

Telecom Traffic and Investment in Developing Countries

The Effects of International Settlement Rate Reductions

Scott J. Wallsten

In 1997 the U.S. Federal Communications Commission ordered sharp reductions in international settlement rates (bilaterally negotiated rates for telecom traffic between pairs of countries) for telecom traffic between the United States and the rest of the world. Even the very poorest countries, with the least developed telecommunications networks, must slash rates for traffic to the United States by 2003. Will this, by reducing telecom revenues in developing countries, reduce investments in those countries' telecom sectors?



Summary findings

Developing countries, which received about \$35 billion in net settlement payments from U.S. telecom carriers between 1985 and 1998, were upset by the FCC's decision to slash rates, because lower rates mean lower payments. They claim that the payments help finance telecom investment, and that the FCC's decision will therefore harm their telecom sectors.

Wallsten uses a panel data set for 178 countries from 1985 to 1998 to test how changes in settlement rates affect telecom traffic and investment. He finds that rates are significantly negatively correlated with traffic, with the greatest effects in the poorest countries.

In other words, reduced settlement rates *spur* telecom traffic from developing countries to the United States.

And while there is a statistically significant correlation between settlement payments and telecom revenues in developing countries, he finds no correlation between the payments and the number of telephone mainlines or imports of telecommunications equipment. In short, there is no evidence that the payments are invested in telecom networks.

This paper—a product of Regulation and Competition Policy, Development Research Group—is part of a larger effort in the group to examine the effects of privatization and liberalization in infrastructure in the developing world. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Paulina Sintim-Aboagye, room MC3-422, telephone 202-473-8526, fax 202-522-1155, email address psintimaboagye@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. The author may be contacted at wallsten@stanford.edu. July 2000. (25 pages)

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The Effects of International Settlement Rate Reductions**

Scott J. Wallsten
Stanford Institute for Economic Policy Research
and
The World Bank

Wallsten@stanford.edu

Introduction

Between 1985 and 1998, United States telephone carriers transferred almost \$50 billion to non-US carriers for international telecommunications traffic between the US and other countries (FCC, 2000). Developing countries received about 70 percent of these payments (Braga, et al 1998). The payments result from large traffic imbalances between the US and almost every other country and international accounting rates—bilaterally negotiated symmetric prices carriers pay each other to terminate international telephone calls in the other country—that are far above cost. To deal with what US carriers perceived as unfair subsidies of foreign telecom providers, in 1997 the U.S. Federal Communications Commission (FCC) unilaterally established benchmark settlement rates far below those in effect at the time. The FCC established a stringent timeline, with the rates between the US and even the poorest countries with the least developed telephone networks scheduled to fall dramatically by 2003. Not surprisingly, developing countries are upset by the FCC's action, noting that these payments represent a substantial share of their total telecom revenues and asserting that the payments are necessary for funding investment in their domestic telecom networks.

Curiously, given the large magnitudes of the payments and the importance of international settlement rates to international telephone traffic, there is almost no empirical work on the effects of settlement rates. In this paper, I ask two questions. First, how do settlement rates affect international call volume? This question is important because telecom traffic is a real economic good, while the settlement payments are, in a global sense, merely monetary transfers. Second, do developing countries, in fact, use the payments to fund telecom investment? I use a panel dataset of 179 countries from 1985 to 1998 to explore the effects of settlement rates on international telecom traffic and on investment in domestic telecom networks.

I find a strong, statistically significant negative relationship between international settlement rates and calls from other countries to the US, even controlling for country and year fixed effects, population, per capita income, and country's income classification (low, lower-middle, upper-middle, and high income). The relationship appears to be strongest in the poorest countries, where I find an elasticity of about negative 0.9—each one percent decrease in settlement rates leads to a 0.9 percent increase in outbound traffic to the United States. In other words, reducing settlement rates stimulates international telecom traffic, which, presumably, improves economic growth.

Lower settlement rates also reduce settlement payments from the US. How will reduced payments affect developing countries? Consistent with the claims, I find a statistically significant positive relationship between settlement payments and telecom revenues in poor countries. However, the results suggest that the settlement payments are **not** invested in the local network. I find no correlation between settlement payments and telephone mainlines or imports of telecommunications equipment.

International Accounting Rates

“Accounting rates” for International Message Telephone Service (IMTS) are bilaterally negotiated rates for international telephone calls between every pair of countries in the world. In theory, the accounting rate represents the cost of an international telephone call between a country-pair (Frieden, 1996). The originating and terminating carriers are assumed to have equal costs in completing the call. The “settlement rate”—the amount the originating carrier pays the foreign carrier to complete the call—is typically half the accounting rate. The originating carrier

bills the caller some retail price (the “collection rate”), pays the foreign carrier the settlement rate, and keeps the balance.¹

While accounting rates are supposed to reflect the cost of a telephone call between two countries, almost nobody even pretends to maintain that fiction anymore. The FCC (1997) estimated that accounting rates were five to ten times the true cost of completing a call. By some estimates, the total cost (including operating expenses) of an international call over cable and satellite services was less than \$0.01 per minute by 1996 (FCC, 1997). That year the average settlement rate for calls between the US and other countries excluding Western Europe and North America was about \$0.88 per minute. Even countries that receive large net settlement payments from US carriers do not claim that the accounting rates reflect the true costs of IMTS service. Instead, they say that the payments are an important component of their telecom revenue and are necessary for financing investments in the local network (e.g., Khalidson, 2000; Braga, 1999; *Telecommunications Reports*, 1997).

