

# A Real World Property Rights Approach to Spectrum Management

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Pablo T. Spiller

University of California  
Berkeley,

and

NBER

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Improving Spectrum Management Through Economic or Other Incentives  
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# Measuring Spectrum Efficiency

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- No clear direct measure
  - Price?
  - Quantity assigned?
- The “proof is in the pudding”
  - Consumer use of spectrum based products
  - Commercial introduction of new spectrum based technologies
- Does US use spectrum inefficiently?
  - Relatively low wireless penetration
  - Relative slow pace of introduction of
    - New wireless services
    - New wireless technologies
- How much is the result of spectrum policy?

# Guatemala

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- Celebrating 10 yrs of a property rights based spectrum management system

# Guatemala: Basic Features of Spectrum Management

- Title (TUFs) given via competitive process
  - Limitations
    - Frequency range
    - Hours of operation
    - Maximum effective radiation power
    - Maximum power emitted at border
    - Geographic extent
    - Period
      - 15 yrs - renewable
  - Rights
    - Resale
    - Lease
    - Subdivide
    - Freedom from prejudicial interference

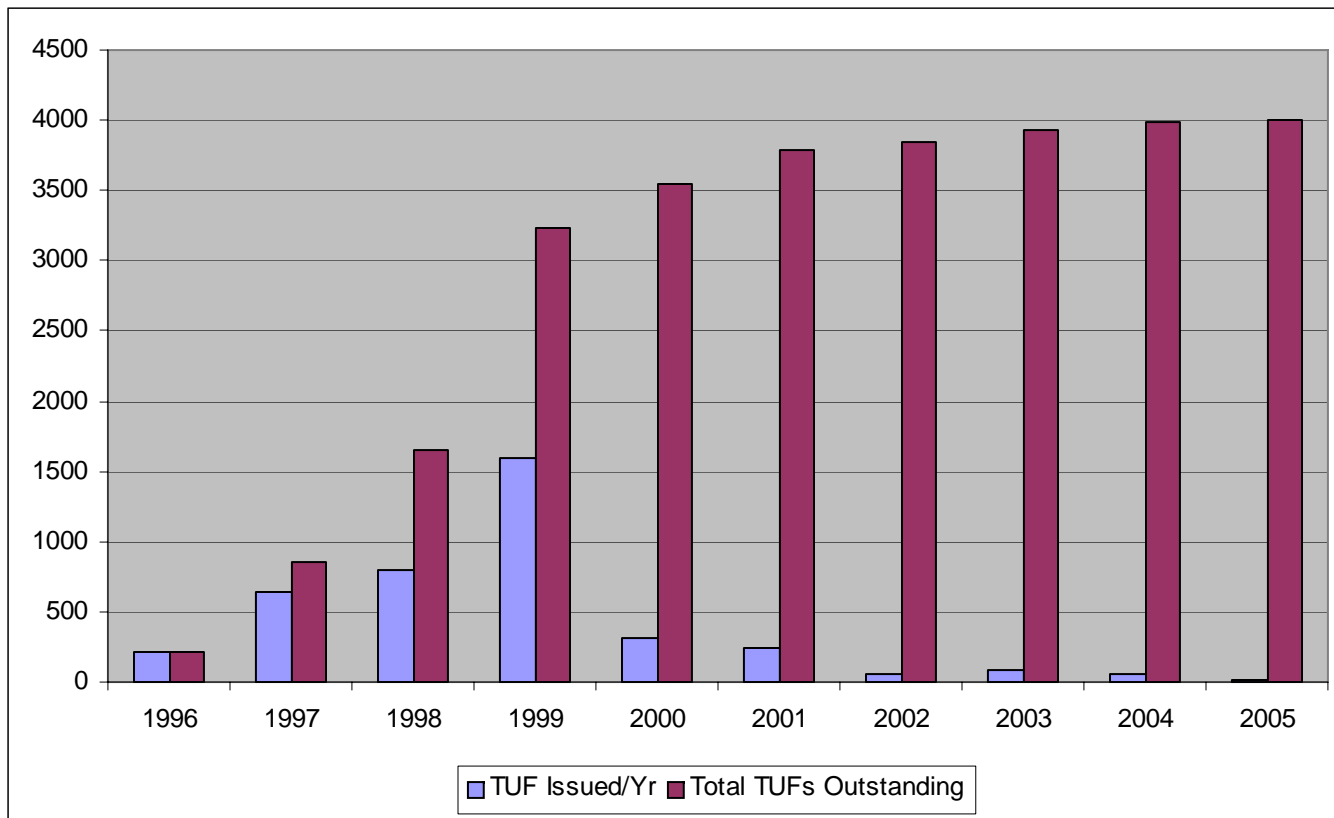


# Granting of TUFs

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- Straightforward
- Request to regulator triggers auction process
  - Anybody can request open regulated spectrum
    - Granted if unchallenged
    - If challenged, implement auction within **95** working days
    - Cash bids - highest wins
- Grandfathering of existing licenses/permits
  - Under existing restrictive conditions
    - Private operators
  - Under new TUFs
    - Public TelCo
    - Broadcasters
- Almost exhaustively given already

