any TFA reduces the ability of a firm to pay down debt, attract new capital and invest in the network

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# The economic welfare losses due to taxes, fees and assessments are proportional to the price elasticity of demand and the base level of the TFA

**Economic Welfare Loss = Producer Loss + Consumer Deadweight Loss ***

- The loss of economic efficiency is a measure of the economic costs of the current level of TFAs
- The producer loss of marginal profit is proportional to the elasticity of demand **
  - the more elastic the demand, the higher the efficiency losses
- The consumer deadweight loss is proportional to the elasticity of demand and the level of TFAs **
  - the more elastic the demand, the higher the deadweight loss
  - the higher the base level of TFAs, the higher the deadweight loss

* The direct tax to the consumer is not included since it is assumed that the proceeds of the tax are redistributed
** These relationships are derived and discussed further in the attachment "Economic Welfare Costs of Taxes, Fees and Assessments"

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# Mobile wireless has a high price elasticity of demand relative to other telecommunications services

| Estimates of Price Elasticity of Demand | Wireless [a,b] | Local Wireline [c,d] | Long Distance [e] |
|---|---|---|---|
| | -0.51 to -1.00 | -0.005 | -0.63 to -0.72 |

- The price elasticity of demand of wireless has been increasing -- new wireless subscribers are likely more price sensitive users who choose lower priced service plans
- The demand for flat-rate local phone service does not appear to be very sensitive to price
  - the basic monthly rate is less important for telephone penetration rates than are usage-based charges (i.e. intra-lata or long distance charges)
  - monthly local wireline expenditures vary relatively little by income

a See, e.g. Jerry Hausman, "Efficiency Effects on the U.S. Economy from Wireless Taxation", National Tax Journal, Vol. 53, no. 3 Part 2, (September 2000).
b See, e.g. Yankee Group report, "Competition Begins to Have an Impact on Wireless Pricing", April 18, 1997.
c See, e.g. Jerry Hausman et. al. "The effects of the Breakup of AT&T on Telephone Penetration in the United States", 83 American Economic Review, 178, 1993, and
d D. Lynn Solvason, "Cross-Sectional Analysis of Residential Telephone Subscription in Canada using 1994 Data", 9 Information Econor and Policy, 241, 1997.
e See Joseph P. Gatto et. al., "Interstate Switched Access Demand Analysis", 3 Information Economy and Policy 333-334 (1988).

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## The relatively high elasticity of demand and the high total taxes, fees and assessments on the wireless bill result in high average economic welfare (i.e. efficiency) losses

- On average for every $1.00 raised of a TFA, the average efficiency loss is $0.55
  - Loss in producer efficiency is about 0.50 x Tax Revenue *
  - Consumer deadweight loss is about 0.05 x Tax Revenue *
  - The total average efficiency loss from current cumulative TFAs (including universal service fees) is about 0.55 x Tax Revenue *

*** Based on average assessment rate of 14% and wireless industry elasticity of -0.71 -- see attachment**

## Every $1.00 of tax, fee or assessment on the wireless bill ends up costing the wireless operator $0.50 in marginal profit

