

International Settlements: Rate Alternatives

Network Economics

James Alleman

CITI, Columbia University
ITP, University of Colorado

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Agenda

- Overview
- Alternative Procedures
- Modelling Approach
- Summary & Conclusions

An extension of James Alleman, "International Settlements: An Analysis of Rates,"
Communications & Strategies, Special Edition, IDATE, 2nd. Quarter, 1998, Montpellier, France and
"International Settlements: A Time for a Change"
James Alleman & Barbara Sorce
Proceedings of the Global Network 97 Conference
Calgary, 16 - 18 June 1997

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Overview

- Accounting/Settlement Rates
- Mechanics of Settlements
- Recent Activities
 - ▶ International Telecommunication Union
 - ▶ United States Government

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Accounting/Settlement Rates

- Settlement Rate
 - ▶ Bilateral negotiation
 - ▶ One-half of accounting rate

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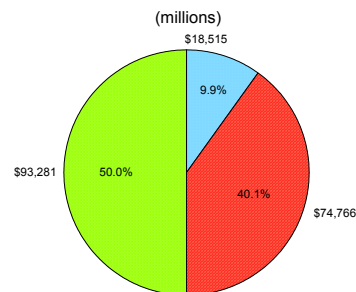
Mechanics of Settlements

- US \$, SDRs, or Gold Francs
- Based on traffic differences

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Telephone Revenues



Source: FCC

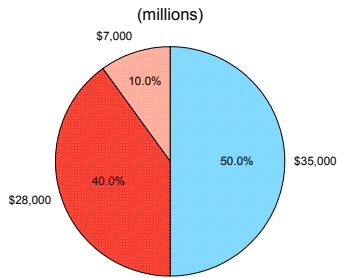
http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/trends.html

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International Revenue

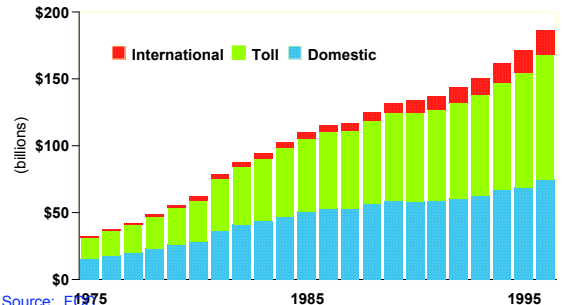
■ Non-facsimile
 ■ facsimile, low estimate
 ■ facsimile, high estimate addition



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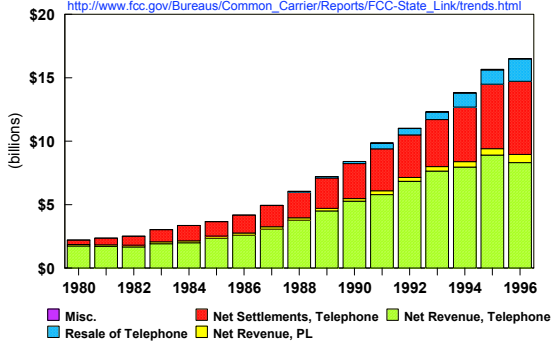
Telephone Revenues



Source: FCC
http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/trends.html
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International Revenues, USA

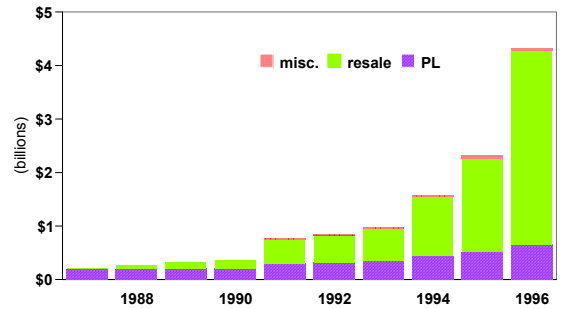
Source: FCC International Trends Report, August 22, 1996 &
http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/trends.html



