ATTACHMENT A

A GAME-THEORETIC ANALYSIS OF THE FCC'S PROPOSED RECIPROCITY RULE

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1. INTRODUCTION AND SUMMARY

The FCC is considering whether to adopt a rule that would condition investment by foreigners in facilities-based U.S. international carriers on whether the telecommunications market in the investor's home country is open to entry by U.S. firms. Under the proposed rule, whether there is open entry is one of the factors the FCC would consider in deciding whether to permit the investment. This paper analyzes the effects of adopting a reciprocity rule, which would hold hostage the prize of entry into the provision of international telecommunications service in the U.S. in order to induce foreign governments to open their own telecommunications markets to competition from U.S. and other firms. We reach four broad conclusions:

1. There are likely to be circumstances in which U.S. consumers are made worse off by the imposition of a reciprocity rule. This would occur when foreigners valued the gain from entry into the U.S. market less than the cost they experienced from opening their own markets to competition. Because foreigners would decline to open their markets in such circumstances, imposing a reciprocity rule would cause U.S. consumers to forego the benefits of foreign entry, while U.S. firms remained unable to enter the foreign markets.

2. The decisions by foreigners about opening their markets will depend on such factors as the size of their investment in the U.S. carrier, whether the investment is controlling, and the size and profitability of the foreign markets that the U.S. wishes to have opened. As a result, the U.S. may attempt to tailor its policy to the circumstances of each particular investment in order to encourage foreigners to open their markets while limiting the risk that the investment in the U.S. carrier will be lost. However, if the U.S. adopts such a policy, the effect will inevitably be to undermine the belief by foreigners that the U.S. has committed to the reciprocity policy. There is thus a contradiction between adopting a policy for each specific case and adopting one that foreigners will view as something to which the U.S. is strongly committed.

3. If the U.S. must establish the same reciprocity rule for all foreign investors, the likelihood that these investors will decline to invest in U.S. markets in order to continue to protect their home markets becomes even stronger. Because no single rule can take into account the circumstances of each particular investment, such a rule will often result in demands for openness that foreign investors will find it unprofitable to meet.

4. If, in response to the U.S. policy, a foreign country announces that it will not accede to a demand to open its market in return for the right of its nationals to invest in U.S. international carriers, one of three outcomes is possible. First, there can be an impasse, where neither the foreign investment nor the opening of the foreign market

occurs. Second, the U.S. can eventually drop its demand for reciprocity, thus allowing foreign investment without the opening of the foreign market. Third, the foreign country can eventually concede and open its market in order to permit its nationals to invest in the U.S. Regardless of the outcome, the benefits of foreign investments to U.S. consumers are either foregone or delayed, and only in the third case does the U.S. policy have the effect of opening the foreign market.

2. OUTLINE OF THE PAPER

This paper examines a series of simple game-theoretic models that analyze how foreigners will react to the imposition of a reciprocity rule and, in turn, whether adopting such a rule is in the best interests of U.S. consumers. The first game assumes that the U.S. can, but need not, commit to not allowing the foreign investment unless the required opening of the foreign market occurs. Given such a commitment, the U.S. will not allow the foreign investment unless the concession occurs, even if the U.S. were later to conclude that it would be better off if it were to do so. In this game, we also assume that the foreign "player" cannot commit to not open its market. Finally, we assume that the U.S. can make a different commitment in the case of each investment and country.

In the second game, if the U.S. chooses to commit to a reciprocity rule, it must commit to the same rule for all foreign investments, regardless of any differences in circumstances. As a result, the decision about whether to commit cannot be tailored to each individual case.

In the third game, both the U.S. and the foreign government can each commit to a reciprocity rule. In this case, not only does the U.S. demand some form of reciprocity as a condition of allowing foreign investment, but the foreign government also does the same.

Finally, we analyze the imposition of a reciprocity rule and the reaction of foreign governments to it. Here, the U.S. insists that it will not allow the foreign investment unless its demands for reciprocity are met, while the foreign player insists that it will never accede to such demands.