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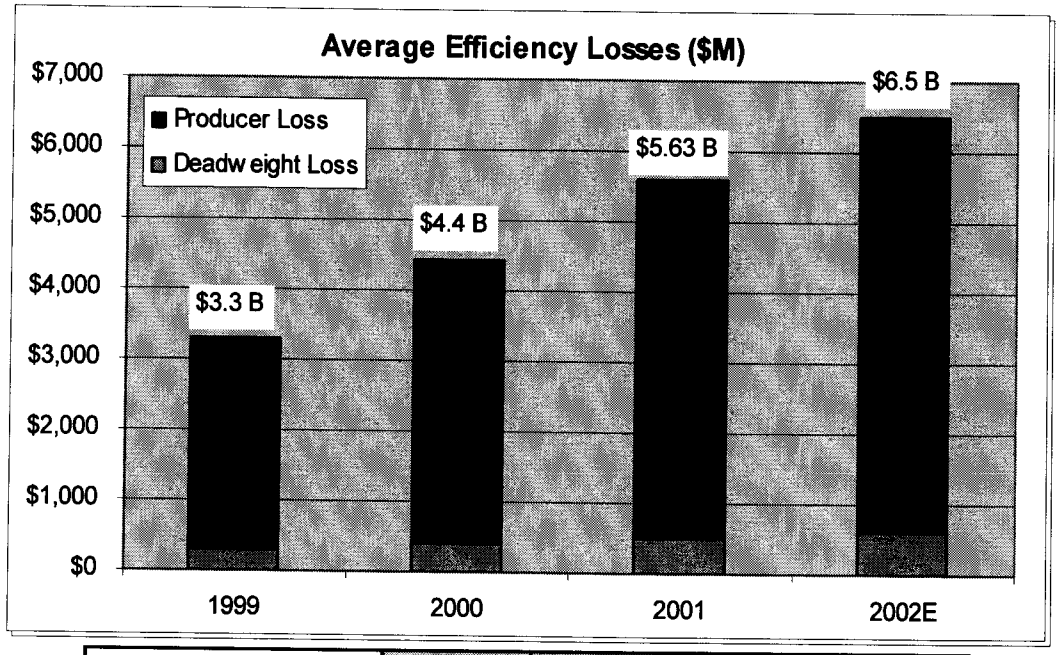
## Efficiency Costs Due to Overall Taxation

# The average economic efficiency loss to the industry (i.e. lost marginal profits) is estimated at about $5.9 B for 2002




| | 1999 | 2000 | 2001 | 2002E |
|---|---|---|---|---|
| Service Revenue | $42.6 | $57.4 | $72.6 | $84.4 |
| TaxRevenue | $6.0 | $8.0 | $10.2 | $11.8 |
| Deadweight Loss | $0.3 | $0.4 | $0.5 | $0.6 |
| Producer Loss | $3.0 | $4.0 | $5.1 | $5.9 |
| Total Loss | $3.3 | $4.4 | $5.6 | $6.5 |

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## The majority of the proposals to reform the USF contribution methodology fall into three categories

- ***Connection Based Proposals***
  - Contributions based on number of connections a carrier provides to a public network
  - Assessments usually the same for residential, single line business and mobile wireless
  - Difference (residual) between connection based assessments and USF requirement would be recovered from assessments on multi-line business users
- ***Number Based***
  - Contributions based on the number of working (i.e. activated) telephone numbers
  - Connections based assessments for special access and private lines
  - No residual assessments
- ***Modified Revenue Based***
  - Contributions based on collected interstate revenues (collect and remit)
  - Wireless safe harbor adjusted upward (from 15%) to at least 20% or more, [illegible] wireless carrier can determine its actual interstate revenue

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# The various proposals for reforming the USF contribution methodology shift funding burdens from one segment to another

| Burden of USF Funding (% of total) | | | | |
|---|---|---|---|---|
| Contributor | Current System | Modified Revenue* | Customer Connection | Assigned Numbers |
| IXCs | 63% | 56% | 19% | 0% |
| LECs | 23% | 21% | 53% | 70% |
| Wireless | 14% | 23% | 26% | 26% |
| Pagers | 0% | 0% | 2% | 4% |
| Broadband | 0% | 0% | 0% | 0% |

*** Assumes safe harbor increased to 25%**

# None of these proposals, however, consider economic welfare costs nor bring broadband service providers into the USF assessment pool

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## As additional USF fees are levied, the economic welfare loss will increase more rapidly than the corresponding USF revenues

- For every additional $1.00 raised of tax, fee or assessment -- the additional economic welfare loss is $0.63
  - Additional loss in producer efficiency is about 0.53 x Additional Tax Revenue*
  - Additional consumer deadweight loss is about 0.10 x Additional Tax Revenue*
  - The marginal economic welfare loss from additional taxes, fees or assessments (on the current cumulative base) is about 0.63 x Tax Revenue*