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International Revenues, USA

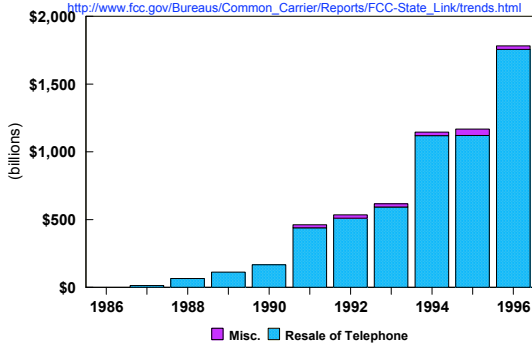


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International Resale Revenues, USA

Source: FCC International Trends Report, August 22, 1996 &
http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/trends.html

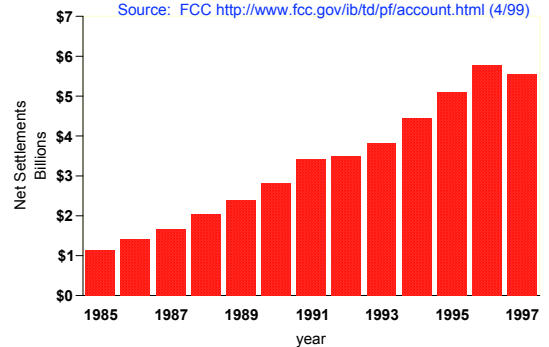


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International Settlements, USA

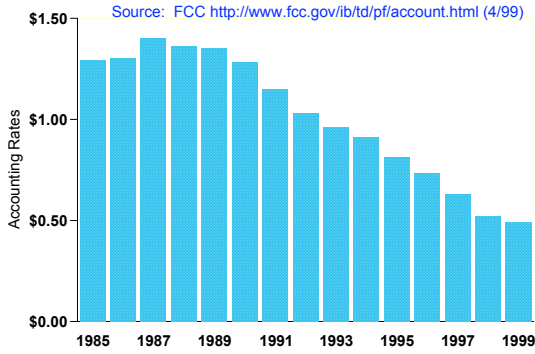
Source: FCC <http://www.fcc.gov/ib/td/pf/account.html> (4/99)



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Accounting Rates

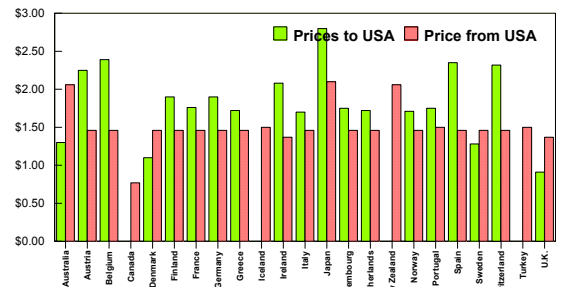


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International Prices

International Prices, 1985



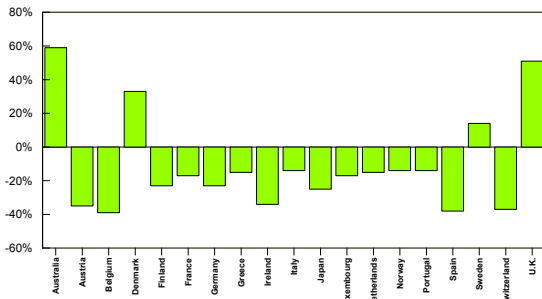
Source: OECD International Telecommunications Pricing Practices and Principles: A Progress Report, 1995

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International Prices

International Prices, Percentage Difference, 1985



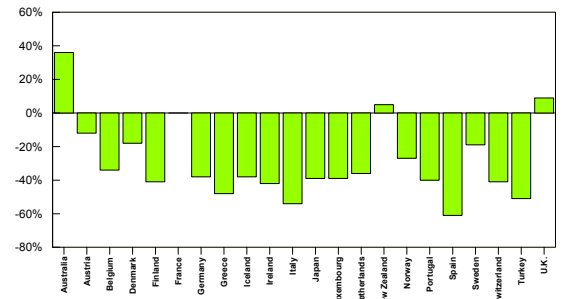
Source: OECD International Telecommunications Pricing Practices and Principles: A Progress Report, 1995

