

# The Logic of Social Interactions in Foreign Policy:

## The 1994-1996 US-Chinese Negotiations on Intellectual Property Rights

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### 1. Introduction

The primary objective of this dissertation is to demonstrate the viability of sociocybernetics, the quantitative study of social systems, in the analysis of social interactions in foreign policy. One of the goals of foreign policy analysis is to explain outcomes and predict developments of foreign policies (McKeown, 1993). In order to understand the dynamics of foreign policy we have to analyze social systems in foreign policy. A social system is any bounded set of interrelated, social elements (Geyer & Zouwen, 1986). In the context of foreign policy social systems are made up of the actors in international affairs. They range from state governments to non-governmental entities such as industries, firms, pressure groups, non-governmental organizations, and many others. Of course, not all of them play a central role in every single foreign policy issue, are homogeneous or speak with one voice. They may act independently, as agents, or on behalf of a coalition of actors. One of the axioms of this dissertation is that the dynamic nature, structure, patterns, and rules of interactions within and between these social systems define the process and outcome of foreign policies. This is why the analysis of social interactions in foreign policy helps us understand the causes of processes and outcomes in international affairs. The idea of sociocybernetics is to represent social systems as machines and describe them mathematically. It thus becomes possible to simulate the interactions of social systems with the help of a computer. This is one of the greatest advantages of sociocybernetics. *In vitro* experimentation overcomes the problems of time scale and the isolation of parameters that confront *in vivo* experimentation. This special feature makes sociocybernetics attractive to both the theoretical researcher and policy practitioner. It becomes possible to vary the components of the social interactions of the actors and describe the resulting system behavior. Sociocybernetic simulations can help develop and explore propositions of social interactions in foreign policy and test them *in vitro* (Druckman, 1971). However, we have to understand that a computer model is an approximation of reality and can represent only certain features of the real world. This is why it is crucial to base the model on realistic and operational assumptions. The scope of a simulation is necessarily limited and we have to complement the simulation results with background information about the real context of the simulated case. In other words, simulating social interactions in foreign policy requires a prior understanding of their context.

If we want to understand the dynamics of foreign policy and explain the causes of certain outcomes we have to analyze the social interactions in foreign policy (cf. Neale and Bazerman, 1992, 10). The big question is where to start this obviously very complex analysis. Theories and models of foreign policy are helpful insofar as they structure and explain reality. They "provide a basis for diagnosing the sources of apparent policy failures and for formulating prescriptions for reform" (McKeown, 1993, 4). However, foreign policy practitioners seldom apply theoretical models of foreign policy and often treat them as irrelevant in practice.<sup>1</sup> Foreign policy practitioners are in need of relatively simple and easy to understand conceptual models of foreign policy. Yet, there are no general and simple theories of foreign policy that can be applied to all potential cases in reality. One of the challenges of foreign policy analysis is to develop appropriate methodologies that model and explain the complex social interaction patterns in foreign policy. Sociocybernetics is a methodology that meets these criteria. It was first applied to the analysis of individual, social interactions. In recent years it has been successfully utilized in the study of international relations (Hamman, 1993 & 1996; Singh, 1996). However, it has not been applied to model the interconnectedness of the social interactions on and between the international and

<sup>1</sup> See George (1993) and Newsom (1995/96).

domestic levels of foreign policy. The dissertation fills this gap and demonstrates the explanatory value of sociocybernetics. In particular, the thesis develops a discrete sociocybernetic model of the 1994-1996 US-Chinese negotiations on intellectual property rights (IPRs). The negotiations arose from an ongoing dispute between the US and China about the effective protection of American IPRs in China. In 1994 the United States threatened to impose sanctions against China unless it improved its IPR regime. A last minute agreement between the countries in 1995 avoided an imminent trade war. Unfortunately, China did not implement the accord to the full satisfaction of the US. IPR piracy continued to prevail. Consequently, the US warned China again that it might retaliate. The second round of negotiations from the end of 1995 until the summer of 1996 ended in a reinforcement agreement of the 1995 IPR Accord. Since then China has made progress in the protection of IPRs. Nevertheless, IPR piracy continues to be a problem in China today.