*** Based on average assessment rate of 14% and wireless industry elasticity of -0.71 -- see attachment**

## Because of the already high cumulative base of taxes, fees and assessments, levying additional TFAs on wireless services will result in even greater economic welfare losses

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# Based on projected USF funding for 2003 of $6.3 B, the additional efficiency loss to the wireless industry would range from about $360 M to about $460 M

| | Current | Modified Revenue* | Customer Connection | Assigned Numbers |
|---|---|---|---|---|
| Wireless Share | 14% | 23% | 26% | 26% |
| Wireless Total | $770 M | $1,500 M | $1,640 M | $1,640 M |
| Δ USF Fees | - | $680 M | $870 M | $870 M |
| Δ Deadweight Loss | - | $68 M | $87 M | $87 M |
| Δ Producer Loss | - | $360 M | $460 M | $460 M |
| Δ Total Efficiency Loss | - | $428 M | $548 M | $548 M |

* Safe harbor assumption increased to 25%

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## The challenge facing the FCC is to raise the necessary revenue in a manner that minimizes efficiency losses to both consumer and producer

- As USF funding requirements grow, economic welfare losses increase
- The loss of efficiency represents one of the costs of TFAs -- it should be taken into account when calculating the total cost of financing Universal Service and other mandated requirements
- Treating all services "equally" when considering the TFA burden causes unequal harm -- thus policymakers must consider elasticity of demand
- The high elasticity of demand plus the high current level of taxes, fees and assessments on wireless services suggest that further raising TFAs on wireless services will have high efficiency costs

**To minimize the efficiency costs of TFAs, telecommunications services with relatively inelastic demands should be assessed more heavily than services with relatively elastic demand characteristics**

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# The Commission needs to focus on three critical areas in reforming the USF and contribution methodology

- Controlling USF growth while improving current processes
- Ensuring that all providers of interstate telecommunications services, including broadband service providers, contribute to the USF
- Allocating USF funding burdens across all carriers in a manner that minimizes the total economic welfare cost

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# Control USF growth while improving current processes

- Control USF growth by:
  - Applying new caps on subsidies
  - Developing better tests for needs assessment
  - Limiting ILEC second line support
  - Distributing subsidies consistent with legal, economic and policy goals
- Improve current processes
  - Adopt collect and remit
  - Eliminate unnecessary lags between reporting and collection
  - Achieve transparency for consumers -- by requiring a uniform pass-through of the assessment, along with a uniform program administration cost safe harbor.

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# Ensure that all providers of interstate telecommunications services contribute to the USF

- The Commission cannot exempt large segments of the interstate telecommunications market from contributing to the USF while funding demands keep increasing
- Assessing only some carriers USF fees distorts competition and skews investment incentives based solely upon USF assessment avoidance
- Whatever proxy is used for assessment --broadband service providers should contribute their fair share to USF
- If the FCC is concerned about harming a fledgling industry then it can create a transition to full assessment of broadband service providers

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# Allocate USF funding burdens in a manner that minimizes the total economic welfare cost

- Levying additional funding requirements without considering the relative elasticity of demand for the service fails the competitive neutrality test
- Differentiating carriers based on the carrier's elasticity of demand is equitable
  - The statute does not require any absolute equality of payment, but instead requires contributions be made on "an equitable and non-discriminatory basis."
- The FCC would not be discriminating by setting classes of carriers and assessments based on an elasticity of demand analysis
  - The fundamental discrimination test applied under the Communications Act has at its core the requirement that services be "like" services before there can be the possibility of discrimination

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## Conclusion

# Universal service is an important statutory goal that should be funded at the lowest possible cost to consumers and telecommunications service providers