# 4000+ TUFs Granted Since 1996 ....



SIT

# With No Usage or Technology Restrictions....

Superintendencia de Telecomunicaciones  
Guatemala, Centroamérica

Inventario de Frecuencias al 12 de diciembre 2003

Limite inferior MHz	Limite Superior MHz	Usuario	Area de cobertura
450.1000	450.5000	DIGERA-DIRECCION GENERAL DE RADIODIFUSION	
450.1000	450.5000	DIGERA-DIRECCION GENERAL DE RADIODIFUSION	
450.1000	450.5000	DIGERA-DIRECCION GENERAL DE RADIODIFUSION	
450.5000	450.5500	SECRETARIA DE ASUNTOS ADMINISTRATIVOS Y SEGURIDAD DE LA PRESIDENCIA DE LA REPUBLICA	NACIONAL
451.0875	451.1125	MEZCLADORA S.A.	NACIONAL
451.1125	451.1375	MEZCLADORA S.A.	NACIONAL
451.1850	451.1800	FINCA EL RECREO Y ANEXOS	NACIONAL
451.2000	451.2250	TRUNKING, SOCIEDAD ANONIMA	NACIONAL
451.2750	451.3000	SERVICIOS PARA LA CONSTRUCCION, S.A.	NACIONAL
451.3125	451.3375	BANCO GRANAL & TOWNSON S.A.	NACIONAL
451.3375	451.3625	SISTEC, S.A.	NACIONAL
451.4000	451.5000	TRANSECEPTORES, SOCIEDAD ANONIMA	NACIONAL
451.5550	451.5800	FLORIA HERTZDOR SARDIA DE GONZALEZ	NACIONAL
451.6100	451.6350	CORPORACION T. SOCIEDAD ANONIMA	NACIONAL
451.6375	451.6625	ERNESTO LUIS BRODTMAN RODRIGUEZ	NACIONAL
451.6875	451.7125	SISTEC, S.A.	NACIONAL
451.6875	451.7125	SISTEC, S.A.	NACIONAL
451.6875	451.7125	SISTEC, S.A.	NACIONAL
451.6875	451.7125	SISTEC, S.A.	NACIONAL
451.6875	451.7125	SISTEC, S.A.	NACIONAL
451.7125	452.0150	VICTOR HUGO AGUILAR M.	NACIONAL
452.0150	452.0550	PUERTO QUILTAL POWER	NACIONAL
452.0630	452.0880	DELTA COM	NACIONAL
452.0880	452.1125	EPTEL, SOCIEDAD ANONIMA	NACIONAL
452.1375	452.1625	CEMENTOS PROGRESO S.	NACIONAL
452.1750	452.2000	CEMACO, S.A.	NACIONAL
452.2000	452.2350	INSTALACIONES ELECTRO	NACIONAL
452.2450	452.2800	SUSPENSIDA INDEFINIDA	NACIONAL
452.3750	452.4000	MULTISERVICIOS, S.A.	NACIONAL
452.4000	452.4250	ODRATTEL	NACIONAL
452.4250	452.4500	FERNANDO JULIO MALAGA	NACIONAL
452.4500	452.4750	SERVICIOS ELECTRONICO	NACIONAL
452.4750	452.5000	SERVICIOS COMERCIALES Y AGENCIA	NACIONAL
452.5250	452.5500	GRANDES OBRAS EN BIEN	NACIONAL
452.5750	452.6000	LABORATORIO DE COMUN	NACIONAL
452.6000	452.6300	CORMAR GUATEMALA, SO	NACIONAL
452.6300	452.6550	SERVICIOS DE TELECOMUNICACIONES	NACIONAL
452.6550	452.6800	PROMOCION DE SERVICIOS	NACIONAL
452.6800	452.7050	ELECTRO WILCO, SOCI	NACIONAL
452.7050	452.7300	SISTEMAS ELECTRONICOS	NACIONAL
452.7300	452.7550	MANUEL FERNANDO VARG	NACIONAL
452.7550	452.7800	COMSUR, SOCIEDAD ANON	NACIONAL
452.7800	453.0000	GLESIA CRISTIANA FAMILI	NACIONAL
453.0000	453.0250	AGUAS TECNICAS DE GEN	NACIONAL
453.0250	453.0500	OPICINA DE INGENIERIA, S	NACIONAL
453.0500	453.0750	CORPORACION RADIO ELE	NACIONAL
453.0750	453.1000	CORPORACION DE ALUMIN	NACIONAL
453.1000	453.1250	ORGANIZACION RADIAL AL	NACIONAL
453.1250	453.1500	BANCO GRANAL & TOWNS	NACIONAL
453.1500	453.1750	ELECTRONICA INDUSTRIAL	NACIONAL
453.1750	453.2000	TRUNKING, SOCIEDAD AN	NACIONAL
453.2000	453.2250	DEPRONSA S.A.	NACIONAL
453.2250	453.2500	CORPORACION T. SOCI	NACIONAL
453.2500	453.2750	BANCO GRANAL & TOWNS	NACIONAL
453.2750	453.3000	COMPAÑIA DE SEGUROS G	NACIONAL
453.3000	453.3250	BANCO GRANAL & TOWNS	NACIONAL
453.3250	453.3500	SUSPENSIDA INDEFINIDA	NACIONAL
453.3500	453.3750	SERVICIOS METALURGICO	NACIONAL
453.3750	453.4000	AGUATEC, S.A.	NACIONAL
454.0125	454.0375	ORGANIZACION RADIAL AL	NACIONAL
454.0375	454.0625	UNIVERSIDAD FRANCISCO	NACIONAL
454.0625	454.0875	PROMOCION DE SERVICIOS	NACIONAL
454.0875	454.1125	JOSE HERIBERTO ABRANA	NACIONAL
454.1125	454.1375	AVEL AUGUSTO LOPEZ OS	NACIONAL
454.1375	454.1625	TRANSECEPTORES S.A.	NACIONAL
454.1625	454.1875	MOLINO VENECIA, S.A.	NACIONAL
454.1875	454.2125	INSTALACIONES ELECTRICAS, S.A.	NACIONAL
454.2125	454.2375	MMOBELIARA DEL LAGO, S.A.	NACIONAL
454.2375	454.2625	AGENCIA INDEPENDIENTE DE SEGUROS Y FINANZAS, SOCIEDAD ANONIMA	NACIONAL
454.2625	454.2875	FERRERIA DE LA CONSTRUCCION, S.A.	NACIONAL
454.2875	454.3125	TRANSECEPTORES S.A.	NACIONAL
454.3125	454.3375	TRANSECEPTORES S.A.	NACIONAL
454.3375	454.3625	TRANSECEPTORES S.A.	NACIONAL
454.3625	454.3875	TRANSECEPTORES S.A.	NACIONAL
454.3875	454.4125	TRANSECEPTORES S.A.	NACIONAL