The sociocybernetic model simulates the domestic as well as international dynamics among the main government and non-governmental actors and generates a number of hypotheses and policy prescriptions. The sociocybernetic model turns out to be a good approximation of reality. In addition to explaining actual developments, the model outlines several other scenarios including a trade war that could have resulted.

It is important to recognize that the computer simulation does not make a thorough analysis of the foreign policy context of the negotiations obsolete. In order to quantify the negotiation process it is necessary to identify the main actors, their objectives and constraints, decision environments and relationships. This requires an institutional analysis of the negotiations and the involved actors. Institutions are the humanly devised constraints and social orders that shape social interactions and vice versa. They structure and organize incentives in social exchange, whether political, social, or economic (North, 1990; Sadowsky, 1991; Zeleny, 1991). The combination of sociocybernetics with an institutional analysis proves to be a valuable tool for the case study. The dissertation develops a sociocybernetic model that accounts for systemic as well as subsystemic variables<sup>2</sup> in one framework. It thus provides a solid methodology for a balanced analysis of social interactions in foreign policy.

The thesis is divided into three parts. The following part (i.e., Section 2) establishes the context of social interactions in foreign policy and reviews several models of social interactions in foreign policy. Putnam's (1988) description of the interconnectedness of domestic and international politics as a two-level game is one of the most widely used analytical approaches. Putnam distinguishes interactions on two levels. The first level consists of states' chief diplomatic negotiators, government representatives, or other entities that are directly involved in international negotiations and diplomacy. Their goal is to reach international agreements that can be ratified or supported on the second, domestic level that consists of the parliament, bureaucracies, public opinion, and other domestic organizations, coalitions and groups. For obvious reasons, applications of the two-level games approach are often embedded in a rational choice framework. Rational choice helps clarify basic configurations, relationships and social interactions. It is primarily interested in identifying optimal strategies to achieve well-defined goals. Unfortunately, it does not sufficiently explain the dynamics of social interactions in foreign policy. This leads us to the discussion of alternative approaches. The social-psychological perspective comes closest to integrating multiple variables of social interactions into one coherent framework. It emphasizes the interdependence of variables. This relates the social-psychological approach to open systems theory and cybernetics. Cybernetics is the theory of communication and control in the living

<sup>2</sup> Systemic variables are positional, structural, dispositional and problem-specific variables. Subsystemic variables emphasize the significance of political institutions, domestic and transnational actors in explaining foreign policy (Zangl, 1994, 280).

organism and machine. The concepts of cybernetics of describing systems as machines and analyzing how the organization of these machines determines the state, behavior, and output of the systems have also been applied in policy analysis. Unfortunately, those applications have major shortcomings. They are usually descriptive and often their analytical scope is too broad for an adequate explanation of the logic of social interactions. In addition, they lack the elegance and simplicity of quantitative approaches such as rational choice or sociocybernetics. Sociocybernetics focuses on the analysis of social systems. It differs significantly from rational choice because it drops the assumption of rational and optimizing behavior. Instead, it allows us to describe general behavioral patterns and explain how they affect the process and outcomes of foreign policy. One of the greatest theoretical and practical advantages of sociocybernetics is the computer simulation of social interactions. Even the simplest, non-trivial sociocybernetic set-up yields a huge number of insights about the logic of social interactions. This is demonstrated in the second part (i.e., Section 3.) of the dissertation. It includes the case study of the 1994-1996 US-Chinese negotiations on IPRs. The case study is an impressive example of the explanatory value of sociocybernetics. The third and final part (i.e., Section 4) of the dissertation goes beyond the case study and evaluates the value of sociocybernetics in foreign policy analysis. Section 5 contains tables and a glossary and Section 6 an extended bibliography.