- The Commission's decision about which fees should be increased to subsidize universal service has important implications for economic welfare -- not all price increases have the same economic effect on consumers and service providers
- The proposals to reform the USF fund and contribution methodology would impose unnecessarily high economic welfare costs on both consumers and wireless service providers
- The economically efficient and best USF policy change would be to:
  - ensure that all providers of interstate telecommunications services contribute to the USF
  - allocate more of the USF funding burden on services with relatively inelastic demand

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# Economic Welfare Cost of Taxes, Fees and Assessments

**Back-up materials for Presentation to the Federal Communications Commission**

**Washington, D.C.**

**4 December, 2002**

Sun Fire Group LLC
Alexandria, VA 22304

Reference: 1002

# A variety of federal, state, county and local government taxes, fees and assessments (TFAs) appear explicitly on the consumer's wireless bill

**Federal TFAs:**

- Universal Service Fund (USF) Assessment
- Telecommunications Relay Service (TRS) charge
- Federal Excise Tax

**State, County and Local TFAs (vary with locality):**

- Excise Tax
- Gross Receipts Tax
- 911 taxes
- Regulatory Fees
- Sales Tax

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## Wireless carriers may add explicit assessments to recover capital expenditures (CapEx) and operational expenses (OpEx) required to meet unfunded federally mandated requirements

- Communications Assistance for Law Enforcement Act (CALEA)
  - Federal reimbursements for meeting CALEA Phase 1 objectives have not covered many of the required hardware upgrades
  - There is no reimbursement for meeting CALEA Phase 2 (digital packet network) upgrades (software or hardware)
  - Requires continuing OpEx (only partially reimbursed)
- Wireless Number Portability (WNP) and Number Pooling
  - Has required significant CapEx to implement
  - Requires continuing OpEx
- Enhanced 911 (e-911)
  - Phase 2 program will require significant CapEx to ensure goal of 95% user base is e-911 enabled by end of 2005
  - Requires significant OpEx

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## An array of hidden implicit charges increase the cost of doing business

- Unrecovered CapEx and OpEx (from federally mandated requirements)
- Federal, State and Local Corporate Income Taxes
- Property Taxes
- Recording and Transfer Fees
- Franchise Taxes
- Lease Taxes
- Incorporation/Registration/Yearly Fees
- Antenna/Permit Fees

**For the purpose of this analysis, we are concerned primarily with the explicit taxes, fees and assessments that are added to the consumer's wireless bill**

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# The explicit charges appear as line items on the consumer's monthly bill and vary by locality

***Sample Nextel Statement for New York City***

| | | |
|---|---|---|
| Access and other charges | $71.00 | Average Revenue per User (3Q 2002) |
| Federal Excise Tax | $ 2.28 | |
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| Total Charges | $87.51 | |

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# The total taxes, fees and assessments on the consumer's wireless bill average more than 14% -- and can range up to 25% in high cost areas such as Los Angeles or New York

- PCIA survey of 52 MSAs (1999) -- Wireless *intrastate* revenues are taxed an average of about 12%
  - High of 24.78% (Los Angeles)
  - Low of 3.76% (Boise)
- COST study (2001) -- total average state and local tax burden for telecommunications services is about 17.9%
- Hausman (2000) et. al. have estimated the median tax rate at 14.5% when federal tax rates are included