If international telecom traffic were relatively balanced, telecom carriers would have little reason to complain, as net settlement payments would be minimal.² But there is no reason to believe that incoming and outgoing telecom traffic should be equal. First, international trade always involves imbalances, and telecom traffic is no different (Melody, 2000). Second, residents of wealthier countries are likely to make more calls to residents of poorer countries than vice-versa if prices are symmetric. Finally, and perhaps most importantly, different levels of competition and market structure around the world and arbitrary accounting rates between countries have led to serious distortions in the international telecommunications market.

¹ The accounting rate system began in the 1930s when all countries had monopoly telecom providers. A system was needed to facilitate interconnection between these carriers to make international telephony possible. See Ergas and Paterson (1991) or Frieden (1996) for a detailed history of the accounting rate system.

The most serious distortion in international telecom markets is call turnaround, or “callback.”³ The liberalized and relatively competitive US market means that retail prices of calls from the US to other countries are typically much lower than prices of calls to the US. Technological advances make it trivial to reverse a call terminating in the US and make it appear to originate in the US (or any other country). Consumers abroad have probably benefited from callback, which effectively brings the price of calls to the US closer to the prices of calls from the US.⁴

All these factors stimulating calls from the US (both those that truly originate in the US and those that cause calls to *appear* to have originated in the US) have generated a large gap between incoming and outgoing US telephone traffic. As Figure 1 demonstrates, traffic from the US to the rest of the world soared while traffic to the US increased only slightly during the 1990s. As a result, net settlement payments from the US to these countries increased from about \$1 billion in 1985 to more than \$5 billion in 1996 before falling to about \$4.4 billion in 1998 as accounting rates began to fall (see Figure 2). Needless to say, US international telecom carriers were increasingly upset by the large payments they were making to foreign telecom firms. And, indeed, the FCC (1997) estimated that “at least seventy percent of that total [is] an above-cost subsidy from US consumers to foreign carriers.”

² Consumers, however, would have great cause to complain. Balanced traffic would simply allow all telecom firms to benefit equally from accounting rates that keep prices far above cost.

³ Call rerouting—diverting traffic through a third country—is also common and has the same effect as callback.

⁴ Many believe that callback benefits liberalized countries by pushing down prices. Malueg and Schwartz (1998), however, demonstrate how the symmetric division of accounting rates and “proportional return”—a feature of the accounting rate system mandating that traffic from foreign monopolists go to US carriers in proportion to those carriers share of traffic to the foreign country—can actually benefit the monopolists.

Incoming traffic highly profitable

One reason US interexchange carriers find the imbalance upsetting is because incoming traffic under the accounting rate regime tends to be much more profitable to them than is outgoing traffic. Consider a telecom firm's profits for outgoing and incoming calls, where π is the firm's profit, Q is telecom traffic, S is the settlement rate, MC is the true marginal cost of the call (assumed to be equal for originating or terminating a call), and P is the price charged to the consumer:

$$\text{Incoming: } \pi_i = Q_i * [S - MC]$$

$$\text{Outgoing: } \pi_o = Q_o * P - Q_o * [S + MC]$$

An incoming minute is more valuable to the firm than an outgoing minute if

$$S - MC > P - [S + MC]$$

$$S > \frac{1}{2}P$$

As long as the settlement rate is more than half the price charged the consumer, the firm's profits from incoming calls are greater than from outgoing calls.

As Cave and Waverman (1998, p.884) note, "each operator will have a desired optimal accounting rate. In determining this rate, the operator—if unconstrained by regulation—will strike a balance between the profits available to it from terminating a call (causing it to favor a high rate) and the desire to earn profits on outgoing calls (causing it to prefer a lower settlement rate paid to its correspondent)." The current system also means that firms with net inflows prefer higher accounting rates, since $S - MC$ represents profit, while countries with net outflows prefer low accounting rates, since S is a cost they must cover (Ergas and Paterson, 1991).