3. THE ROLE OF COMMITMENT

In all of the games analyzed in this paper except the one in which the foreign government insists that it will never open its market in response to U.S. policy, if the U.S. adopts a reciprocity rule it is assumed to be committed to not allowing foreign investment unless its conditions for reciprocity are met. This implies that the U.S.

cannot later change its mind and allow the foreign investment without the opening of the foreign market, even though that may then be in its best interests. However, in the game theory literature, pre-commitment is thought to be a very restrictive assumption, and there are not many games in which true pre-commitment is a viable strategy.[1] As we show below, it may be in the interest of the U.S. to abandon a reciprocity rule after it is announced. In particular, in the models we analyze, as soon as the U.S. believes that a foreign player will not concede and open its market, the U.S. should abandon a reciprocity rule and allow the investment in the U.S. firm. Nonetheless, in all but one of the games described below, an externally guaranteed commitment is assumed to exist.[2]

In the models examined in this paper, the level of entry that triggers the reciprocity rule and the definition of an open market are assumed to be well-defined and measurable. Also, the benefits to the U.S. and the benefits and costs to the foreign investor may be known to each opposing player. Finally, we assume that the U.S. has committed to the reciprocity rule, so that the foreign investment would be prohibited unless the investor's

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[1] For a definition of commitment in games see J. W. Friedman, Game Theory with Applications to Economics (Oxford: Oxford University Press, 1986), p. 11, and D. Fudenberg and J. Tirole, Game Theory (Cambridge, MA: MIT Press, 1991), p. 74.

[2] Externally guaranteed commitment is not often used in economic modeling. Economists usually assume that players will always act in their own best interests, and will therefore change their strategies if it is in their best interests to do so. This is especially true when at some stage of a game every player is made better off by a change in strategy. When examining a game for equilibria, it is often productive to look for "renegotiation-proof" strategies. This implies that at every point in the game, no player wants to deviate from its equilibrium strategy, i.e., no player wishes to renegotiate the outcome of the game once play has started. In the games we examine, a player cannot renegotiate once a commitment has been made.

market is open. Since the U.S. is assumed to bear substantial costs of breaking its commitment, it is not engaging in "cheap talk."[3]

If, on the other hand, the level of the reciprocity required, or the markets involved, or even whether reciprocity will be required, are negotiable, the proposed rule will be less effective. The proposed rule does not explicitly state that foreign investment will be denied unless the U.S. demands for market openness are met. Rather, the degree of openness appears to be only one of many factors that the FCC will take into account when deciding whether to allow a particular foreign investment. But, to the extent that the FCC is willing to negotiate over the required degree of reciprocity, the threat of denying the foreign investment becomes less credible.

In actual applications, both the negotiability of the rule to be enforced and the payoffs to the players will depend on the level of investment, whether a controlling interest is

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[3] Games in which claims of commitment are made, but where such claims are untrue, are termed "cheap talk." Players may claim that they will take some action in the future in reaction to an opposing player's actions, for instance by requiring reciprocity. However, if there is no penalty for reneging on this claim, and deviating is a more attractive action at a later time, then the initial claim is cheap talk. Thus it is ineffective, although costless, for a player to claim that it will pursue a particular strategy in the future if it is free to change that strategy when circumstances dictate. If, for example, the FCC is willing to negotiate about any aspect of the reciprocity rule at a later time, then it may be viewed as engaging in cheap talk, and its "commitment" to the rule will carry little weight. For example, if decisions to allow investments in U.S. firms continue to be made on a case-by-case basis, any claimed commitment to a reciprocity rule is unlikely to be believed. As we point out below, however, it is likely to be difficult to avoid case-by-case treatment.

acquired, the type of carrier in which the investment is made, and many other factors.[4] Actual reciprocity rules will have to specify all of these factors; the more complicated the rule, the more difficult it will be to commit to, and the more likely that negotiation and compromise will take place. Although in what follows we often assume that commitment is credible and enforced in the analysis, if the FCC is not perceived by foreigners as "committed" to the policy, in the sense in which that term is used here, then the Commission may be unable to realize the benefits of a reciprocity rule.[5]

4. PLAYER PAYOFF ASSUMPTIONS

A foreign firm that wishes to invest in a U.S. carrier obviously expects to benefit from the investment.[6] In the analysis that follows, it is also assumed that U.S.