## 2. Modeling Social Interactions in Foreign Policy

### 1 *The Importance of Social Interactions in Foreign Policy*

“It is a truism that all action within the international system can be reduced to the action of individuals. It is also true, however, that international relations cannot be adequately understood in terms of individual attitudes and behaviors” (Verba 1961, 93). Diplomacy functions as a link between the abstract international system and the interactions of its social components. Consequently, the analysis of diplomacy allows us to gain a better understanding of international relations and especially the social dynamics of foreign policy. Diplomacy is an important element in international relations. It comprises diplomatic negotiations in an international and culturally diverse arena<sup>3</sup>, implementations of foreign policies, and other international social interactions of polities.<sup>4</sup> Traditionally, diplomacy is understood as the peaceful dialogue between independent and sovereign states.<sup>5</sup> It is a mechanism by which foreign policy can be implemented. It reduces uncertainties within international relationships between countries, is ongoing and ever changing. It establishes rules and conventions for international interactions on many levels and for many purposes.<sup>6</sup> For example, it can deal with economic, social, environmental, or cultural policy issues that are of relevance to the countries at play. Diplomacy sets up a framework for easier information gathering about the host country or region, can promote and clarify domestic and foreign policies and ideologies, facilitate travel arrangements for its home country’s citizens in the host country, and protect national security. It addresses a wide array of issues that are of national interest, such as security and bilateral trade arrangements, or international interests, such as the protection of the global environment or the worldwide promotion of freer trade.

Modern diplomacy has been undergoing major changes.<sup>7</sup> Today’s international social world is disorderly, complex, and uncertain (Nicholson, 1992, 234). We live in an interdependent world that makes bargaining and negotiations between and among states, societies and polities a necessity. Diplomacy manages these complex interdependent relationships (Kahn 1991, 39). States are no longer the only actors in international relations. Even though they still play a dominant role in the international arena, other key players have entered the international stage. Today there are a variety of non-governmental entities that are involved in international relations and that play an increasingly important role in diplomacy. Examples are industries, firms<sup>8</sup>, epistemic communities<sup>9</sup>, international

<sup>3</sup> Zartman (1976) points out that “it is only by looking into negotiators’ behavior that negotiated outcomes can be explained. The operational problem that remains is how to translate different types of behavior, using different resources very differently, into comparable elements of analysis” (ibid., 18).

<sup>4</sup> Examples of polities are states, governmental and non-governmental organizations, and firms.

<sup>5</sup> Realists emphasize national interests in diplomacy. Morgenthau (1985), for example, describes the primary objective of diplomacy as the promotion of the national interest that is foremost security by peaceful means. Pluralists and globalists treat other variables like international environmental issues as equally important as purely national security interests.

<sup>6</sup> Given the interdependent nature of international relations there are no alternatives to diplomacy. A world government does not exist and would not be feasible in the first place and the interdependence of states rules out the absence of inter-state dialogue.

<sup>7</sup> For a discussion of the emerging nature of diplomacy and global markets see, for example, Ohmae (1995b), Reich (1992), Stopford & Strange (1991), Strange (1992), and Stremmler (1995/96).

<sup>8</sup> See Strange (1992) on firms as actors in international relations and the new international political economy (Murphy & Tooze, 1991).

<sup>9</sup> “An epistemic community is a network of knowledge-based experts who have an authoritative claim to policy-relevant knowledge within the domain of their expertise” (Sebenius 1992a, 351). Trade experts in a commerce

governmental organizations, trans-governmental coalitions, international courts, non-governmental organizations, pressure groups, and many others. Of course, not all of them take an active part in every international negotiation, are homogeneous and speak with one voice. They may act independently, as agents, or on behalf of a coalition of actors. It is crucial to recognize the key players on both the international and the domestic levels.