Accounting rates and the FCC's decision

Since US international carriers are unlikely in the foreseeable future to have more incoming than outgoing traffic, it is not surprising that they would like settlement rates to decrease. As settlement rates come down, outgoing calls become more profitable. Likewise, foreign carriers, which even absent callback are likely to receive more calls from the US than vice-versa, oppose reducing settlement rates. And while callback has undoubtedly put downward pressure on retail prices of calls to the US, by itself it is unlikely to push down accounting rates. Because incoming calls are so profitable, non-US monopolists can still earn above-normal profits from callback even if incoming calls substitute for outgoing calls.⁵

Along with settlement payments, Figure 2 shows average US accounting rates by region from 1985 to 1999. The figure reveals an unmistakable downward trend in accounting rates to all points in the world. This trend probably resulted from the FCC's 1986 decision to allow the resale of international private leased circuits for international telecommunications (Stern and Kelly, 1997). The FCC hoped that the use of private circuits would introduce competition into the international telecommunications market, putting downward pressure on prices. Nonetheless, US outgoing traffic increased faster than settlement rates decreased, and net settlement payments continued to skyrocket.

In 1992, the ITU attempted to reduce accounting rates with agreement ITU-T D.140, "which committed them to implementing principles of cost-orientation, non-discrimination, and transparency when negotiating accounting rates, and to do so within a five-year period" (Kelly, 1997). This initiative had moderate success at best. Indeed, by 1996 rates remained far above

⁵ Some carriers have taken this arbitrage a step further. In 1997 Hong Kong Telecommunications International launched its own callback service, which presumably allowed it to receive a settlement payment for incoming calls it generated and also reap additional profits as long as it could price the callback service above the settlement rate.

cost, and the rate of decrease even seemed to slow (for example, the average accounting rate for traffic between the US and Africa barely budged between 1991 and 1995). Moreover, rates are anything but transparent—only the US, the U.K., and New Zealand make their accounting rates public (Kelly, 1997; Wheatley, 1999).

Under pressure from US international carriers and anxious to reduce prices of international calls, the FCC decided to act unilaterally. In August 1997 the FCC adopted an order specifying benchmark rates and a strict timeline for their adoption. Table 1 shows the benchmark rates, whose level and adoption timeline depend on national income and teledensity (telephones per capita). High-income countries (those with a per-capita income of about \$9000 and higher) had to reduce settlement rates to \$0.15 per minute almost immediately. Low-income countries (those with annual per-capita incomes of less than about \$730) with less than one mainline per hundred people had until 2003 to adopt settlement rates of \$0.23 per minute.

High-income countries with liberalized telecom markets had no trouble meeting this goal. For example, by 1999 the off-peak accounting rate between the US and the U.K. was about \$0.14 per minute (meaning the settlement rate was about \$0.07 per minute)—well below the benchmark. Indeed, in 1999 the FCC decided that the accounting rate system is entirely unnecessary for countries with competitive telecom markets. FCC Order 99-73 “removed the international settlements policy and contract filing requirements for arrangements with foreign carriers that lack market power [and] removed the international settlements policy for arrangements with all carriers on routes where rates to terminate US calls are at least 25 percent lower than the relevant settlement rate benchmark previously adopted by the FCC in its

Settlement Rate Benchmark Order” (FCC 1999a). By July 1999, the FCC exempted 11 countries from the accounting rate regime (FCC 1999b).⁶

Meeting the benchmarks is not easy for developing countries. While they were allowed settlement rates more than 50 percent higher than high-income countries, their rates had much further to fall. In 1996 the average settlement rate for African and South Asian countries, for example, was almost \$1.00 and \$1.40 per minute, respectively. By 1999 those rates had fallen to about \$0.60 and \$1.20 per minute. These reductions have affected net settlement payments, which began to decline in 1997. While dramatic, the rates are still far from the FCC benchmarks.

Developing countries have objected strongly to the FCC’s order. This is hardly surprising given the direction of the payments and the fact that the payments can represent more than half of all reported telecom revenue in some developing countries (Braga, et al, 1998).⁷ But the important question is what the real effects of reduced settlement rates are likely to be. Madden and Savage (1998) demonstrate that accounting rates, along with market structure and ownership, are an important determinant of retail prices. Thus, lower settlement rates, by reducing the costs to the carrier of an international call, should reduce retail prices. Ergas and Paterson (1991) note that international telecom traffic is quite price sensitive. Lower prices, by stimulating additional telecom traffic, would benefit the economies of developing countries. Lower settlement rates also mean lower settlement payments, which developing countries view

⁶ These countries are Canada, Denmark, France, Germany, Hong Kong, Ireland, Italy, The Netherlands, Norway, Sweden, and the United Kingdom.

⁷ Interestingly, while US interexchange (long distance) carriers such as AT&T and WorldCom supported the FCC’s decision to lower accounting rates, other US telecom firms, such as SBC and GTE, opposed it (*Telecommunication Reports*, 1997). This opposition is undoubtedly because those firms are large stakeholders in foreign carriers including Telmex (Mexico, partly owned by SBC) and CANTV (Venezuela, partly owned by GTE), which receive large net settlement payments. In 1997, Mexico and Venezuela received \$710 million and \$72 million, respectively, in net settlement payments. Because of their ownership positions in foreign telecom firms, many US telecom firms also benefit from net settlement payments. In other words, some of the settlement payments are simply transfers

as detrimental. What are the likely effects of reduced settlement payments? Developing countries maintain that these transfers help finance the development of their local networks. Whether that is true is an empirical question.