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[4] The smaller the level of investment, the smaller the payoff to the foreign firm and the less leverage the U.S. will have to influence the opening of the foreign market.

[5] Two apparently inconsistent aspects of the FCC's treatment of "reciprocity" in the Notice of Proposed Rulemaking ("NPRM") should be noted. First the Commission would seek to exercise leverage with respect "only to common carriers providing international facilities-based service" (para. 80). However, there would seem to be no reason why that leverage argument would not apply equally well to foreign carriers that wish to provide any telecommunications service. In this sense, the areas in which the NPRM seeks to exercise leverage seem too narrow. At the same time, even in cases where the nation of the carrier desiring to enter the U.S. market does not foreclose entry by American carriers that wish to offer the same service, the NPRM suggests that the FCC may still seek to exercise leverage. Thus, the Commission notes that "if comparable market access exists for the international facilities-based services in a particular country, but all other telecommunications markets are closed to U.S. carriers, the balance of the public interest factors may weigh against granting entry to a carrier from that country" (para. 41, emphasis added). Here, the policy proposed in the NPRM appears to be broader than is necessary to achieve comparable access.

[6] The analysis, although couched in terms of investment in an existing U.S. carrier, also applies to de novo investment by a foreign firm.

telecommunications consumers will benefit from the investment, through increased competition in the U.S. market and/or efficiencies that the foreign firm will bring to the U.S. carrier. The FCC recognized these benefits in granting approval for British Telecom's investment in MCI when it observed that "BT's substantial equity contribution will facilitate MCI's ability to expand and improve network services and products that it may offer to American consumers, stimulating U.S. economic growth and creating new job opportunities."[7] We assume that the U.S. player, the FCC, takes these gains to U.S. consumers into account in the policy it adopts. The U.S. player also is assumed to take into account any gains to Americans that result from opening the foreign market.[8] These take the form of benefits to U.S. consumers of telecommunications services in the foreign market and to U.S. firms that sell services in that market.[9]

The foreign player, presumably the foreign telecommunications regulatory authority or government, must view opening its local market as costly, because otherwise it would

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[7] *MCI Communications Corporation, British Telecommunications plc*, 75 RR 2d 1024, at 1029 [1994].

[8] It is conceivable, although unlikely, that the U.S. player will take into account the benefits to consumers and suppliers in other countries from the opening of the foreign market.

[9] Although we assume the benefits the U.S. seeks in return for permitting the foreign investment in the U.S. carrier take the form of opening the foreign telecommunications market to competition, there is no need for the desired reciprocity to take this form. Indeed, it will often be the case that the U.S. obtains larger benefits if it obtains reciprocity in a different market, i.e., outside the telecommunications sector. Whether reciprocity should be required in the same product sector is currently the subject of debate. See J. Jackson, The World Trading System, Law and Policy of International Economic Relations (Cambridge, MA: MIT Press, 1989), p. 125.

open the market even in the absence of pressure to do so from the U.S.[10] Therefore, the foreign player is implicitly assumed to be acting not in the best interests of foreign consumers but in the interests of the foreign telecommunications supplier. In actual practice, the foreign player represents a variety of possibly competing local interests, including those of the foreign telecommunications supplier, its employees, and foreign consumers of telecommunications services. As a result, predicting its actions is more complex than modeled here, further adding to the difficulty of the U.S. in formulating a reciprocity policy.[11]

In the models that follow, we make the following assumptions about the payoffs to the two players.

1. If the foreign player does not open its market and the U.S. does not allow the foreign investment, then the status quo is maintained and the payoffs to both players are zero. U.S. consumers and the foreign player do not enjoy the benefit of the foreign investment, and the U.S. does not benefit from the opening of the foreign market.