Nota: datos sujetos a revisión

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Superintendencia de Telecomunicaciones  
Guatemala, Centroamérica

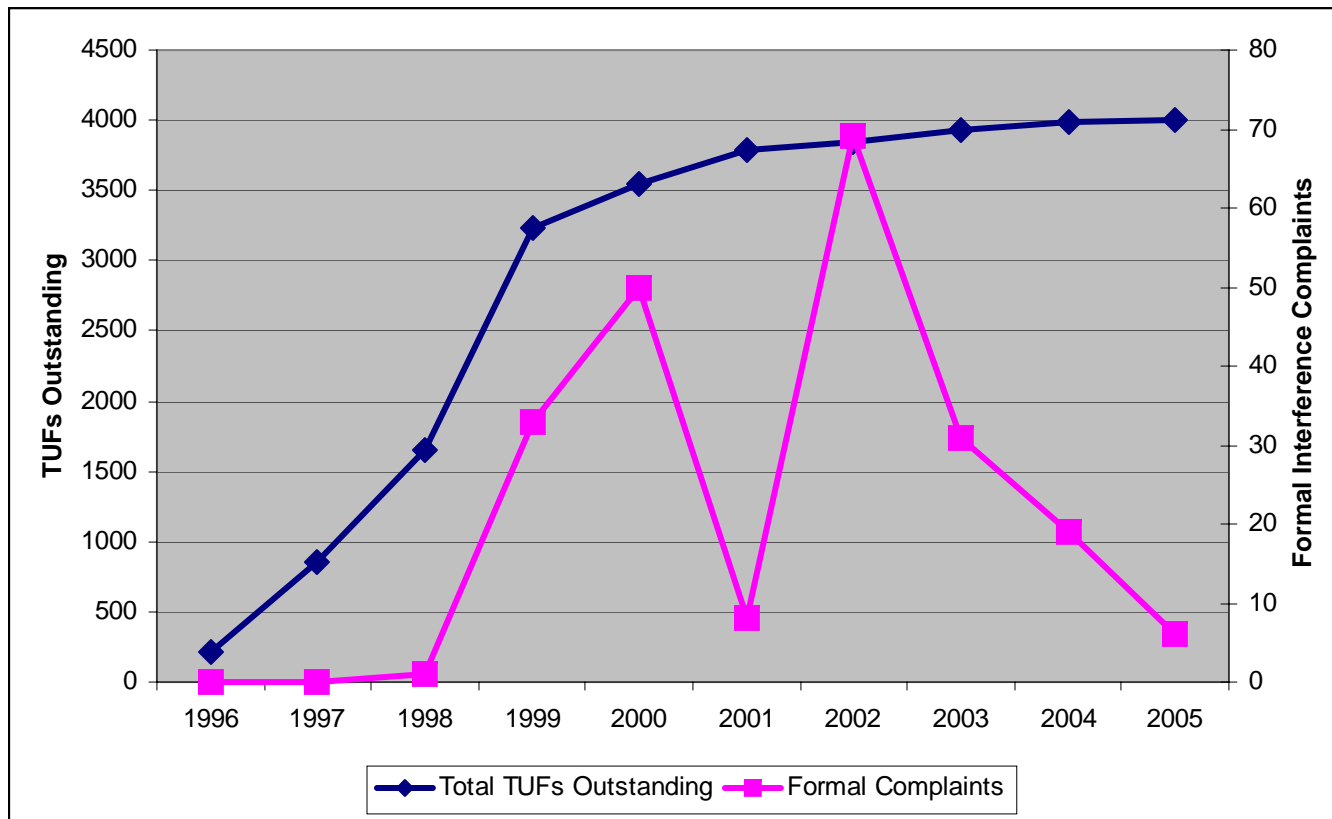
Inventario de Frecuencias al 12 de diciembre 2003