In the remainder of the paper I set out to uncover the real effects of international settlement rates. Specifically, I ask two questions. First, how do settlement rates affect telecom traffic? Second, how do settlement payments affect investment in the local telecom network? The following sections discuss the data, methodology, and results.

Empirical Methods and Results

Data

The data I use to investigate these questions come from several sources. The FCC publishes historical accounting rates between the US and all other countries.⁸ These data are currently available from 1985 through 1999. To make the rates comparable across countries and over time, I calculate the rate for a three-minute call between the US and each other country. In a few countries with multiple carriers the rate differs by carrier. In those cases I take the average rate for that country. International traffic data also comes from the FCC. Each year the FCC publishes what is known as the “43.61 International Traffic Report” which provides, among other information, total minutes of incoming and outgoing traffic between the US and every other country. Traffic data are currently available from 1992 through 1998.⁹ Finally, net settlement payments also come from the FCC, and are available from 1985-1998.¹⁰ Figures 1 through 3, discussed above, show regional trends in these data.

from one US-based carrier to another.

⁸ Available from <<http://www.fcc.gov/ib/td/pf/account.html>>

⁹ Available from <http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/intl.html>.

¹⁰ Available from <<http://www.fcc.gov/ib/td/pf/account.html>>

The International Telecommunications Union (ITU) compiles information on the telecommunications sector in countries around the world. The ITU data I use include telecom revenues, the number of telephone mainlines, and imports of telecommunications equipment (in dollars) by country for 1985-1998. Finally, World Bank Development Indicators provide each country's population and GDP.

Accounting rates and call volume

Perhaps the most serious problem with the accounting rate system is that it has kept telephone rates for international calls far above cost by essentially putting a floor on the rate any firm can charge. Madden and Savage (1998) demonstrate that accounting rates are an important determinant in retail prices. Ergas and Paterson (1991) report a strong price elasticity of international calls, with greater elasticities for higher accounting rates. These relationships suggest that lower accounting rates are likely to stimulate additional telecom traffic.

To test the relationship between accounting rates and call volume, I estimate equation (1):

$$(1) \quad M_{it} = \beta_1(R_{it} * Low_{it}) + \beta_2(R_{it} * LowMid_{it}) + \beta_3(R_{it} * UpMid_{it}) + \beta_4(R_{it} * High_{it}) + \gamma_1(Low_{it}) + \gamma_2(LowMid_{it}) + \gamma_3(UpMid_{it}) + \gamma_4(High_{it}) + \alpha_1(population_{it}) + \alpha_2(income_{it}) + \delta_1(Year) + \delta_2(Country) + \varepsilon_{it}$$

In this equation, M_{it} is the number of minutes from country i in year t to the US that are billed in country i . R_{it} is the settlement rate between country i and the US in year t . Low_{it} , $LowMid_{it}$, $UpMid_{it}$ and $High_{it}$ are dummy variables indicating whether the country is considered low, lower-middle, upper-middle, or high income, respectively. I include population and income to control for the two factors that are likely to be the most important determinant of international telecom traffic. I include year fixed effects to control for time trends, and country fixed effects

to control for unobserved country differences. All variables are included as logs of the actual value, so the equation is a log-linear specification.

I interact the settlement rate with the income level dummy variables to test how the effects of accounting rate changes affect countries depending on their development status. Specifying the model this way is important for several reasons. First, the FCC order sets the benchmark settlement rate according to this division. It is therefore necessary to determine how accounting rate changes are likely to affect countries within these groupings. Second, accounting rates tend to be much higher for poorer countries, meaning both that they have further to fall to meet the benchmarks and that changes may have bigger effects. Finally, poorer countries are upset by the decision and will see the biggest changes; we must determine how they will be affected.

The careful reader will note that M_{it} is the number of minutes of telecom traffic to the US billed outside of the US rather than total telecom traffic. I purposely exclude the number of minutes billed inside the US. The reason for this decision is that callback and other innovations have caused much of incoming US traffic to appear in the data as outgoing US traffic (and thus billed in the US). Because outgoing minutes surged as accounting rates fell, any empirical analysis that did not control for callback volume would likely find a negative correlation between traffic and accounting rates. Without that crucial control, however, the finding would be specious. Unfortunately, there is no good estimate of callback volume between the US and each other country.

Using *minutes billed abroad* nicely solves this problem for the purposes of the analysis. Callback and other technologies have suppressed the number of minutes billed outside the US, as some traffic that actually originates outside the US is recorded as if it had originated inside the

US. By using this figure I bias the estimation *against* finding a negative correlation between settlement rates and call volumes since rates fell while incoming minutes were artificially suppressed. In other words, this analysis will understate any stimulatory effect that reduced accounting rates may have on outgoing telecom traffic.