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[10] In foreign markets that are already open to competition, the proposed rule is unnecessary. As foreign markets change their regulatory structure, the Commission's rule will be shooting at a moving target.

[11] For example, if the foreign telecommunications supplier is willing to open its market in order to obtain the benefits of investing in the U.S., but its employees, who obtain none of the benefits of the U.S. investment are not, and if the foreign government gives great weight to the interests of the workers, the reciprocity rule will be ineffective.

2. If the investment by the foreign player is made in the U.S. firm, then the foreign player receives positive payoff P_f.[12] The value to the U.S. player of the purchase, P_u, is also positive.[13] These payoffs are assumed to be well defined and may be observable by the players.
3. If the foreign player opens its local market, then it receives negative payoff, O_f. The value to the U.S. of opening the foreign market, O_u is positive.[14]

The particular determinants of these payoffs are less important than the assumptions that the U.S. wants the market to open and the foreign player wants to keep it closed.

A. U.S. First Mover Game

In this game, in the first stage the U.S. chooses whether to commit to a rule that does not allow investments in U.S. firms unless access is granted by the foreign player to its market. The foreign player is not allowed to pre-commit to a strategy.

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[12] The magnitude of this payoff will depend on factors such as the size of the investment and on whether it affords control.

[13] These benefits accrue to U.S. consumers. Although some U.S. firms may be harmed by the additional competition, either these losses are ignored or they are assumed to be smaller than the gains to U.S. consumers.

[14] Recall that we are assuming that the foreign regulators are serving the interests of the foreign firm, not those of foreign consumers. Thus, the gains to foreign consumers from U.S. entry are either ignored here or are assumed to be smaller than the losses to the foreign firm and, perhaps, its employees.

In the second stage of the game, the U.S. and the foreign player play simultaneously. If the U.S. has not committed to a reciprocity rule, then it must decide whether or not to allow the investment. The foreign player must decide whether or not to keep its local market closed or to allow entry. If the U.S. has committed to a reciprocity rule, then the only play is by the foreign player, which must decide whether to open its market. If the market is opened, the foreign investment is permitted. Otherwise, it is not. The game is depicted graphically in Figure 1, with the payoff to the U.S. listed in each box first and the payoff to the foreign player listed second.

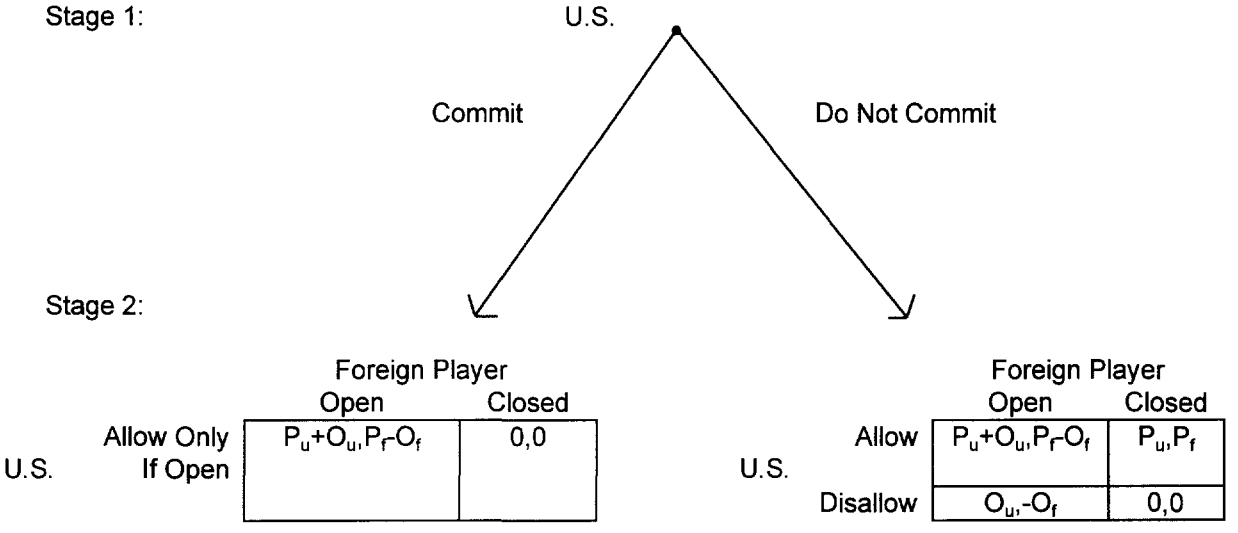

Figure 1.

