GOVERNMENTS IN DILEMMA: A GAME THEORETIC MODEL FOR THE CONCLUSION OF BILATERAL INVESTMENT TREATIES

A COMMENT ON *COMPETING FOR CAPITAL*

*Christoph Engel**

Divide et impera! Julius Caesar's maxim has also helped industrialised countries to break resistance by developing countries. This is, in essence, Elkins, Guzman, and Simmons's claim.[1] Although it is questionable whether many developing countries are individually better off concluding bilateral investment treaties, they are forced to do so because of competition among themselves for foreign private investment. Elkins, Guzman, and Simmons tell a practical and relevant story, and back it up with impressive econometric evidence. This comment is complementary in that it further explores the underlying theoretical hypothesis.

Section I formalizes Elkins, Guzman, and Simmons's claim. The claim holds if developing countries play a prisoner's dilemma among themselves. Section II explores the implications for the payoffs. It argues that those holding office in developing countries mainly care about internal political support. Measured in this currency, attracting foreign capital is chiefly relevant if it makes a country better off than its perceived competitors. Section III shows that the game is no longer a prisoner's dilemma if all (relevant) countries prefer a situation where only the other country concludes a bilateral investment treaty, over the situation where both do so. Section IV looks at a scenario where only one of two countries holds the latter preference. Section V introduces a three-person game where each country wants to conclude an investment treaty only if it remains alone. Section VI adds another period to a two-person game. States only want to conclude a bilateral investment treaty if they are the forerunners in both periods. Section VII concludes.

* Director, Max Planck Institute for Research on Collective Goods, Bonn.

1. Zachary Elkins et al., *Competing for Capital: The Diffusion of Bilateral Investment Treaties*, 2008 U. ILL. L. REV. 265.

I. THE BASIC PRISONER'S DILEMMA

Elkins, Guzman, and Simmons's hypothesis is one of strategic interaction. If one only considers the economy of developing countries, concluding a bilateral investment treaty ("BIT") is inefficient. The community of developing countries would do better by resisting. If all resist, all would be better off. Resistance would be Pareto efficient.[2] Behind this claim is a game-theoretic model.[3] The incentive effects are best seen if one starts by making two assumptions: developing countries only interact once, and they are all similar. Specifically, developing countries all order the options as their peers do. Both assumptions will be dropped later.

Under these assumptions, the following matrix portrays the game each developing country is playing with the community of the other developing countries, where $3 > 2 > 1 > 0$.

	no BIT	BIT
no BIT	2,2	0,3
BIT	3,0	1,1

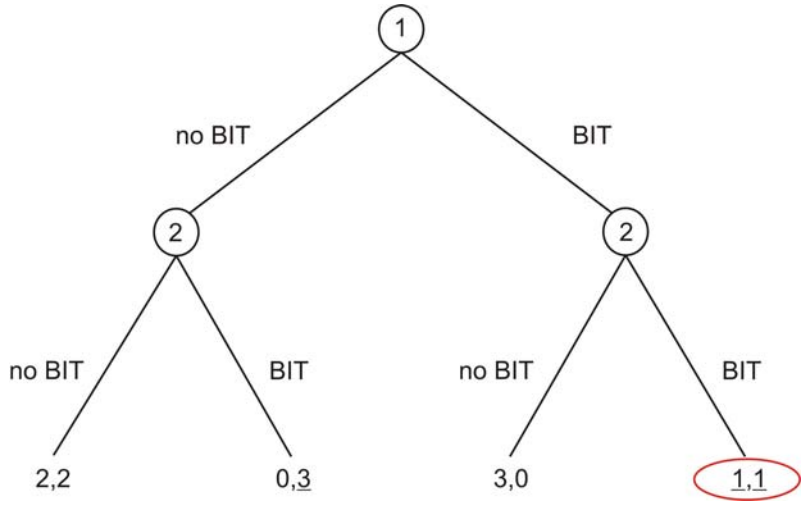
This game is a standard prisoner's dilemma. There are two ways of solving it. For either player, the no-BIT strategy is dominated. Whatever the other player does, she is better off playing BIT. This leads to BIT/BIT as the only equilibrium. Alternatively, one may solve for the Nash equilibrium. Each player compares her two options, provided the other player makes a specific move. In the following matrix, these best responses are underlined. The only cell in which two best responses coincide is again the BIT/BIT cell.

	no BIT	BIT
no BIT	2,2	0,<u>3</u>
BIT	<u>3</u>,0	<u>1,1</u>

The presentation thus far has made an additional assumption. States interact simultaneously. No state knows what the other states are going to do when it decides on its own policy. If one drops this assumption, the sequential game has the following structure.