We have to be very careful in identifying the objectives and constraints, decision environments, and relationships of international actors. This is no easy task since often the selection has to be issue-specific. For example, the objective of US diplomats in international negotiations may not always be clear-cut. The objectives of other actors in the international arena as well as domestic factors constrain the diplomats’ pursuit of their objectives. Due to the fact that there is a great number of international interactions that are consistent with the national interests of the US, it can be misleading to speak of *one* national objective. Instead, we may want to speak of an objective set that contains several acceptable outcomes of domestic and international interactions. The objective set of diplomacy shapes the belief structure and the conduct of diplomats. In other words, the behavior and actions of actors in foreign policy is a reflection of their objective sets, internal as well as external constraints, and the dynamics of social interactions. Given the complex dynamics of international relations, social interactions patterns are not static, but change over time.<sup>10</sup> These changes are not necessarily instantaneous, but may occur gradually. Consequently it is difficult to describe patterns of social interactions in foreign policy. This is especially true when we want to analyze the interconnectedness of diplomacy and domestic politics in one coherent analytical framework. This is the issue of the following section.

### 2 *Linking Diplomacy and Domestic Politics*

#### .1 *Levels of Analysis in International Relations*

“Explanations of interstate relations have traditionally been categorized according to their ‘level of analysis’” (Moravcsik, 1993, 5). In the 1950s Waltz introduced the notion of three images or levels of analysis: the systemic or international level dealing with the relative position of nation-states in the international system, the domestic level analyzing society, culture and political institutions of nation-states, and the individual level explaining personal and psychological characteristics of individual foreign policy decision makers (cf., ibid.). Realist and neorealist theories as well as the world system approach focus on the first image; the second and third levels of analysis are usually banned into a “black box” and remain unexplained. However, indeterminate, unrealistic and implausible assumptions make pure system theory circular, defensive and counterproductive. Theories that treat the “black box” of domestic politics as an intervening variable improve the explanatory value only marginally. Domestic factors are believed to explain the residual variance of traditional realist models. Yet, state preferences are still assumed to be stable over time and the nation-state is treated as the unitary actor in the international system. Examples for such approaches are reformed security studies and the literature on hegemonic stability. Unfortunately, this residual variance approach leads to ad hoc interpretations of the significance of domestic politics in international relations.

Other classical attempts to link international and domestic politics are Mitrany (1966)

department serve as an example. For a detailed discussion of epistemic communities, their functions, importance, and influence see the special issue of *International Organization* 46 (1), 1992.

<sup>10</sup> Thus, we can describe the objective set as a value function of its own objectives as well as the objectives of other parties, domestic and international constraints, time and circumstances.

and Keohane & Nye (1977) with their notion of complex interdependence, Katzenstein's (1975; 1978) analysis of foreign economic policy, and Allison's (1969) bureaucratic politics model with which he tries to bridge the levels of analysis.<sup>11</sup> Allison's analysis<sup>12</sup> of the decision making process during the Cuban Missile Crisis is not without problems. Bendor & Hammond (1992) point out the flaws of the internal logic of his models: The underlying assumptions of the baseline models often fail. It is difficult to discuss the model's defining properties. Logical implications are ambiguous and inconsistent and can lead to misunderstandings of the true nature of the influence of government policy making and bureaucracy on the foreign policy decision making process. Ripley (1995) expands Allison's bureaucratic model. He stresses that the importance of incorporating the analysis of political psychology, social cognition and intelligence into a larger framework of foreign policy analysis. He thus attempts to bridge the second and third levels of analysis. Rosati (1981; 1995) puts a greater emphasis on the third image in Allison's bureaucratic model. According to Rosati it is important to pay particular attention to the decision structure, context and process of foreign policy decision makers as well as the contents, structure, continuity and change of their beliefs because they can significantly influence the behavior of foreign policy decision makers.

## .2 Putnam's Two-Level Games Approach and Beyond

Similar to diplomacy, diplomatic negotiations are of a complex and multidimensional nature. The analysis of diplomatic negotiations should not be isolated from the analysis of domestic politics because the bargaining position of delegations is strongly influenced by the domestic level. Most models and approaches that attempt to integrate theories of international and domestic politics focus on merely one level of analysis and thus have only limited explanatory value. They often make state-centric assumptions and fail to explain the dynamic, complex political interactions on the international and domestic levels. Putnam (1988) explains that domestic and international foreign policy issues have to be studied simultaneously. His analysis goes beyond the artificially separated levels of analysis of traditional foreign policy analysis.