Analyzing the second stage of the game reveals that the equilibrium strategy for each player depends on the magnitudes of the payoffs. The equilibrium under the commitment strategy of the first stage will have the foreign player opening its market only if its gain from investing in the U.S. firm, P_f, is more than its loss from opening its

home market, O_f, (P_f-O_f>0). If the total payoff is negative (P_f-O_f<0), the foreign player will not open its home market, and the status quo will be maintained with payoffs of zero for both players.

If, on the other hand, the U.S. chooses the no-commitment strategy, the equilibrium will be for the U.S. to allow the purchase, because U.S. consumers gain from the foreign investment, and for the foreign player to keep its market closed, because the foreign player is assumed to lose as a result of the additional competition its telecommunications suppliers face in its home market. The payoffs will be positive for both players, P_u for the U.S. and P_f for the foreign player.

Taking the equilibrium payoffs from the second stage into account, we now consider whether the U.S. should commit to a reciprocity rule in the first stage. The payoff to the U.S. to committing is zero if the value to the foreign firm of the closed market is higher than the value of its investment, because then the foreign player will not open its market even if that means its investment will be rejected. Otherwise, the gain to the U.S. is the combined value of the foreign entry in the U.S. market and the gain to the U.S. of the opening of the foreign market, P_u+O_u. The payoff to <u>not</u> committing is the value to the U.S. of the foreign investment in the U.S. carrier, P_u.

If the U.S. knew the payoff to the foreign player, it could easily determine whether to commit to a reciprocity rule. As long as the foreign player values the purchase of the interest in the U.S. firm more than it values keeping its home market closed, the U.S. will gain more from committing to a reciprocity rule than if it does not do so. On the other hand, if the foreign player values its closed market more than it does the interest in the U.S. firm, then the U.S. will get a higher payoff by not committing to a reciprocity rule. [15]

If the U.S. does not have perfect information about the valuations of the foreign firm, then the U.S. must estimate whether the foreign investor values its closed home market more than it does its investment in the U.S. firm. Let γ be the probability that the value of the investment to the foreign player is larger than the loss from opening its home market. If $\gamma=1$, the U.S. is certain that $P_f-O_f>0$, and commitment is the optimal strategy. If $\gamma=0$, the U.S. is certain that $P_f-O_f<0$, and not committing is the optimal strategy. For values of the probability between zero and one, the expected payoff to committing is $V_c=\gamma(P_u+O_u)$, while the payoff to not committing, V_n, is $=P_u$. In order for the expected payoff of commitment to be greater than that of not committing, the ratio of the value to

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[15] Clearly, one factor that will affect the value of the investment in the U.S. firm to the foreign investor is the magnitude of that investment. The smaller is that investment, the less likely is the foreign player to open its market. Whether the investment is passive or controlling will also affect the value of the investment to the foreign player.

the U.S. of the purchase to the value of opening the foreign market must be less than the ratio of the probability γ over one minus the probability. Thus, the rule is:

$$\text{Commit if } \frac{P_u}{O_u} < \frac{\gamma}{1-\gamma}$$

As this rule shows, commitment, i.e., adopting a reciprocity rule, is optimal only if: 1) the probability that the foreign player will open its market is high; and/or 2) the value to the U.S. of the foreign investment is small relative to the value to the U.S. of opening the foreign market.[16]