2. "A particular situation is said to be *Pareto* or *allocatively efficient* if it is impossible to change it so as to make at least one person better off (in his own estimation) without making another person worse off (again, in his own estimation)." ROBERT COOTER & THOMAS ULEN, LAW AND ECONOMICS 16–17 (4th ed. 2004).

3. *Cf.* DOUGLAS G. BAIRD ET AL., GAME THEORY AND THE LAW 7 (1994) (describing the game theory model as one in which a social situation is simplified and irrelevant details ignored for analysis); DREW FUDENBERG & JEAN TIROLE, GAME THEORY 174–79 (1991).



Sequential games are solved by backward induction. First, state 2 compares its two moves, provided state 1 has either chosen no BIT or BIT. When it decides on its own policy, state 1 anticipates this. It, therefore, only considers the no-BIT/BIT and the BIT/BIT combinations. In the latter case, it only has to accept its second worst (not its worst) outcome. Therefore, again BIT/BIT is the only equilibrium. Switching from simultaneous to sequential interaction does not alter the outcome in a prisoner's dilemma. This is due to the fact that the no-BIT strategy is dominated for state 2.

II. CONSTRUCTING THE PAYOFFS

If these models capture the essence of the interactions of developing countries, they indeed face a dilemma. But is the prisoner's dilemma the correct model? This depends on the payoffs. For a game to be a symmetric prisoner's dilemma, two conditions must hold.[4] To make notation less cumbersome, in the definition of these conditions, "no BIT" is replaced by "C" (for cooperation) and "BIT" is replaced by "D" (for defection). Condition 1 requires that each player ranks her potential outcomes as follows:

$$DC > CC > DD > CD,$$

where the first letter denotes the player's own action, and the second denotes the action by her competitor.

Condition 2 further demands that

$$CC \geq \frac{DC + CD}{2}.$$

4. PHILIP D. STRAFFIN, GAME THEORY AND STRATEGY 73–74 (1993).

This second condition makes sure that mixed strategies are irrelevant.[5]

In order to define the preferences of developing countries, one must specify the ensuing benefits and losses. Elkins, Guzman, and Simmons aim at explaining actual state behaviour. It would, therefore, not be appropriate to model policymakers in an idealistic way. They are not disinterested representatives of national welfare. Rather, they aim at generating sufficient political support internally. In democratic countries, their motivation is to win the next election. In authoritarian countries, they are wary of resistance that might result in upheaval.

Against this backdrop, the effects of concluding a BIT are felt on two levels. First, such treaties make it safer for capital from industrialised countries to be invested in a host country. If only a few developing countries have concluded such treaties, this should make it more likely that capital is imported into these countries. Conversely, if other developing countries protect investors by such treaties, it should be more difficult for countries without an investment treaty to attract foreign capital. Second, countries with more foreign capital should be able to nurture a larger workforce, and to provide more public goods. Critically, if internal political support is the normative currency, absolute wealth is, at most, of secondary importance. In order to see the effects for strategic interaction more clearly, it is assumed that absolute wealth is irrelevant for political support. All that matters is how well one country does, compared to other countries. If the country falls behind, national policymakers loose support. If the country is ahead, policymakers stand a better chance to stay in office.

In political reality, those who have an impact on the degree of support for the regime in power will compare the economic performance of the country to a limited sample of other countries. For modelling, however, this may be ignored. All other countries that matter are condensed to one virtual player. However, if a country falls behind another country that used to be economically much weaker, this observation will matter more. Consequently, past comparative performance also matters. It would be possible to formalise this observation. But this would make for a relatively complicated model, and the major insight is already captured by the simplifying assumption that the exclusive object of comparison is the average economic performance at this one point in time.