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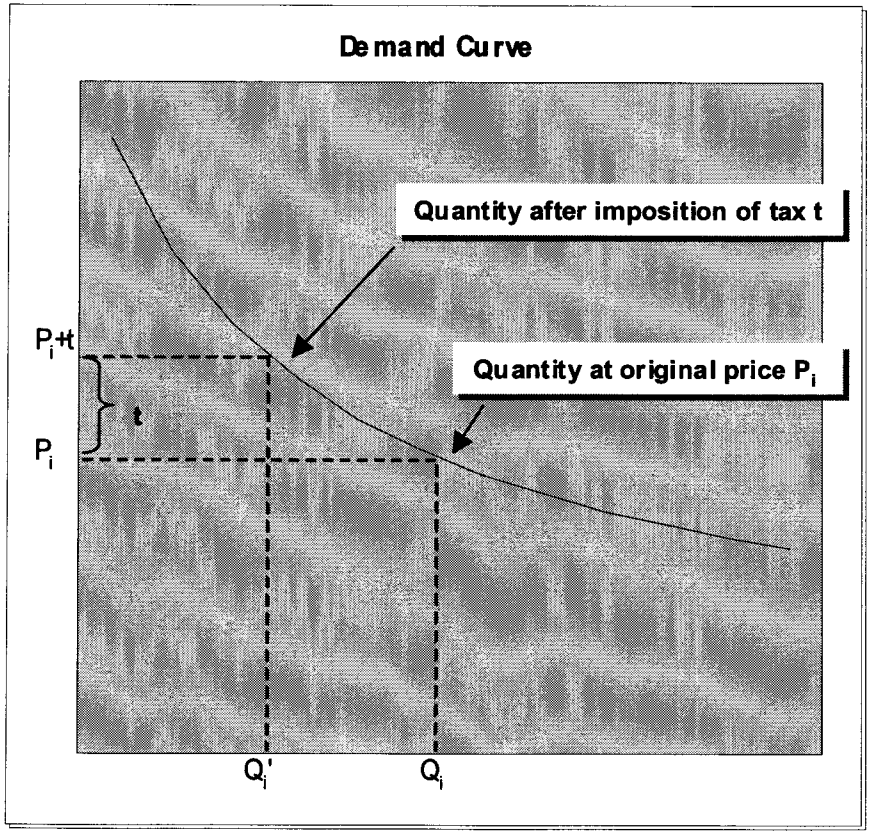
## In a competitive market, the result of levying a tax, fee or assessment (TFA) is a the same from an economic viewpoint -- an increase in prices and reduction in overall demand

- The increase in price due to the tax, fee or assessment results in a decrease in consumer demand
- The firm sells the reduced quantity at the original price -- thus revenue and profits are reduced
- The increased prices and reduced profit imposes economic costs to consumer and producer (wireless operator)

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# Economic Efficiency is a measure of the costs of the current policy and alternatives for reform

**$\Delta$ Economic Efficiency ★ $\Delta$ Producer Surplus + $\Delta$ Consumer Surplus**

## Economic costs to the consumer ( $\Delta$ Consumer Surplus)

- Direct cost of the tax, fee or assessment -- for every dollar of revenue raised, a dollar has to be taken away from a consumer or firm
  - in competitive markets, the tax, fee or assessment will be reflected in higher prices paid by consumers
- Deadweight loss of taxation -- costs for which there are no offsetting benefits (i.e. deadweight)
  - the imposition of a tax, fee or assessment distorts subscribers' consumption decisions, giving rise to efficiency losses over and above the direct losses of income that consumers suffer from bearing the tax, fee or assessment burden

## Economic costs to the producer ( $\Delta$ Producer Surplus)

- Loss in marginal profit -- producer surplus declines as less output is sold and the firm receives the same revenue per unit (since the tax, fee or assessment is passed on to the consumer)