To consider a specific case, assume that the value to the U.S. of the investment by the foreign player is proportional to the value of the purchase to the foreign player ($P_u \propto P_f$), and that the value to the U.S. of opening a foreign market is proportional to the value that the foreign player places on keeping that market closed ($O_u \propto O_f$). We have shown that the U.S. should commit to a reciprocity rule if the value to the U.S. of the foreign investment is small relative to the value to the U.S. of opening the foreign market. When the payoffs are proportional, this condition implies that the U.S. should commit when the value to the foreign player of the purchase is small compared to the value of keeping its market closed. But when this is true, the foreign player is unlikely to open its market, and commitment will fail to induce that result. Therefore, if payoffs are

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[16] As noted above, this latter value will accrue both to U.S. firms, who can now compete in the foreign market, and to U.S. consumers, who will purchase services in the foreign market at prices that are reduced by competition.

proportional, the two situations in which commitment is an optimal strategy are contradictory. It will, therefore, not be optimal to commit.

To effectively employ a reciprocity rule, the U.S. player must be able to accurately measure the benefits and costs the foreign player realizes. In practice, the rule will have to describe precisely the level of investment required to trigger the rule, the market or markets that will have to be opened, and what constitutes opening a market. Since the payoffs will be different for different investments, commitment will not always be the optimal strategy. A pre-commitment strategy should be employed against some opponents and not against others. If the U.S. mis-estimates the values of the payoffs, and attempts to obtain larger concessions than foreigners are willing to make, some foreign investments that are valuable to the U.S. will not be made.[17] Alternatively, some markets that could be opened will not be, i.e., the U.S. may accept too little in the way of opening foreign markets in return for permitting foreign investments.

B. Repeated U.S. First Mover Game

In the previous game, whether committing to a reciprocity rule was optimal depended on the particular investment being considered. Now assume the U.S. must commit to a

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[17] Alternatively, the investments may only be delayed if the U.S. eventually reduces its demand, but this may serve to undermine its credibility in other circumstances.

single reciprocity rule for all investments, or not be able to commit at all.[18] The assumptions about the measurability of foreign payoffs and level of complexity of a reciprocity rule are even more restrictive in this model. The rule must define such things as levels of investment, identify markets to be opened, and specify what constitutes a market opening for every possible investment before commitment is possible. Any negotiation made over these parameters in a particular case erodes the credibility of the commitment, and therefore its value.

For simplicity, assume the same payoff structure as the previous game except that each payoff is now superscripted by an i to indicate the country of the foreign investor. The payoff for the U.S. to committing in the first stage is: $V_c = \sum_{i=1}^{N} P_u^i + O_u^i$, where N is the number of foreign players that open their local markets in order to be allowed to invest in the U.S. firm (All i for which $P_f^i - O_f^i > 0$). The payoff to not committing and allowing every foreign investment in equilibrium is: $V_n = \sum_{i=1}^{M} P_u^i$, where M is the total number of foreign players. In order for the commitment strategy to have a larger payoff, it must be true that:

$$V_c > V_n \Rightarrow \sum_{i=1}^{N} P_u^i + O_u^i > \sum_{i=1}^{M} P_u^i$$

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[18] This scenario seems to be a more accurate representation of the problem under consideration than the first model presented, since a "commitment" to apply a reciprocity rule on a case-by-case basis is not likely to be regarded as an irrevocable commitment.

Rearranging terms we have:

$$\text{Commit if } \sum_{i=1}^{N} O_u^i > \sum_{i=N+1}^{M} P_u^i$$

For commitment to be an optimal strategy, the total value to the U.S. of the foreign markets that are actually opened must be larger than the value to the U.S. of the foreign investments that are not made. This indicates that the value of a commitment strategy depends on the expectation of the types of investments that will be proposed. Also, if we again assume that the values of the investments to foreign players and the U.S. are proportional ($P^i_u \propto P^i_f$), and the values of the market openings are proportional ($O^i_u \propto O^i_f$), then the cases for which the U.S. places the largest value on opening a market are those in which it is least likely that the foreigner will open its market when faced with a reciprocity rule. The left side of the equation above will be summed over the N foreign investors with smaller values of O^i_f, and therefore smaller values of O^i_u, so that instituting a reciprocity rule is unlikely to be optimal.