Cost and benefit must be compared with the same normative currency. Therefore, the loss of sovereignty inherent in the conclusion of an investment treaty does not matter as such. The relevant effect is again on internal political support. There are two main reasons for this. First, policymakers may foresee that it might be easier for them to stay in power in the future if they expropriate foreign capital. But, realistically,

5. *See* ANATOL RAPOPORT & ALBERT M. CHAMMAH, PRISONER'S DILEMMA: A STUDY IN CONFLICT AND COOPERATION 207–08 (1965).

they are likely to discount this cost. Staying in power today will be more important for most of them than having a better chance to defend their influence and privileges in more remote times. The second effect, however, is immediate: national pride might be affected. It is plausible that this second effect is stronger if few countries have concluded investment treaties. If one thinks this to be true, it would not only be the benefits, but also the costs, that would have a relative component. It is, however, unlikely that the costs are exclusively defined in relative terms. Even if many countries have concluded investment treaties, the political cost for giving in to home country pressure will still be positive. In order to simplify the analysis, the following assumes that the cost has no relative component. Under these assumptions, the following table defines the payoffs.

	benefit	cost
DC	$\overline{b_i} - \bar{b}$	$-c$
CC	0	0
DD	0	$-c$
CD	$\underline{b_i} - \bar{b}$	0

If one country concludes a BIT, and those countries competing with it for foreign capital do not, it attracts more capital. Due to this outcome, its economy does better than the average of countries to which it is compared. Political support for its regime $\overline{b_i}$ is thus above the average $\bar{b}$. It gains from concluding the treaty. However, it has to bear the negative effects on political support from the ensuing sovereignty cost $-c$. If neither country gives in to pressure from home countries, none of them entices additional foreign capital. But none of them has to accept any sovereignty cost, either. Critically, if all of them ratify investment treaties, the benefit in terms of political support is zero. Remember that the benefit stems from being ahead of similar countries, not from absolute wealth. Consequently, if all have investment treaties, they are all worse off. They still have to pay the sovereignty cost, but they do not get anything in return. Finally, if the others conclude investment treaties and one country does not, foreign capital is likely to stay outside this country. Compared to its peers, its economic performance deteriorates. Its benefit in terms of political support goes down to $\underline{b_i}$, which is below the average $\bar{b}$ of its peers.

Let us now check the conditions for a prisoner's dilemma. DC > CC implies

$$\overline{b_i} - \bar{b} - c > 0$$

or

$$\overline{b_i} - \bar{b} > c .$$

This is not a strong assumption. Forerunners will only conclude a BIT if the expected benefit in terms of political support outweighs the sovereignty cost.

CC > DD means

$$0 > -c .$$

This is trivially true whenever the sovereignty cost is positive. The third condition, however, is critical. DD > CD is only fulfilled if

$$-c > \underline{b_i} - \bar{b} .$$

In words, the expected loss in political support from falling behind the economic performance of peer countries is larger than the sovereignty cost from concluding the investment treaty in question. Empirically, this need not be the case. For the political economy of some developing countries, foreign capital may be of relatively small importance. They may, for instance, have raw materials to sell. Public opinion may be relatively insensitive to comparative economic performance. Conversely, giving in to capitalist pressure might, politically, be very costly. Arguably, this is the case if the political system is based more on ideology than on materialism, as in some Islamic countries.