Limite inferior MHz	Limite Superior MHz	Usuario	Area de cobertura
807.5000	807.5250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.5250	807.5500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.5500	807.5750	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.5750	807.6000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.6000	807.6250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.6250	807.6500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.6500	807.6750	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.6750	807.7000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.7000	807.7250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.7250	807.7500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.7500	807.7750	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.7750	807.8000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.8000	807.8250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.8250	807.8500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.8500	807.8750	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.8750	807.9000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.9000	807.9250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.9250	807.9500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.9500	807.9750	A-TEL COMMUNICATIONS, S.A.	NACIONAL
807.9750	808.0000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
808.0000	809.0000	TELECOMUNICACIONES DE GUATEMALA, SOCIEDAD ANONIMA	NACIONAL
809.0000	809.0250	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.0250	809.0500	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.0500	809.0750	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.0750	809.1000	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.1000	809.1250	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.1250	809.1500	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.1500	809.1750	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.1750	809.2000	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.2000	809.2250	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.2250	809.2500	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.2500	809.2750	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.2750	809.3000	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.3000	809.3250	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.3250	809.3500	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.3500	809.3750	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
809.3750	809.4000	COMUNICACIONES INTELIGENTES, S.A.	NACIONAL
811.1750	811.2000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.2000	811.2250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.2250	811.2500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.2500	811.2750	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.2750	811.3000	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.3000	811.3250	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.3250	811.3500	A-TEL COMMUNICATIONS, S.A.	NACIONAL
811.3500	811.3750	A-TEL COMMUNICATIONS, S.A.	NACIONAL

Nota: datos sujetos a revisión

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# Generating Minimal Formal Complaints...