If the U.S. must commit to always employing a reciprocity rule, if it wants to use one at all, then it must believe that the value to it of the markets that will actually be opened as a result are larger than the value to the U.S. of the foregone investments. In any event, the U.S. must make the decision to commit before any investments are proposed. If the U.S. eases its commitment and negotiates in each case, then any "rule" is just cheap talk, and the value of commitment will be eroded.

C. No First Mover Game

In this third version of the game, both players can pre-commit to a reciprocity strategy. In order for the foreign player to consider pre-commitment, there must be a U.S. firm that wishes to invest in a foreign firm and a U.S. market that the foreign player wishes to open. For the same reasons that the U.S. may wish to commit to a reciprocity strategy in order to open a foreign market, the foreign player may wish to commit to a reciprocity strategy in order to open a U.S. market.[19]

In the first stage, both countries simultaneously decide whether to pre-commit to a reciprocity rule. There are therefore four possible outcomes in this stage: 1) both countries commit; 2) the U.S. commits and the foreign player does not; 3) the foreign player commits and the U.S. does not; 4) neither player commits. In the second stage, if a player has not committed to a reciprocity rule, it must decide whether to allow the investment in its local firm and whether to open its local market. If a player has pre-committed, then it must only decide whether to open its local market.

Since the decision to open a player's local market and the decision to allow the purchase of an interest in a domestic firm are independent in this model, the decision to

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[19] Foreign governments may, for example, insist on relaxation or elimination of limits on foreign ownership, even where U.S. markets are otherwise open.

commit for each player will be determined by the expectation of the payoffs of its opponent. Each player will make the same analysis that the U.S. makes in the first game. It is optimal for a player to commit if the other country's valuation of the purchase is greater than the cost of opening its own market. A player will open its own market only if the other country has committed, and it values the purchase of an interest in the foreign firm more than maintaining its closed local market. The fact that both players can commit does not affect the fundamental analysis.

D. Reciprocity as a Game of "Chicken"

We have indicated above that it may be difficult for the U.S. to commit to a reciprocity rule because foreign investors may believe that the U.S. will abandon the rule if it is in its interest to do so.[20] A more appropriate formulation of the problem faced by the U.S. may, therefore, be illustrated by the game of "chicken."[21] In the usual depiction of this game, two drivers race their cars toward each other. The first driver to turn away loses prestige (-20), while the driver that continues on gains prestige (+30). If neither driver turns away, they crash and both drivers die (-100). If both drivers turn away, they neither gain nor lose prestige (0). This game, with appropriate but artificial payoffs[22], is shown in Figure 2.

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[20] It becomes even more difficult if the extent of reciprocity that may be required must be specified.

[21] This game is described in D. Fudenberg and J. Tirole, op. cit., p. 18.

[22] The analysis of this game does not depend on the fact that the value of the additional prestige from not turning exceeds the loss in prestige from turning.

		Driver 2	
		Turn	Straight
Driver 1	Turn	0,0	-20,30
	Straight	30,-20	-100,-100

Figure 2

The game of chicken has three possible strategies for each player. If player 1 is certain that player 2 will turn, then it is best to go straight and get 30 rather than 0. If player 1 is sure player 2 will go straight, then it is best to turn and get -20 rather -100. Player 2 has exactly the same best strategies. This type of game also has a "mixed strategy equilibrium."[23] In this equilibrium, each player's strategy is to race toward the other car and in each moment in time have some (non-zero) probability of turning away. As long as the probability of turning is high enough, or there are enough moments, then in equilibrium one driver will turn away first and the cars will not crash. If both players have the same probability of turning, then each player has a 50 percent chance of turning first. The mixed strategy equilibrium payoff is then the probability of turning first multiplied by the payoff for turning plus the probability of your opponent turning first multiplied by the payoff for going straight (0.5*30 + 0.5*-20 = 5).[24,25]

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[23] For a formal definition of mixed strategies, see J. W. Friedman, op. cit., p. 27.