Before we consider the effects of CD > DD on strategic interaction, let us check the second condition for a prisoner's dilemma.

$$CC \geq \frac{DC + CD}{2} \text{ implies}$$

$$0 \geq \frac{\overline{b_i} - \bar{b} - c + \underline{b_i} - \bar{b}}{2}$$

$$\Rightarrow c \geq \overline{b_i} + \underline{b_i} - 2\bar{b},$$

which must be true. For $\bar{b}$ is the average of $\overline{b_i}$ and $\underline{b_i}$. Consequently,

$$\overline{b_i} + \underline{b_i} = 2\bar{b} \quad \text{or} \quad \overline{b_i} + \underline{b_i} - 2\bar{b} = 0 .$$

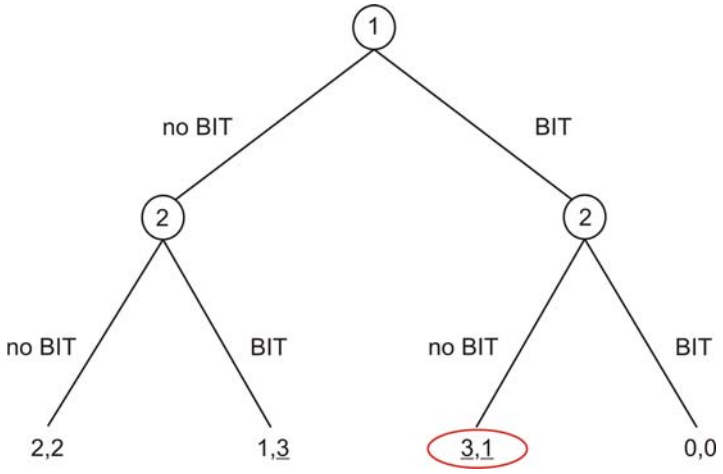
Whenever there is a positive sovereignty cost, the second condition is therefore fulfilled.

III. THE CHICKEN GAME ALTERNATIVE

Let us now come back to the only critical condition. If CD > DD is true for all countries, we get the following game.

	no BIT	BIT
no BIT	2,2	1,3
BIT	3,1	0,0

This game is no longer a prisoner's dilemma: it is a chicken game. The game has the two equilibria in pure strategies that are underlined in the matrix.[6] In this game, only one country concludes a BIT, whereas the other does not. Moreover, states face a problem of equilibrium selection. If they have to act simultaneously, coordination may well fail altogether. This problem is solved if the second state can observe whether the first has concluded a treaty. The sequential game looks as follows.



This game has a unique equilibrium in pure strategies. However, the first mover gets her best outcome, while the second is left with the second-to-worst result.

IV. ASYMMETRIC GAMES

Now CD > DD for all countries is at least as strong an assumption as is DD > CD. However, it is quite plausible that developing countries differ in this respect. The resulting asymmetric game has the following structure.

	no BIT	BIT
no BIT	2,2	0,3
BIT	3,1	1,0

6. Actually, the game has a third equilibrium in mixed strategies. In this equilibrium, both players randomise between concluding a BIT and not doing so with probability .5. The probabilities are calculated in the following way. Each player chooses her own moves such that her opponent becomes indifferent between her two moves. Since the game is symmetric, it suffices to calculate these probabilities for one of the players. If the row player attaches probability x to not concluding a BIT, this implies that she concludes a treaty with corresponding probability $1 - x$. Given this choice of the row player, the column player expects $2x + 1(1 - x)$ if she does not conclude a BIT. If she does, she expects $3x + 0(1 - x)$. She is indifferent between both strategies if $x + 1 = 3x$, or if $x = 1/2$. It is, however, not easy to imagine how governments could implement this strategy in practice.

In this matrix, the row player has the preferences that are characteristic for a standard prisoner's dilemma: DC > CC > DD > CD. For the column player, however, the last two arguments are reversed. This government thus prefers CD over DD. For this government,

$$-c < \underline{b_i} - \bar{b}.$$

In the resulting game, there is no problem of equilibrium selection. The first state concludes a BIT, whereas the second does not. In distributional terms, this second state may be said to be worse off: its government is forced to accept the reduction in political support resulting from the fact that foreign capital predominantly goes to different countries. But despite this fact, the government of the second state has no incentive to react by itself concluding an investment treaty.