Table 2 shows the results of this estimation. The first column shows the results when country and year fixed effects are included. The estimation reveals a strong, statistically significant, negative price elasticity for all income levels. Even more striking is the fact that the elasticity (and statistical significance) appears stronger for poorer countries. The poorest countries show an elasticity of negative 0.9: for each one percent decrease in the settlement rate outgoing traffic increases by about 0.9 percent.

It seems surprising at first that population and income are not significant in determining outgoing call volume. The main reason for this result appears to be the inclusion of the country fixed effects. These fixed effects control for much of the variation in population and income, as the second column of the table, which shows the estimation without the country fixed effects, reveals. This estimation shows that the negative price elasticity remains, and also that population and income are correlated with outgoing minutes. While excluding the fixed effects is useful to demonstrate more simple correlations, they are important to include since the estimation cannot otherwise control for so many other unobserved country-specific factors.

The empirical results strongly suggest that, as we would expect, reducing accounting rates will stimulate international telephone traffic. Moreover, this effect is stronger for poorer countries. In this respect, not only will poor countries benefit from reductions in accounting rates, but they will benefit by even more than rich countries. Consider, for example, Africa. In 1998 the average settlement rate was about \$0.72 per minute. Telecom traffic from Africa to the

US that year totaled about 98 million minutes. Reducing the accounting rate to \$0.23 per minute implies approximately a 70 percent decrease in the settlement rate. Assuming that most African countries fall in the “low income” category, our estimated price elasticity suggests the rate decrease would mean a 63 percent increase in minutes. While it is dangerous to project out-of-sample, the estimates suggest that traffic to the US could increase by almost 59 million minutes as a result of the rate decrease alone.

Settlement payments and investment in telephone networks

Few would argue with the conclusion that reduced settlement rates will stimulate telephone traffic. Instead, the controversy focuses on the settlement payments. Essentially, developing countries contend that those payments help finance investments in their domestic networks. In this section I evaluate that claim. I estimate three versions of equation (2) to explore the relationship between investment and settlement payments.

$$(2) \quad Y_{it} = \beta_1(\text{Pay}_{it} * \text{Low}_{it}) + \beta_2(\text{Pay}_{it} * \text{LowMid}_{it}) + \beta_3(\text{Pay}_{it} * \text{UpMid}_{it}) + \beta_4(\text{Pay}_{it} * \text{High}_{it}) + \gamma_1(\text{Low}_{it}) + \gamma_2(\text{LowMid}_{it}) + \gamma_3(\text{UpMid}_{it}) + \gamma_4(\text{High}_{it}) + \alpha_1(\text{population}_{it}) + \alpha_2(\text{income}_{it}) + \delta_1(\text{Year}) + \delta_2(\text{Country}) + \varepsilon_{it}$$

Pay_{it} is the net settlement payment from the US to country i in year t . The other independent variables are as defined above. Y_{it} represents a different variable for each of the three versions of the equation. First, I run the regression defining Y_{it} as telecom revenues. Second, I define the dependent variable as the number of mainlines in the country. Number of mainlines is probably the best indicator of true investment as it indicates national penetration of the telecom network. Finally, I define the variable as spending on imports of telecommunications equipment. While this may not be a good indicator of investment for industrialized countries, it is quite good for

developing countries, which import almost all such equipment and claim to need the hard currency from the settlement payments in order to pay for those imports.

The first column of Table 3 shows the relationship between telecom revenue and settlement payments. With the exception of upper-middle income countries, we observe a statistically significant positive correlation between settlement payments and telecom revenues. In this light, it is clear why telecom firms in developing countries are upset by the FCC decision: reduced settlement payments will reduce their revenues. The question is, what happens to this additional telecom revenue? Is it invested in the domestic telecom network? Will reduced settlement payments reduce investments in domestic networks?

The second column of Table 3, which shows the results of estimating equation (2) when the dependent variable is the log of the number of mainlines, begins to suggest the answer. The estimation reveals no correlation between settlement payments and network growth (except in the wealthiest countries). Indeed, for the poorest countries the estimation reveals a t-statistic of only 0.17 on the payment coefficient. We cannot reject the hypothesis that settlement payments have no effect on network growth. In other words, the data do not support the contention that settlement payments have been invested in the domestic network.

To investigate further, I explore the effects of settlement payments on imports of telecommunications equipment. The third column shows the result of estimating Equation (2) using imports of telecom equipment as the dependent variable. Again, there is no statistically significant correlation between payments and imports (moreover, the sign on the coefficient, though statistically insignificant, is negative). Similar to the estimation just described, the evidence suggests that settlement payments are not used for imports of telecommunications equipment.