[24] Assume that the probability that both players turn at the same time is small.

[25] Another way to describe this game is as a war of attrition, as described in D. Fudenberg and J. Tirole, op. cit., p. 119. Two players are trying to reach an agreement that gives positive payoffs to both players. Each player would like the agreement to be on the most favorable terms possible, and there is a cost to both players over time of not reaching an agreement. The advantage of playing "tough" and holding out for more is that you may get more. The advantage of playing "weak" and giving in is that an agreement will be reached. If I know my opponent is tough, I should be weak and at least get something. If I know my opponent is weak, I should be tough and get a bigger share. There is also a mixed strategy

If we assume that the U.S. announces a reciprocity rule and a foreign country announces that it will "never" accede to a demand to open its market, then we have the game of chicken. If the U.S. knows that the foreign player will play "weak" and open its market, then it should play "tough" and hold fast to its reciprocity rule. If the U.S. knows that the foreign player will play tough, then it should play weak at least to gain the benefit of the investments. The third equilibrium is for both players to play tough, but in each moment have some probability of conceding. Eventually a player will give in, and the investment will be made. Depending on which player concedes, the market may or may not be opened. This game is shown in Figure 3.

		Foreign Player	
		Weak	Tough
U.S.	Weak	No Reciprocity, Investment-Open	No Reciprocity, Investment-Closed
	Tough	Reciprocity, Investment-Open	0,0

Figure 3

This game does <u>not</u> entail external enforcement of the commitment to a reciprocity rule, as was assumed in the previous models. Therefore, this may be the most appropriate way to model this interaction.

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equilibrium where both players play tough but in each moment have some probability of giving in. Eventually one of the players will give in and the payoffs are calculated as in the chicken game.

The results of the chicken game are the same as the first mover game presented as the first model in this section. In that game, if the foreign player's payoff from investing in the U.S. is higher than the cost of opening the local market, then the U.S. should commit to a reciprocity rule. This is the same as the U.S. knowing that the foreign player will play weak, and therefore it should play tough. In the first mover game, if the foreign player's payoff from investing is less than the cost of opening the local market, then the U.S. should not commit to a reciprocity rule. This is the same as the game of chicken when the U.S. is sure the foreign player will play tough. In this case, the U.S. should play weak, and allow the foreign investment without demanding the opening of the foreign market.

In the first mover game, if the U.S. is unsure of the payoffs accruing to the foreign player or the payoffs are difficult to measure, then the probability that the foreign player values the investment more than the closed local market, γ, determines whether or not it pays to commit to a reciprocity rule. This result was summarized as:

$$\text{Commit if } \frac{P_u}{O_u} < \frac{\gamma}{1-\gamma}$$

In the game of chicken, when a player is unsure of the opponent's strategy, then it should randomize its own play. It should announce a reciprocity rule and then see if the foreign player plays weak and opens its local market. If the foreign player does not open its market, then the player should randomly determine when to allow the investment without the reciprocal foreign market opening.

The optimal U.S. strategy in both the game of chicken and the first mover game depends on the beliefs the U.S. holds about the foreign player. Similarly, in the game of chicken, the foreign player's optimal strategy depends on its beliefs about the U.S. player.[26] If beliefs about the opposing player are "fuzzy," or not well measured, then a fixed commitment strategy is not possible. The players may engage in cheap talk, but the opposing player will always act on its beliefs about its counterpart and cheap talk will not affect the outcome of the game.

Just as in the first mover game, where it was not always optimal for the U.S. to commit to a reciprocity rule, here it will not always be optimal for the U.S. to play tough. Refusing to enforce a reciprocity requirement may produce benefits to U.S. consumers, either by encouraging foreign investments that would not otherwise have occurred or by limiting the delays in obtaining the benefits of those investments.

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[26] In the first mover game, the U.S. commits with external enforcement, so the foreign player is sure of the U.S. action and does not need a probabilistic belief.