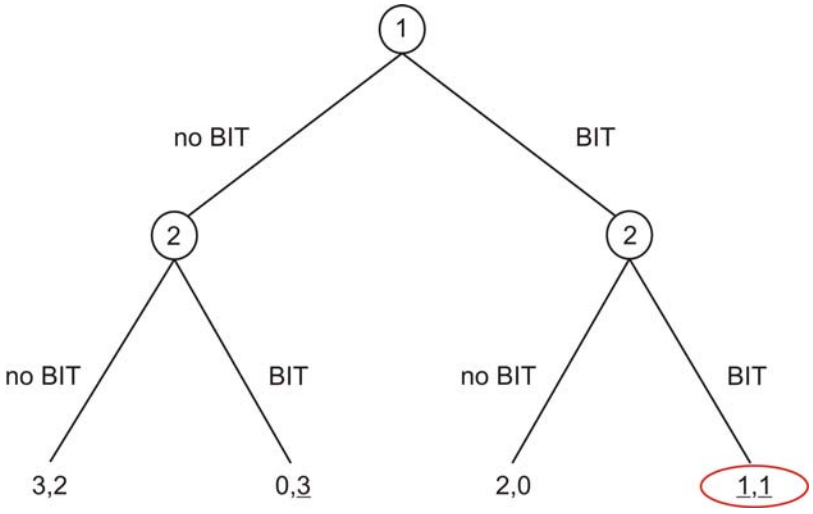
There is a second possibility for an asymmetry. Some states might have less to gain from attracting foreign capital. They might be relatively well endowed with capital in the first place. The human capital of the workforce might be so low that foreign investment is likely to only have a small effect on per capita income. Alternatively, the expected loss in political support might be pronounced if government gives in to foreign pressure. In such states,

$$\overline{b_i} - \bar{b} < c,$$

and consequently, DC < CC. The resulting asymmetric game is as follows.

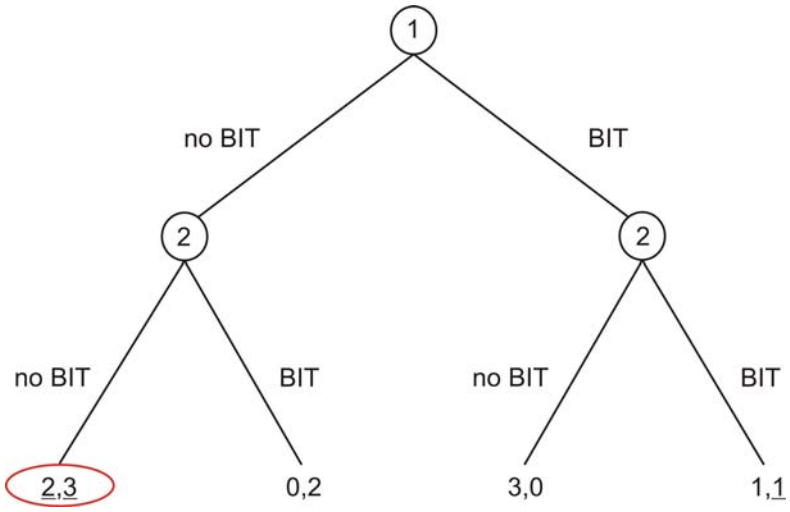
	no BIT	BIT
no BIT	2,<u>3</u>	0,2
BIT	<u>3</u>,0	<u>1</u>,<u>1</u>

If they interact simultaneously, the asymmetry does not change the equilibrium from the symmetric prisoner's dilemma. The same holds true if, in a sequential game, the state that does not want to be the forerunner moves first. By anticipating the other state's reaction, this state is forced to conclude an investment treaty, although it moves first and has no independent interest in being the forerunner.



As in the symmetric prisoner's dilemma, this result is due to the fact that the no-BIT strategy is dominated for the state moving second, i.e., the one with the standard preferences from the prisoner's dilemma.

However, a different equilibrium results if the state that holds the standard preferences moves first. Since the no-BIT strategy is not dominated for the other state, governments end up in the no-BIT/no-BIT equilibrium. In this game, the state preferring CC > DC has a second-mover advantage. Since they do not have an interest in being forerunners in the first place, it should not be difficult for such states to force competitors with a different preference structure into such a sequential game.