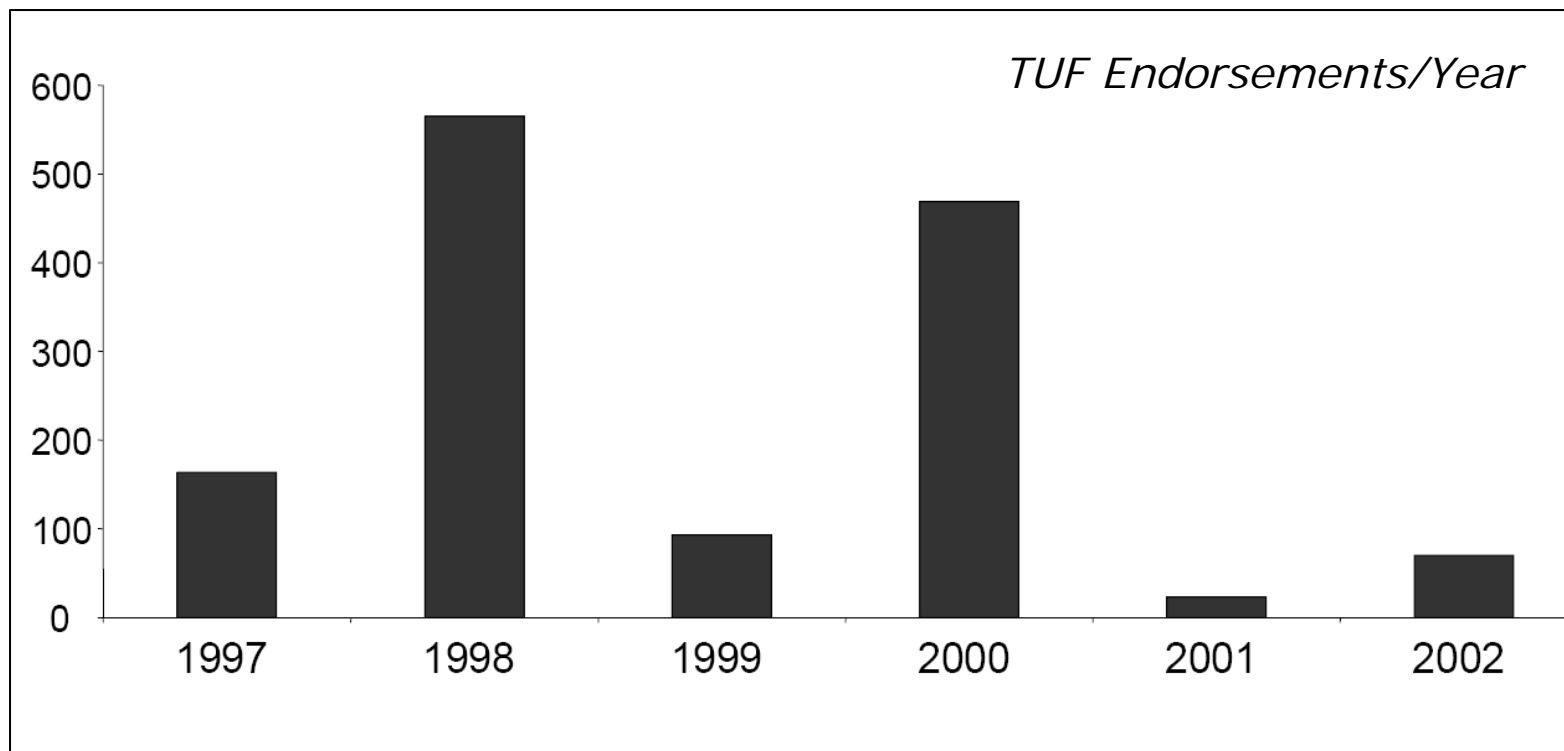


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