Putnam's objective is to describe how diplomacy and domestic politics are interconnected. He distinguishes games on two levels that illustrate this interconnectedness. The first level consists of states' chief diplomatic negotiators, government representatives, or other entities that are directly involved in international negotiations and diplomacy. Their goal is to reach international agreements that can be ratified on the second, domestic level that consists of the parliament, bureaucracies, public opinion, and other domestic organizations, coalitions and groups. For methodological simplicity Putnam treats these games as sequential. In reality, however, they often overlap and it can be difficult to clearly distinguish them from each other.

Level *I* negotiators accept only those international agreements that have a chance for ratification in their home country. The sum of these possible agreements constitutes the *win set*. If the win sets of two negotiating parties overlap there is a chance for an international agreement. Disregarding further interactions of the involved actors, international agreements are more likely the greater the win set.

The win set defines the strategy and negotiation space of the diplomats on the first

<sup>11</sup> Mingst (1995) provides an overview of several other approaches to link international and domestic actors and their strategies.

<sup>12</sup> Allison explains the rational actor model, the standard operating procedures or organizational model, and the bureaucratic politics model.

level. It can either enhance the negotiation position of a country or undermine it. If the win set is very small, there is a risk that an international agreement cannot be ratified in the home country. In this case we speak of involuntary defection. Thus, the larger the win set the more likely is ratification because there is less uncertainty involved, involuntary defection becomes less probable, and level *I* negotiators can commit to international agreements more credibly. Due to this considerable amount of uncertainty, interactions between the two levels are highly complex. Therefore, level *I* negotiators have to be able to correctly assess the credibility and negotiation leverage of the level *I* negotiators of the other party.

The size and shape of the win set are a function of the relative power and preferences of domestic coalitions, political institutions such as the nature of the ratification process itself, and the strategies of level *I* negotiators.<sup>13</sup> The chief level *I* negotiator plays a special role since he<sup>14</sup> functions as a mediator between the two levels and has to choose the most effective strategy to achieve his objectives.<sup>15</sup> Ideally, chief negotiators have accurate knowledge of the size and shape of their own win set.<sup>16</sup> They function as intermediaries between the two levels, but other actors and circumstances influence the social interactions between level *I* and *II* as well.<sup>17</sup>

The shape and size of the win set are not constant. They change over time and level *I* negotiators can influence them only indirectly. In order to control a win set it is often necessary to restructure the composition of its determinants such as public opinion and the overall state of the domestic economy (Schneider & Weitsman, 1996). The nature of the game can change as players try to restructure the game and the perceptions of the other side. Countries have different motivations to negotiate and may interpret and perceive a negotiating agenda differently from their counterparts. The urgency and relative value of issues to parties may significantly vary among parties.<sup>18</sup> This, of course, can lead to misunderstandings and failure of the negotiation process. Sometimes, negotiators can facilitate the achievement of agreements and link seemingly unrelated issues. Agreements can thus have synergistic effects in their home country. Negotiators can also try to influence the win set of the other side.<sup>19</sup>

The description of win sets is a central element in the two-level-games approach. Its definition is crucial to an accurate account and analysis of social interactions between and within the two levels as well as the ratification process. However, due to the ambiguity and complexity of issues, actors, the decision environment, and the negotiation process it can be extremely difficult to describe the win set precisely. Assumptions of static preferences and decision environments are unjustified. The unpredictability of exogenous shocks that change

<sup>13</sup> "The size of the win-set depends on the distribution of power preferences, and possible coalitions among Level II [the domestic level] constituent" (ibid., 442).

<sup>14</sup> The masculine pronoun is used merely for the sake of simplicity.

<sup>15</sup> It is an interesting and important research question whether the chief negotiator acts purely as an agent of his government, out of personal motives, or on behalf of domestic or international coalitions.

<sup>16</sup> Unfortunately, this is seldom the case. Putnam points out that "Level I [international] negotiators are often badly misinformed about Level II politics, particularly on the opposing side" (ibid., 452).