In sum, the data confirm that settlement payments are an important component of telecom revenues in poor countries. However, claims to the contrary notwithstanding, the data strongly suggest that settlement payments are not invested in domestic telecom networks. This result suggests that investment in telecom networks in developing countries is unlikely to be greatly affected by the FCC's decision to reduce settlement rates.

Discussion

The finding that accounting rates are negatively correlated with telecom traffic is neither surprising nor controversial. We already have evidence that accounting rates are an important determinant of international telecom prices, and that international traffic is sensitive to price. The finding in this paper regarding elasticities follows directly from, and is entirely consistent with, the existing literature.

The finding that settlement payments do not appear to fund telecom investments in poor countries may be more surprising at first, and is certainly more controversial. Upon reflection, however, any result other than the one found here should be surprising. First, there is no particular reason why additional revenues would go for telecom investments as opposed to anything else. As Wettemann and Kelly (1998) note, "hard currency settlement payments can be used to purchase foreign telecommunications equipment, repay infrastructure loans, or (in some cases) fulfill other national fiscal demands outside the telecommunications sector." In other words, money is fungible and payments may not necessarily be funneled into investment.

If the firm is a rational profit maximizer then it will undertake investments if the expected returns exceed the cost of capital. If the firm faces no or low capital constraints then an extra infusion of cash is unlikely to stimulate additional investment. Low, if any, capital constraints,

are not unlikely for many countries. Consider the case of Mexico. Telmex is largely privatized—by 1998 it was 55.1 percent privately-held. Almost 25 percent is publicly-held and 20.4 percent owned by a consortium that includes France Télécom and SBC (SBC has also bought an additional 5.1 percent on its own) (ITU, 1998). Mexico, meanwhile, received almost \$655 million in settlement payments in 1998, about 14 percent of the total. While the payments certainly increase profits, it is difficult to imagine that this multinational consortium faced credit constraints and that the settlement payments would cause it to alter its investment strategy.

While many private telecom firms—especially those that allow foreign ownership—are unlikely to face severe capital constraints, the poorest countries that retain state-owned providers may. Even then, however, it is unrealistic to expect settlement payments to necessarily be used for telecom investments as opposed to other priorities. State-owned firms may have many, perhaps contradictory, objectives (e.g., profit maximization and employment maximization) and constraints. Even if the settlement payment stays in the telecom sector, there may be no incentive to use it for investment as opposed to any other objective. Indeed, unconditional foreign assistance (which are essentially equivalent to settlement payments) can prevent reforms by subsidizing inefficient operations (World Bank, 1995).

The point of this discussion is not that reduced settlement payments would have no consequences for developing countries. Indeed, a sharp reduction in capital inflows—especially if the amount is large relative to the economy—could create real difficulties. The point, however, is that it is not realistic to expect these transfers to be used exclusively for telecom investment.

Conclusion

The international accounting rate system currently helps keep the prices of international telephone traffic significantly above cost. While rates had been falling for the previous decade, settlement payments from the US to other countries had been soaring. In 1997, largely in response to pressure from US carriers who felt they were subsidizing foreign telecom firms, the US FCC unilaterally decided to establish benchmark rates much closer to the true cost of service. The FCC's decision has been extremely controversial. In this paper I take an empirical look at two important aspects of settlement rates: their effect on international telecom traffic, and their effect on telecom investment in developing countries.

I find that telecom traffic is sensitive to settlement rates. Reduced settlement rates lead to increased telecom traffic, and the biggest price effects occur in the poorest countries. That is, the poorest countries are likely to see the largest increase in telecom traffic as a result of decreases in the settlement rate. I also find no evidence that settlement payments are used to fund telecom investment. Settlement payments, while significantly correlated with telecom *revenues*, have no effect on mainline growth or imports of telecommunications equipment. In short, the data suggest that, contrary to conventional wisdom, settlement payments have not been invested in domestic telecom networks in developing countries.