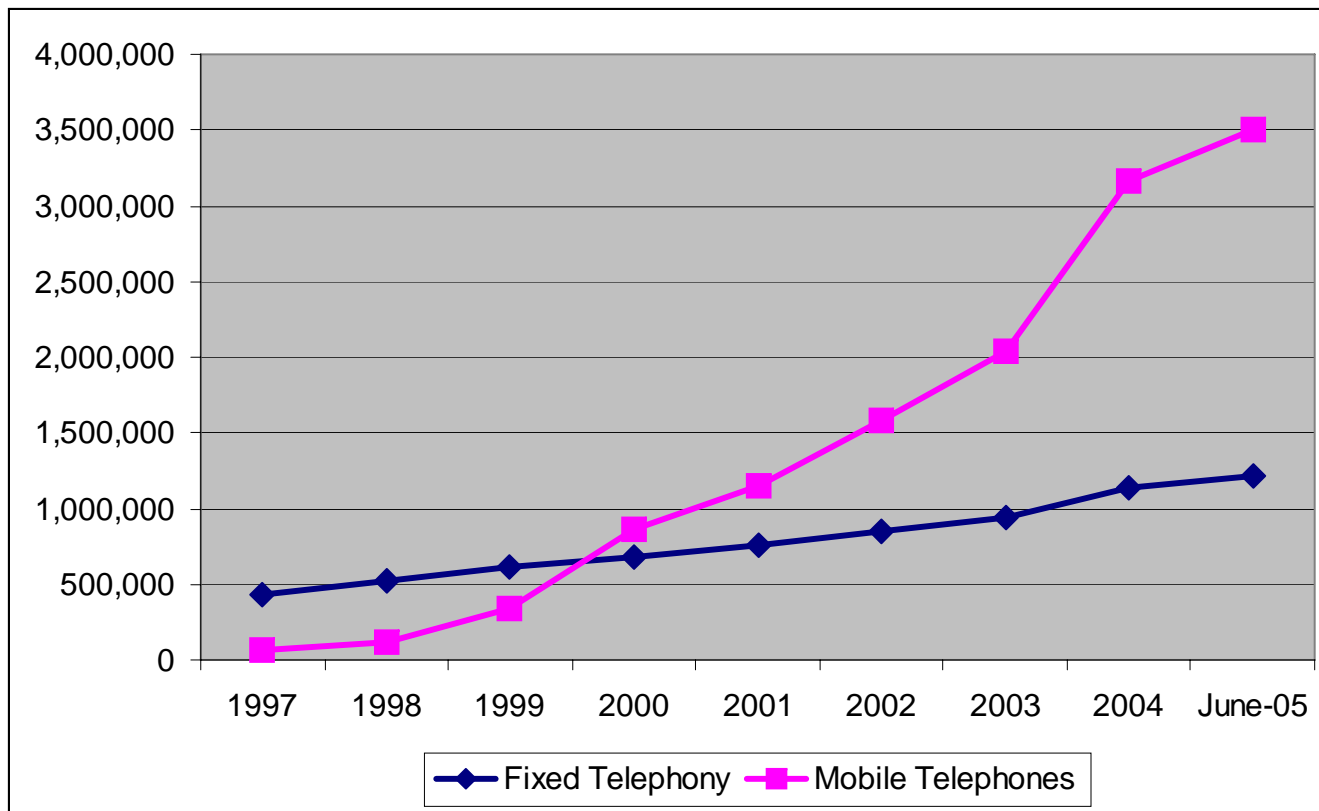
# ... with a Secondary Market