V. BEING WITH THE MINORITY

In many countries, public opinion will not compare economic performance to the totality of other states in the world, but instead, will only compare performance to a number of states that are considered sufficiently similar. However, this will usually not be just one other state. As indicated, the 2 by 2 games presented thus far are able to capture this situation as well. It suffices if each government believes that it stands no chance to have a discriminatory influence on some, but not other, governments. In that case, it must behave as if it played a separate game with each of the remaining governments.

This statement, however, presupposes that increasing the sample leaves preferences unaffected. Given the specification of benefits from investment treaties, this is not necessarily the case. Recall that a forerunner receives $b_i - b$. If there are only two states, there are only four possibilities for each state: it invests and the other does not; no state invests; both invest; and the other invests and it does not. With more than two states, there is the further possibility that more than one, but less than half, of the states invest. Conversely, not only one, but several states may have resisted investment, and they may be less than half of the relevant community. For individual states, this opens up the possibility that

$$\overline{b_i} - \bar{b} \leq c \text{ and } -c \leq \underline{b_i} - \bar{b}.$$

The three person game depicted in matrix 7 captures this situation. It assumes the following identical preferences for all three governments:

DCC	>	CCC	>	DCD	=	DDC	>	CDC	=	CCD	>	DDD	>	CDD
5	>	4	>	3	=	3	>	2	=	2	>	1	>	0.

In words, states only want to be forerunners if they are alone. If there is a minority of forerunners, they prefer not to conclude an investment treaty. Likewise, they only want to conclude an investment treaty for defensive reasons if they are otherwise the only country not to have one. If there is a minority of countries without such a treaty, they would prefer to be part of this minority rather than accept the sovereignty cost. This makes for the following game.

	state 2	no BIT		BIT	
	state 3	no BIT	BIT	no BIT	BIT
state 1	no BIT	4,4,4	2,2,<u>5</u>	2,<u>5</u>,2	0,<u>3</u>,<u>3</u>
	BIT	<u>5</u>,2,2	<u>3</u>,0,<u>3</u>	<u>3</u>,<u>3</u>,0	<u>1</u>,<u>1</u>,<u>1</u>

The modification thus leaves the strategic situation unaffected. The only equilibrium is still that all governments conclude the treaty. This is due to the fact that all best responses are either DCC, DDC, DCD or DDD. For each government, it is never a best response to cooperate by

not concluding the treaty. Despite the modification, the no-BIT strategy is dominated for all governments.

VI. THE SHADOW OF THE FUTURE

By a similar token, one may wonder whether developing countries do better under the shadow of the future. One may capture this in a two-period model. Each country is still best off if it is the forerunner in both periods. However, being a forerunner in only one period does not pay. This may be motivated by the fact that the sovereignty cost is permanent, while political support rests on relative, not on absolute, economic performance. Formally, it is assumed that

$$\overline{b_i} - \overline{b} - 2c < 0.$$

Likewise, being a latecomer in only one period has a smaller cost in terms of political support than facing the sovereignty cost for both periods. Formally, it is thus further assumed that

$$\underline{b_i} - \overline{b} > -2c\ .$$

On these assumptions, each state expects the following payoffs:

	period 1		period 2	
	benefit	cost	benefit	cost
DC DC	$\overline{b_i} - \overline{b}$	$-c$	$\overline{b_i} - \overline{b}$	$-c$
CC DC	0	0	$\overline{b_i} - \overline{b}$	$-c$
CC CC	0	0	0	0
DC DD	$\overline{b_i} - \overline{b}$	$-c$	0	$-c$
CC DD	0	0	0	$-c$
CC CD	0	0	$\underline{b_i} - \overline{b}$	0
DD DD	0	$-c$	0	$-c$
CD DD	$\underline{b_i} - \overline{b}$	0	0	$-c$
CD CD	$\underline{b_i} - \overline{b}$	0	$\underline{b_i} - \overline{b}$	0

where the first two letters signify the strategic constellation in the first period, and the second two letters signify it in the second period. Note that further combinations do not exist, since a treaty is irreversible. If a country has concluded a treaty in period 1, by definition, the treaty is also in force in period 2.