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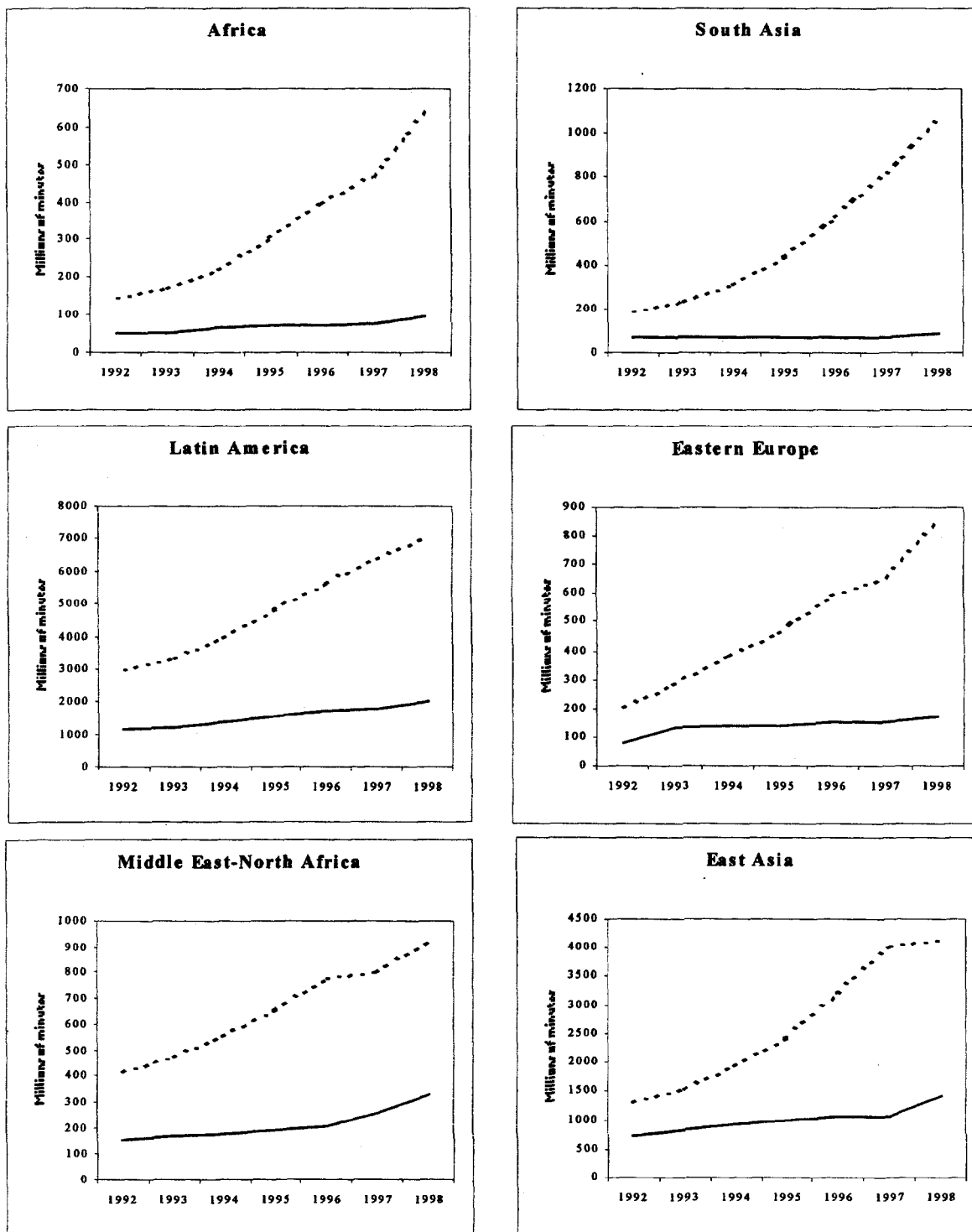
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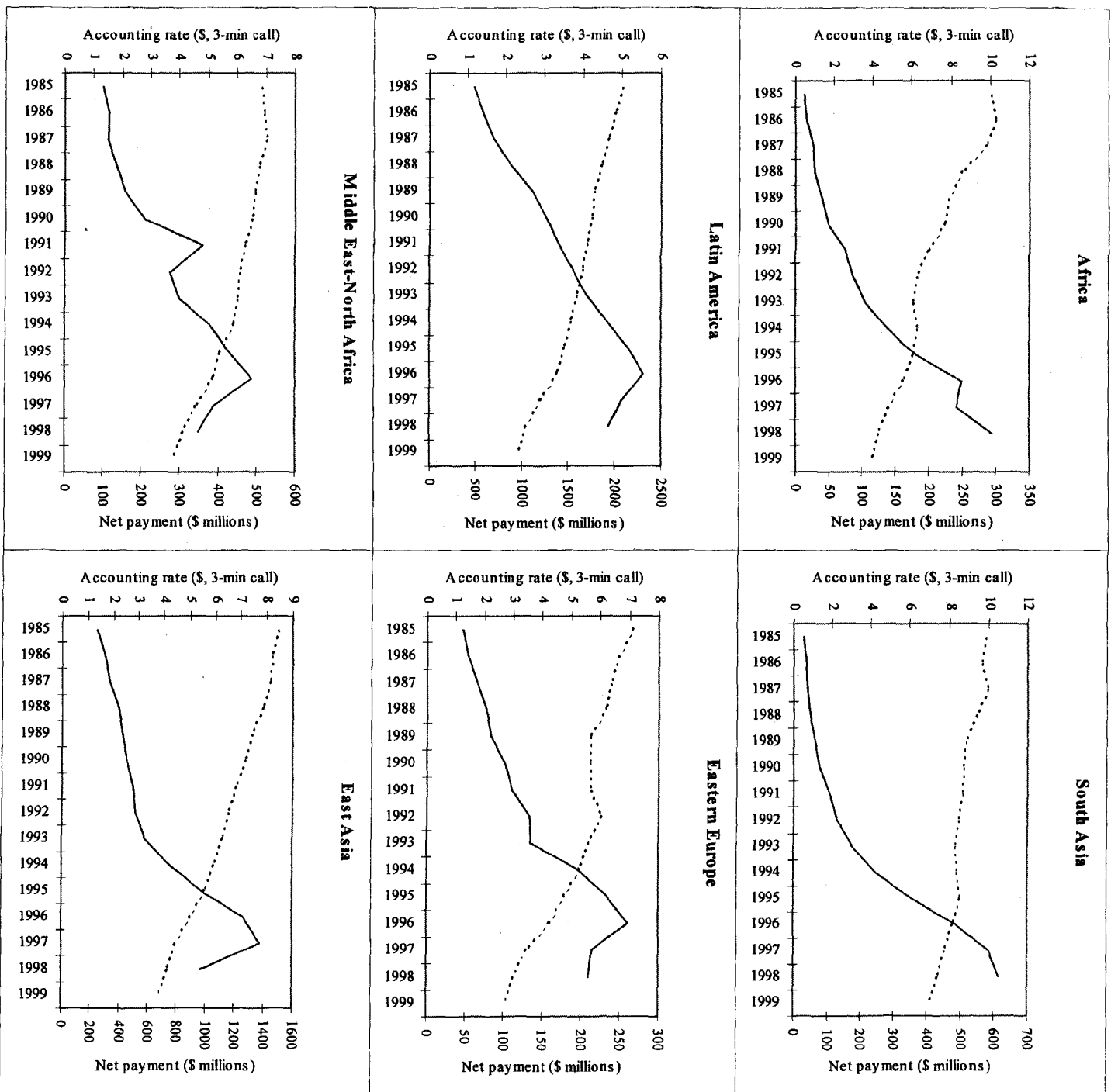
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Figure 1
Telecom Traffic To and From the United States