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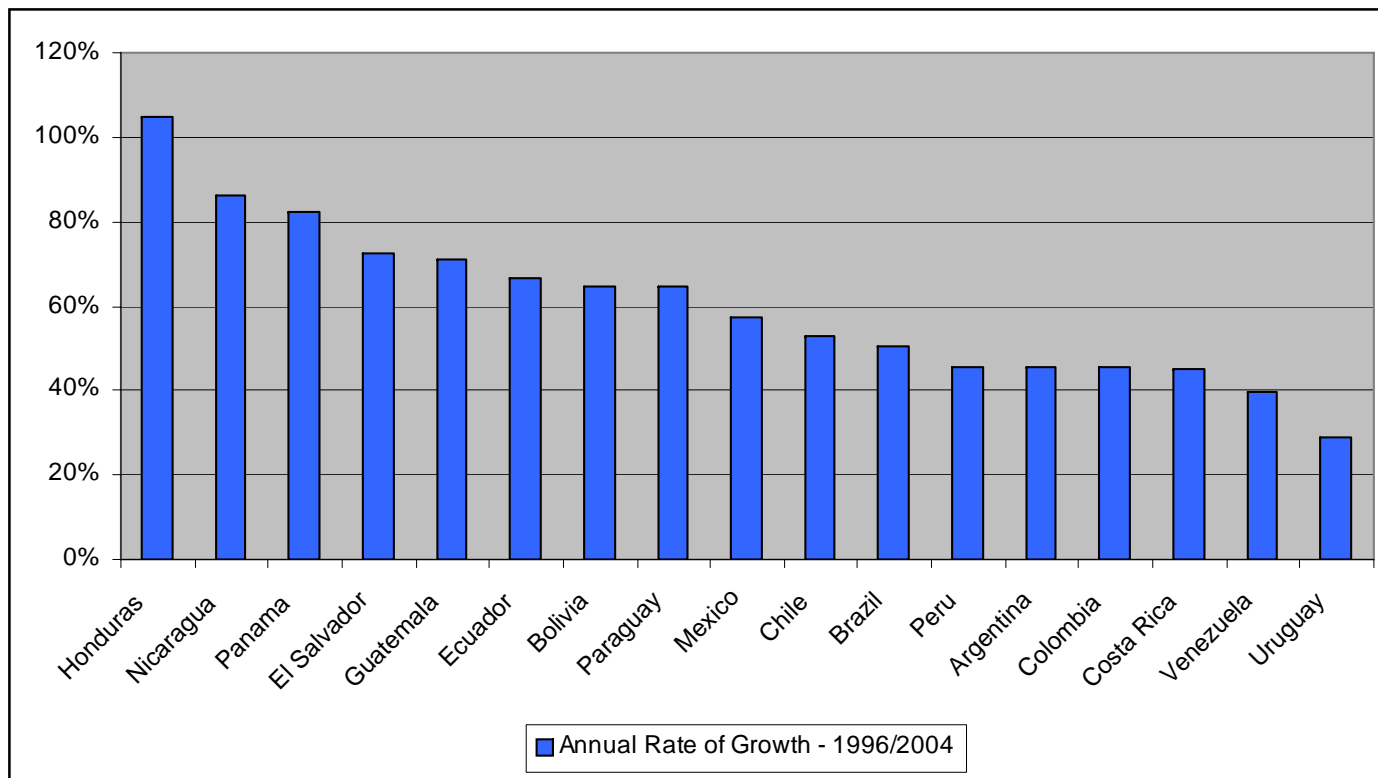
*Ibarguen 2004*