The list of payoffs makes for the following ordering.

combination	DC DC	CC DC	CC CC	DC DD	CC DD	CC CD	DD DD	CD DD	CD CD
rank	8	7	6	5	4	3	2	1	0

From this, the following game results.

	no BIT, no BIT	no BIT, BIT	BIT, BIT
no BIT, no BIT	6,6	3,7	0,8
no BIT, BIT	7,3	4,4	1,5
BIT, BIT	8,0	5,1	2,2

As one can see, the result is not changed. Concluding an investment treaty immediately in the first round is still the only equilibrium. For both governments, the no-BIT, no-BIT and the no-BIT, BIT strategies are dominated by the BIT, BIT strategy.

The foregoing analysis has not addressed one fact: before they decide how to act in period 2, both governments observed what the other did in period 1. In a standard prisoner's dilemma, this opens up a possibility for stabilising cooperation. Both players are better off if they cooperate in all rounds. If one player has defected in one period, the other can punish her in the next period by defecting herself. Rational players anticipate this sanctioning potential. There are three caveats. First, the logic only applies if there is uncertainty about the number of rounds. Otherwise, rational players defect in the last round. This is anticipated by the other player in the penultimate round, which is anticipated in the round before that, and so forth, until the first round.[7] Second, neither party may discount future gains too heavily.[8] Third, even under these conditions, cooperation is only a possibility, for there is an unlimited multitude of equilibria in the repeated game.[9] However, if players can communicate, they can settle down on one of the equilibria.

In one respect, competition among developing countries for foreign capital is different from the standard repeated prisoner's dilemma. Once a host country has concluded an investment treaty with a home country, it is irreversible. The sequence, defection today, cooperation tomorrow, is not available in this game. However, as long as all governments are fully rational, the difference does not matter, for it only says something about payoffs off the equilibrium path. Had one government indeed defected, it would have lost any interest in future cooperation. Yet, fully

7. *See* Reinhard Selten, *The Chain Store Paradox*, 9 THEORY & DECISION 127, 144 (1978).

8. *See* FUDENBERG & TIROLE, *supra* note 3, at 146–50.

9. Robert J. Aumann & L. S. Shapley, *Long-Term Competition—A Game Theoretic Analysis*, *in* ESSAYS IN GAME THEORY IN HONOR OF MICHAEL MASCHLER (N. Megiddo ed., 1994), *reprinted in* 1 ROBERT J. AUMANN, COLLECTED PAPERS 395, 398 (2000).

rational governments realise that they are all better off by cooperating from the very beginning. The difference only matters once governments lose trust in the rationality of their counterparts.

VII. CONCLUSION

To a remarkable degree, Elkins, Guzman, and Simmons's claim can be backed up by game theoretic analysis. There is, however, one critical assumption. Governments only face a competitive dilemma if the sovereignty cost of concluding an investment treaty is smaller than the loss of political support resulting from foreign capital predominantly going to different countries. If this assumption does not hold, governments play a chicken game. This is a game with a first-mover advantage. If the critical assumption only holds for some, but not all, governments, a game with a unique equilibrium results. The country with the preferences that are standard for a prisoner's dilemma concludes an investment treaty. The other country does not. Another asymmetry only matters in sequential interaction. In this situation, some countries do not want to be forerunners in the first place, because the sovereignty cost is larger than the additional support from attracting foreign capital. If these countries move second, neither government concludes an investment treaty. If there are more than two countries, one may distinguish between being the only country to have or not to have an investment treaty, and being part of a minority. Eventually, however, this does not affect the equilibrium. If preferences are symmetric, all countries nonetheless conclude investment treaties. If one adds a second period, it is possible that the gains from being a forerunner in one period are smaller than the sovereignty cost for two periods. Likewise, it is possible that the loss from being a latecomer in one period is smaller than the sovereignty cost for two periods. Even under these assumptions, however, all (symmetric) governments still conclude investment treaties. Yet if repetition is maintained for an uncertain number of rounds, cooperation is a possibility. If governments are fully rational, this possibility is not destroyed by the fact that defection is irreversible. It would be challenging to test these more refined hypotheses against the econometric evidence presented in the main paper.