- - - - - Billed in the U.S.
 _____ Billed outside the U.S.

Figure 2
Accounting Rates and Net Settlement Payments, 1985 - 1999



Net Payments
 Accounting rate

Table 1
FCC Benchmarks

Country income level	Target rate per minute	Target date
High (\geq \$8,956)	\$0.15	1999
Upper-middle (\$2,896-\$8,955)	\$0.19	2000
Lower-middle (\$726-\$2,895)	\$0.19	2001
Low ($<$ \$726)	\$0.23	2002
Teledensity $<$ 1	\$0.23	2003

Table 2
Effect of Settlement Rates on Call Volume
 (absolute t-statistics in parentheses)

Dependent variable: ln(minutes billed abroad)		
Mean of dependent variable: 14.95		
	With country fixed effects	Without country fixed effects
ln(Rate * Low)	-0.89 (3.39)	-1.40 (9.64)
ln(Rate * LowMid)	-0.37 (2.46)	-2.54 (10.69)
ln(Rate * UpMid)	-0.58 (2.87)	-2.65 (7.08)
ln(Rate * High)	-0.17 (1.85)	-0.87 (5.86)
ln(population)	0.56 (0.38)	0.71 (35.76)
ln(gdp per capita)	-0.14 (0.40)	1.11 (11.64)
Low income	0.94 (2.73)	3.11 (17.68)
Low-Middle Income	0.62 (3.35)	4.09 (18.41)
Upper-Middle Incom	0.58 (2.54)	3.59 (10.73)
High Income	0.41 (1.61)	1.68 (4.51)
R-squared	0.98	0.82
Number observations	883	883

Year fixed effects included in both estimations, but not shown.

Table 3
Effect of Settlement Payments on Telecom Provision
 (absolute t-statistics in parentheses)

Dependent variable: log of	telecom revenues	mainlines	imports of telecom equipment
Mean of dependent variable	19.59	12.35	18.92
ln(Payment * Low)	0.04 (1.87)	0.002 (0.17)	-0.03 (0.50)
ln(Payment * LowMid)	0.08 (3.31)	0.01 (0.82)	-0.04 (0.70)
ln(Payment * UpMid)	0.02 (0.85)	-0.002 (0.14)	0.02 (0.26)
ln(Payment * High)	0.05 (2.11)	0.02 (1.96)	-0.07 (1.34)
ln(population)	-0.08 (0.29)	1.16 (9.53)	-0.24 (0.52)
ln(gdp per capita)	1.04 (7.21)	0.702 (9.98)	1.77 (6.51)
Low income	-0.74 (1.56)	-0.2 (1.35)	0.8 (0.64)
Low-Middle Income	-1.23 (2.65)	-0.21 (1.21)	0.93 (0.97)
Upper-Middle Income	-0.32 (0.67)	0.09 (0.47)	-0.06 (0.06)
High Income	-0.81 (1.82)	-0.42 (1.97)	1.49 (1.50)
R-squared	0.99	0.99	0.97
Number observations	1564	1760	826

Country and year fixed effects included, but results not shown.

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