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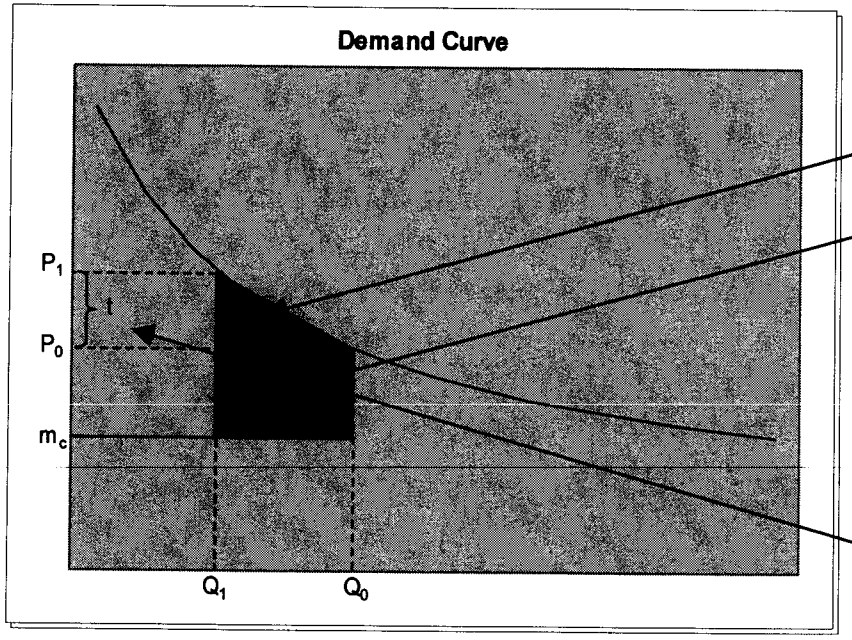
## Reduction in Economic Efficiency

# The change in economic efficiency, $\Delta \eta_o$, can be calculated from the demand curve as follows




$\Delta \eta_o = \Delta \eta_{o_p} + \Delta \eta_{o_c}$, where

$\Delta \eta_{o_c}$ = consumer deadweight loss

$\Delta \eta_{o_p}$ = loss in producer efficiency

(loss of marginal profit)

$m_i$ = marginal cost

$t_i$ = tax rate

TR = tax revenue

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## Change in Economic Efficiency

**$\Delta \mathcal{E}_o$ is a function of: (1) the price elasticity, (2) the magnitude of the price increase, (3) the revenue of the good or service being taxed, and (4) the marginal cost of production**

(1) $\Delta \mathcal{E}_{o_p} = \Delta q_i(p_i - m_c) = \eta\ (\Delta p_i/p_i)(p_i\ q_i - m_c q_i)$, and

(2) $\Delta \mathcal{E}_{o_c} = 1/2\ \Delta q_i\ \Delta p_i = 1/2\ \eta(\Delta p_i/p_i)^2\ p_i\ q_i$ , where

$\eta = (\Delta q_i/q_i)\ /\ (\Delta p_i/p_i)$ is the price elasticity of demand

$\Delta p_i/p_i$ is the magnitude of the price increase

$p_i\ q_i$ is the revenue of the good or service being taxed (before tax)

$m_c$ is the marginal cost of production

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## Efficiency Loss per Tax, Fee or Assessment

# The average efficiency loss from taxation can be calculated as follows

(3) $\Delta \mathcal{W}_p/TR = [\eta\ (\Delta p_i/p_i)\ (p_i\ q_i - m_c q_i)]\ /\ t_i\ p_i\ q_i$, and

(4) $\Delta \mathcal{W}_c/TR = [1/2\ \eta\ (\Delta p_i/p_i)^2\ p_i\ q_i]\ /\ t_i\ p_i\ q_i$, where

$t_i$ = the tax rate (tax fee or assessment)

$TR = t_i\ p_i\ q_i$ is the revenue raised from taxes, fees and assessments

When $t_i = \Delta p_i/p_i$ , i.e. the price increase equals the tax, fee or assessment

(5) $\Delta \mathcal{W}_p/TR = [\eta\ (\Delta p_i/p_i)/\ t_i\ ]\ (1- m_c/p_i\ ) = \eta\ (1 - m_c/pi\ )]$

(6) $\Delta \mathcal{W}_c/TR = [1/2\ \eta\ (\Delta p_i/p_i)^2\ /\ t_i\ ] = 1/2\ \eta\ \ t_i$

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## The change in economic efficiency can be approximated as

(7) $\Delta \mathcal{W} = \Delta \mathcal{W}_p + \Delta \mathcal{W}_c = \eta_i \cdot (1 - m_c/p_i) \cdot TR + 1/2 \cdot \eta_i \cdot t_i \cdot TR$ , where