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International Prices

International Prices, Percentage Difference, 1988



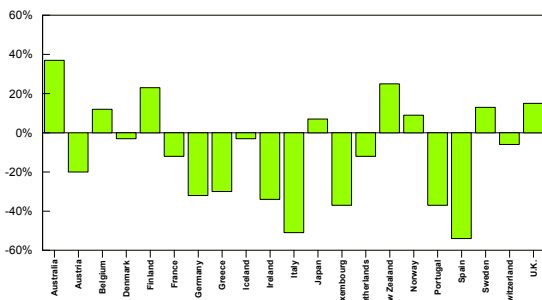
Source: OECD International Telecommunications Pricing Practices and Principles: A Progress Report, 1995

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International Price

International Prices, Percentage Difference, 1991



Source: OECD International Telecommunications Pricing Practices and Principles: A Progress Report, 1995

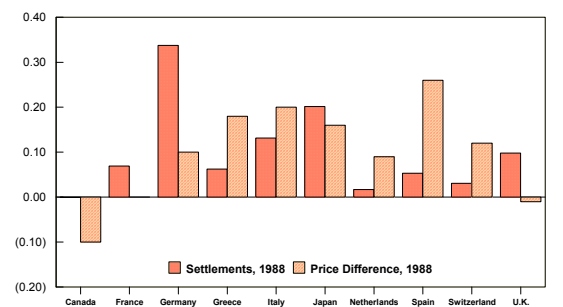
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Price Differences & Settlements

Sources: OECD International Telecommunications Pricing Practices and Principles: A Progress Report, 1995 & FCC International Trends Report, August 22, 1996

Price Differences & International Settlements



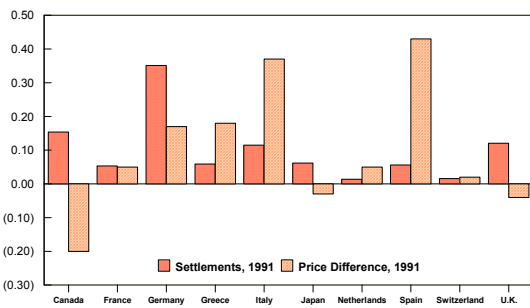
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Price Differences & Settlements

Sources: OECD International Telecommunications Pricing Practices and Principles: A Progress Report, 1995 & FCC International Trends Report, August 22, 1996

Price Differences & International Settlements

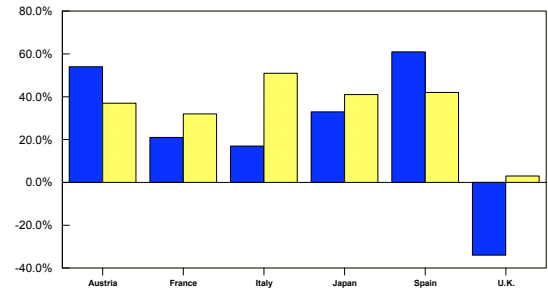


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Price & Traffic Differences

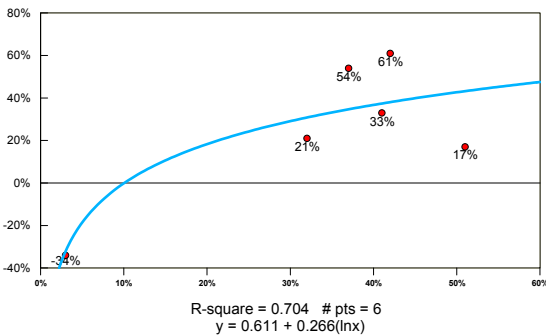
■ % difference price
■ % difference traffic (negative)



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Price & Traffic Differences



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Alternative Procedures

- Interconnection Fees
- Sender-keeps-all
- Resale and Callback
- Negotiated/Flexibility
- Cost-based/Benchmarking