# ...Fast Wireless Usage Growth



SIT

# ...and Faster than most LATAM Countries



ITU

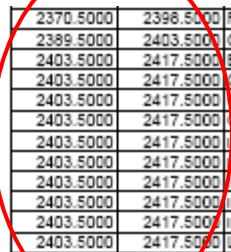
# ...But With Some Problems

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- “Radio wars”
  - Power dog fights (radio/tv)
  - Unlicensed “community radios”
- Relatively weak enforcement
  - 75% complaints against broadcasters
  - 98% of formal penalty reviews against broadcasters
    - However, almost no penalties paid
- Need to reinforce spectrum compliance
  - Procedures
    - Current program to create Registry of Private Spectrum Supervisory Entities
  - Authority centralization
    - Centralize authority in regulatory agency

# Going Forward

- New technological developments with property rights over spectrum
  - 3G already introduced
    - Telefónica Móviles with CDMA2000
  - Wi-fi: no reserved spectrum



2370.5000	2398.5000	RADIO TELEVISION GUATEMALA, SOCIEDAD ANONIMA	
2389.5000	2403.5000	CORPORACION T, S.A.	
2403.5000	2417.5000	BUSINESS & SERVICES, SOCIEDAD ANONIMA	CHIQUMULA
2403.5000	2417.5000	CORPORACION T, S.A.	
2403.5000	2417.5000	CORPORACION T, S.A.	
2403.5000	2417.5000	CORPORACION T, S.A.	
2403.5000	2417.5000	INTEGRADORA DE SOLUCIONES DE TELECOMUNICACIONES Y ENERGIA, S.A.	HUEHUETENANGO
2403.5000	2417.5000	INTEGRADORA DE SOLUCIONES DE TELECOMUNICACIONES Y ENERGIA, S.A.	QUICHE
2403.5000	2417.5000	INTEGRADORA DE SOLUCIONES DE TELECOMUNICACIONES Y ENERGIA, S.A.	RETALHULEU
2403.5000	2417.5000	INTEGRADORA DE SOLUCIONES DE TELECOMUNICACIONES Y ENERGIA, S.A.	SAN MARCOS
2403.5000	2417.5000	INTEGRADORA DE SOLUCIONES DE TELECOMUNICACIONES Y ENERGIA, S.A.	TOTONICAPAN
2403.5000	2417.5000	LONDRINA, S.A.	

# Prejudicial Interference

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- Art. 53 of 1996 General Telecommunications Law specifies enforcement procedure
  - Must “suffer interference”
    - Interference with current commercial activity
    - Low power applications may or may not interfere
    - Large scale “open spectrum” technology deployments may require contracting with spectrum holder
      - Natural development of band spectrum managers

# Implications for US Spectrum Policy

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- Property rights approach to spectrum works
  - Grant well defined title
    - Protect incumbents – assign the rest
      - Entrenched incumbents may required nudge
  - Fragment spectrum
  - Implement speedy conflict resolution process
    - Administrative
    - Arbitration
  - Let market determine spectrum usage

# Thank you

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[spiller@haas.berkeley.edu](mailto:spiller@haas.berkeley.edu)

[www.haas.berkeley.edu/spiller](http://www.haas.berkeley.edu/spiller)