$\eta_i$ = price elasticity of demand

$m_c$ = marginal cost

$p_i$ = price

$t_i$ = tax rate (tax,fee or assessment)

$TR = p_i \cdot q_i \cdot t_i$ = revenue raised from taxes, fees and assessments

**The loss or reduction in economic efficiency is linear with TR, the total revenue from taxes, fees and assessments, and with $\eta_i$, the elasticity of demand**

NEXTEL

## The marginal change in efficiency from imposition of an additional tax, fee or assessment can be calculated as follows

$$(\Upsilon\Delta\Upsilon_o/\Upsilon t)/(\Upsilon TR/\Upsilon t) = (\Upsilon\Delta\Upsilon_{o_p}/\Upsilon t)/(\Upsilon TR/\Upsilon t) + (\Upsilon\Delta\Upsilon_{o_c}/\Upsilon t)/(\Upsilon TR/\Upsilon t)$$

$$(\Upsilon\Delta\Upsilon_{o_p}/\Upsilon t)/(\Upsilon TR/\Upsilon t) = [\eta(1-m_c/p) + (\eta\bullet m_c \bullet t/p^2 + \eta^2 (1- m_c/p)\, t/p)\ (\Upsilon p/\Upsilon t)]/(1+\eta t/p\ (\Upsilon p/\Upsilon t))$$

$$(\Upsilon\Delta\Upsilon_{o_c}/\Upsilon t)/(\Upsilon TR/\Upsilon t) = [\eta t/p + 1/2\ \eta^2(t/p)^2)\ (\Upsilon p/\Upsilon t)/\ (1+\eta t/p\ (\Upsilon p/\Upsilon t))$$

where $t_i = \Delta p/p$ , i.e. the price increase equals the tax and $\Upsilon p/\Upsilon t = 1$, then

$$(\Upsilon\Delta\Upsilon_{o_p}/\Upsilon t)/(\Upsilon TR/\Upsilon t) = [\eta(1- m_c/p) + (\eta\bullet (m_c/p)\bullet t + \eta^2 (1- m_c/p)\, t)]/(1+\eta t)$$

$$(\Upsilon\Delta\Upsilon_{o_c}/\Upsilon t)/(\Upsilon TR/\Upsilon t) = [\eta t + 1/2\ \eta^2 t^2) / (1+\eta t)$$

NEXTEL

## The elasticity of demand is a measure of how sensitive buyers are to changes in price

- We measure sensitivity with the "elasticity of demand". The ratio of the percent change in quantity to the percent change in price along the demand curve (not the same as the slope)

$$\eta = (dq/q)/(dp/p) = (\%\Delta \text{ quantity}) / (\%\Delta \text{ price})$$

- Elasticities are negative, since demand falls as price rises
- Since revenue = p x q, then the impact on revenue is

$$\%\Delta \text{ revenue} = (\%\Delta \text{ price}) \bullet (1+\eta)$$

- If price falls, then
  - revenue rises if $\eta < -1$
  - revenue falls if $\eta > -1$
  - revenue is unchanged if $\eta = -1$

NEXTEL

## The elasticity of demand for wireless service, $\eta$, is estimated at -0.70 or less

- The demand for wireless services remains sensitive to price
- Hausman (2000) et. al. has estimated that the elasticity of demand for wireless services ranges from -0.50 t0 -0.70
- Yankee Group Report has estimated elasticity of demand at about -1.00
- CTIA Semi-Annual Report and Bear Sterns estimate elasticity of demand (mid 2002) at about -1.02
- The price elasticity of demand of wireless has been increasing -- new wireless subscribers are likely more price sensitive users who choose lower priced service plans

NEXTEL

# Mobile wireless has a high price elasticity of demand relative to other telecommunications services

| Estimates of Price Elasticity of Demand | Wireless | Local Wireline | Long Distance |
|---|---|---|---|
| | -0.51 to -1.00 | -0.005 | -0.63 to -0.72 |