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Observation

Accounting Rates are Intermediate/Interconnect Prices

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Survey of the Literature

- Demand Analysis
- Asymmetry of Prices
- Models
- Policy Recommendations

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Demand Analysis & Asymmetry

- Taylor, Lester, *Telecommunications Demand*
- Larsen, A. C. and Dale Lehman, "Symmetrical Pricing and Arbitrage"
- Larsen, A. C., Dale E. Lehman, and Dennis L. Weisman, "A General Theory of Point-to-Point Long Distance Demand"

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Models: Policy

- Johnson, L. L., *Competition, Pricing, and Regulatory Policy in the International Telephone Industry*
- Alleman, J. H., P.N. Rappoport, and K. B. Stanley, "Alternative Settlement procedures in International Telecommunications Service"
- Ergas, Henry. and P. Paterson, "International Telecommunications Settlements Agreements"
- Frieden, Robert., "International Toll Revenue: Tracking the Inequities and Inefficiency"

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Models: Duopoly

- Hakim, S. R. a. and D. Lu, "Monopolistic Settlement Agreements in International Telecommunications Agreements"
- Yun, Kyoung-Lim, Hyun-Woo Choi and Byong-Hun Ahn, "The Accounting Revenue Division in International telecommunications: Conflicts and Inefficiencies"
- Cheong, K. A.. and M. Mullins, "International Telecommunications Service Imbalances"

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Models

- Competitive
- Benchmark
- Monopoly/Competitive
- Callback

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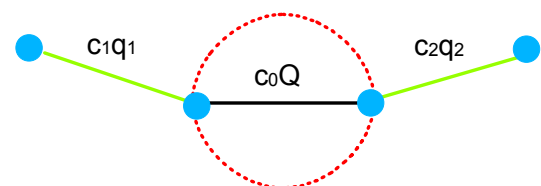
Models (continued)

- **Competitive**
 - ▶ First-best
 - ▶ Cost-based prices
 - ▶ Fifty-fifty split
 - ▶ Sender-keeps-all (Bill-and-keep)

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Models: Competitive



q_0 : joint service (two-way) traffic
 q_i : international service (one-way) traffic
 $Q = q_1 + q_2$
 c_0, c_1, c_2 : average incremental costs and product specific (constant) marginal cost

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Models: Competitive

Prices:

a_i : settlement

p_i : international (collection rate),
country i , $i = 1, 2$

First-best prices are marginal costs:

$$p_1 = c_0 + c_1 + c_2$$

$$p_2 = c_0 + c_1 + c_2$$

Implies: $a_1 = c_0 + c_2$, $a_2 = c_0 + c_1$, & $p_1 = p_2$

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Models: Competitive

- Cost-based Rates Efficient
- Benchmarking Improvement
- Inefficient
 - ▶ Divergence international rates
 - ▶ Fifty-fifty accounting rates
 - ▶ "Sender-keep-all" (Bill-and-keep)

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Models: Competitive

- Competitive
 - ▶ First-best
 - ▶ Cost-based prices
 - ▶ Benchmark improvement
 - ~~▶ Fifty fifty inappropriate~~
 - ~~▶ Sender keeps all inappropriate~~
 - ~~▶ Bill and keep inappropriate~~

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Models

- Competitive
- Benchmark

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Models: Benchmark

$$\max \pi = D(q)q - C(q)$$

thus

$$d\pi/dq = [dD(q)/dq]q + D(q) - dC(q)/dq = 0$$

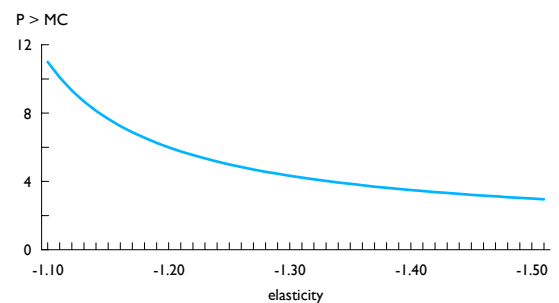
$$\text{or } D(q) [1 + 1/\eta] = dC(Q)/dq$$

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Models: Benchmark

Price greater than Marginal Cost Factor



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Models

- Competitive
- Benchmark
- Monopoly/Competitive

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Models: Monopoly/Competitive

Maximize:

$$\pi = D_m(q_c, q_m) q_m + [D_c(q_c, q_m) - c_c - c_o](q_c - q_m) - C(Q)$$

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Models: Monopoly/Competitive

Specify demand as:

$$D_m(q_c, q_m) = \alpha - \beta q_m - \gamma q_c$$

$$D_c(q_c, q_m) = \alpha - \gamma q_m - \beta q_c$$

$$\alpha, \beta, \gamma, > 0 \text{ and } \beta^2 > \gamma^2$$

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Models: Monopoly/Competitive

Substituting:

Maximize:

$$\begin{aligned} \pi = & (\alpha - \beta q_m - \gamma q_c) q_m \\ & + [(\alpha - \gamma q_m - \beta q_c) - c_c - c_o](q_c - q_m) \\ & - c_m q_m - c_m q_c - c_o q_c \end{aligned}$$

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Models: Monopoly/Competitive

Solving for first order conditions, rearranging and collecting terms:

$$2(\gamma - \beta)q_m + (\beta - 2\gamma)q_c = c_m - c_c$$

$$(\beta - 2\gamma)q_m - 2\beta q_c = c_c - \alpha$$

when $c_o = 0$

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Models: Monopoly/Competitive

Solving using Cramer's rule:

Let:

$$\Delta = 3\beta^2 - 4\gamma^2 \text{ then}$$

$$q_m = [-2\beta c_m + (\beta + 2\gamma)c_c + a(\beta - 2\gamma)]/\Delta$$

$$q_c = [(2\gamma - \beta)c_m - \beta c_c + 2a(\beta - \gamma)]/\Delta$$

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Models: Monopoly/Competitive

The ratio of γ^2/β^2 measures the degree of arbitraging the prices. We would expect to see $\gamma^2 \rightarrow \beta^2$ over time.

Initially γ^2 would be closer to zero since as $\gamma \rightarrow 0$, the differentiation of the services is high and when $\gamma^2 \rightarrow \beta^2$ the services become more substitutable namely, this ratio would measure the ease of arbitrage.

[Shy, 1995, pp. 136 -7]

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Models

- Competitive
- Benchmark
- Monopoly/Competitive
- **Callback**

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Models: Callback

p_m = retail price or collection rate

a_m = the settlement rate

If $p_m - a_m < a_m$ or $p_m < 2a_m$

monopoly gains from callback

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Models: Callback

price	\$2.00	
settlement	(\$1.06)	
net revenue	\$0.94	

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Models: Callback

	No Callback	Callback
price	\$2.00	
settlement	(\$1.06)	\$1.06
net revenue	\$0.94	\$1.06

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Models: Callback

price	\$2.00		
settlement	(\$1.06)	\$1.06	
net revenue	\$0.94	\$1.06	\$0.12

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Models: Callback, Monopoly

- **No Incentive to Reduce Accounting Rate**
- **Settlement Improved**
- **Demand Stimulated**
- **Consumers/Producer Gain**
- **Trade Balance Deteriorates**

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Models: Callback, Competitive

- **Neutral on Accounting Rate**
- **Settlement Exacerbated**
- **Demand Stimulated**
- **Consumers Gain**
(via trade effects)

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Models

- **Competitive**
- **Benchmark**
- **Monopoly/Competitive**
- **Callback**

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Policy Recommendations/Summary

- **Cost-based Prices Confirmed**
- **Benchmarks - Improvement**
 - ▶ Far from marginal costs
 - ▶ Could be tighten

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Policy Recommendations/Summary

- **Cost-based Prices Confirmed**
- **Benchmark - Improvement**
- **Callback Ineffective** (in some cases)
- **Inappropriate**
 - ▶ Sender-keep-all (Bill-and-keep)
 - ▶ Fifty-fifty split
 - ▶ Value-based pricing

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Future Research

- **Refine Models**
 - ▶ Estimation of demand functions
 - ▶ Inclusion of callback/benchmark
 - ▶ Ramsey pricing of settlements
- **Estimation**
 - ▶ Callback effects
 - ▶ Benefits of cost-based settlements
 - ▶ Developing country losses

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