- The demand for flat-rate local phone service does not appear to be very sensitive to price
  - the basic monthly rate is less important for telephone penetration rates than are usage-based charges (i.e. intra-lata or long distance charges)
  - monthly local telephone expenditures vary relatively little by income
- The price elasticity of demand for long distance telephone service has been estimated to range from -0.63 to -0.72
  - these estimates have been consistent despite the fact that long distance rates continue to decline in real terms as consumer incomes have increased

NEXTEL

# The ratio of marginal cost to price ($m_c/p$) for wireless is estimated at less than 0.30

- Marginal cost is the change in cost per unit change in output
- Estimates of marginal cost for wireless include:
  - access/interconnection charges
  - customer acquisition costs -- amortized over average subscription period (1/average churn rate)
- Increasing returns of scale of a wireless network imply that marginal cost is less than average cost
- The ratio of marginal cost to price ($m_c/p$) is relatively low, i.e. gross margins are relatively high, due to the large fixed costs of wireless networks

NEXTEL

## Average Efficiency Costs of Taxation Estimate

**Based on conservative assumptions about elasticity, overall rate of taxes, fees and assessments, and gross margins -- the average efficiency cost can be estimated as follows**

- Based on an estimated demand elasticity of about -0.7 , an average tax rate of about 14% and $m_c/p$ of about 0.3

$$\Delta \eta_{p} \approx 0.50 \times \text{Revenue from TFAs}$$

$$\Delta \eta_{c} \approx 0.05 \times \text{Revenue from TFAs}$$

$$\Delta \eta = \Delta \eta_{p} + \Delta \eta_{c} \approx 0.55 \times \text{Revenue from TFAs}$$

- i.e. on average for every $1.00 raised from taxes, fees and assessments, the efficiency loss to the economy is $0.55
- The loss is considerably greater for service providers
  - $0.50 in loss to wireless service providers in terms of decreased marginal profits
  - $0.05 deadweight loss to consumers

NEXTEL

## Marginal Efficiency Costs of Additional Taxation Estimate

**Based on conservative assumptions about elasticity, overall rate of taxes, fees and assessments, and gross margins -- the marginal increase in efficiency losses from the imposition of an additional taxes, fees or assessments can be estimated as follows**

- Based on an estimated demand elasticity of about -0.7 , an average rate of taxes, fees and assessments of about 14% and $m_c/p$ of about 0.3

$$\Upsilon(\Delta \eta_{o_p})/\Upsilon(TR) \approx 0.53 \text{ x Revenue from TFAs}$$

$$\Upsilon(\Delta \eta_{o_c})/\Upsilon(TR) \approx 0.10 \text{ x Revenue from TFAs}$$

$$\Upsilon(\Delta \eta_{o})/\Upsilon(TR) = \Upsilon(\Delta \eta_{o_p})/\Upsilon(TR) + \Upsilon(\Delta \eta_{o_p})/\Upsilon(TR) \approx 0.63 \text{ x Revenue from TFAs}$$

- i.e. for every $1.00 of additional taxes, fees and assessments, the additional efficiency loss to the economy is $0.63
- The marginal loss is considerably greater for service providers
  - $0.53 in additional loss to wireless service providers in terms of decreased marginal profits
  - $0.10 in additional deadweight loss to consumers

NEXTEL

## The challenge is to raise the necessary revenue in the manner that minimizes economic welfare costs

- The high elasticities of demand of wireless service -- coupled with the relatively high base of taxes, fees and assessments -- suggests that raising wireless prices further will have disproportionate economic welfare costs
- A loss minimizing rule is to raise prices in inverse proportion to the elasticities of demand for the services at issue (Ramsey Pricing)
- If we were to levy a tax, fee or assessment on certain goods, the tax, fee or assessment should be highest on goods which people will continue to buy anyway and low on those items which are very price-sensitive
- Keeping to these rules will minimize the distorting effect of a tax, fee or assessment because it means that consumers will behave very much as they would have without the tax,fee or assessment

NEXTEL

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