<sup>17</sup> Some of these studies emphasize the personality of chief negotiators and propose the introduction of a third level game. However, it is questionable that the personality of foreign policy decision makers is the most significant explanatory variable in a complex web of social interactions (Hermann, 1980).

<sup>18</sup> It can be highly misleading to assume that negotiation issues are always clearly defined. Disputes can be man-made (e.g., trade controversies) or emerging (e.g., environmental pollution); they can deal with private goods (e.g., the market share of foreign companies in their host country) or public goods (e.g., water resources and clean air).

<sup>19</sup> If actions of level *I* negotiators affect the win set of the other party, Putnam refers to this effect as *reverberation*.

the nature of the game aggravates this challenging task. The decision environment is a function of the international and national systems, domestic and international continuities and discontinuities through time, the international and domestic position of the actors involved as well as long term changes in the international order. The decision environment sets up the conceptual and analytical framework for the conduct of negotiators and social interactions within and between the international and domestic levels. It is actor- and issue-specific.

This decision environment has changed during the last decades. Unfortunately, many case studies applying Putnam's two-level games approach limit their analysis to past international events and do not shed much light on the new face of diplomacy, especially the newly emerging commercial diplomacy. Advances in technology and communication have transformed the world economy and the political landscape of the international system. Governments can no longer negotiate without taking the interests and objectives of other international key players into account. Of course, governments have faced domestic constraints before, but the interconnectedness of the international and domestic levels has gained in significance during the last decade or so. Non-governmental organizations, transnational coalitions, industries and especially firms play an increasingly important role in international relations and diplomacy. Economic interdependence has made firms agents of integration within the world system (Stopford & Strange, 1991).<sup>20</sup> Unfortunately, most applications of the two-levels-game approach do not sufficiently emphasize this interconnectedness. Too often they have the inherent tendency to be state-centric. A state-centric view, however, does not provide the framework to answer difficult questions about political, economic, and social international interdependence (Strange, 1989). The role of the state in international relations has to be redefined.<sup>21</sup> To ignore the fundamental changes in the structure of the international system and its components can result in misleading theories of foreign policy.

Issues, actors and their decision environment all affect the negotiating process. Uncertainties about the negotiating process and its outcome are a natural element of the process and cannot be avoided. Continuous restructuring of the game and attempts to influence the win set of other parties in one's favor can have significant impacts on the dynamics of foreign policy. Perceptions and interpretations vary among the actors making actual outcomes hard to predict and control.

Putnam does not claim to have developed a new theory of the link between diplomacy and domestic politics, but hopes that his two-level-game metaphor can serve as a foundation for the development of such a theory. While his analysis is limited to the domestic ratification process of international agreements, his insights are applicable to other fields of foreign policy analysis. A number of applications and modifications of the two-level games approach prove this point. Evans', Jacobson's & Putnam's (1993) *Double-Edged Diplomacy* contains eleven case studies that are based on Putnam's original approach. Mingst (1995) outlines the significance of Putnam's metaphor in the analysis of the modern world that is characterized by complex interdependence. Zangl (1994) modifies Putnam's insights and develops a theory of regime creation. Mo (1994) claims that the domestic constraints of level I negotiators are endogenously determined. He formalizes his hypothesis in a two-level game framework. Iida (1993) elaborates on the uncertainty of domestic constraints level I

<sup>20</sup> Stopford & Strange (1991) write about the new government's dual role: "[The government] is the arbiter of market forces, gatekeeper to the domestic market, and umpire, in the last resort, between conflicting vested interests. And at the same time, it owes its very existence to an alliance of social forces that sees government as the instrument of social domination" (ibid., 63).

<sup>21</sup> See Thomson (1995) for a discussion of the necessity of a redefinition of state sovereignty.

negotiators face and the asymmetric information structure on level I. She describes how the amount of information about constraints influences the likelihood for an international agreement. In addition, she underlines the significance of perceptions of constraints and the real nature of actual constraints. McGinnis & Williams (1993) claim that democratic state systems yield correlated equilibria with respect to the exchange of information, the building of expectations and behavior of relevant actors on both levels. Schneider & Weitsman (1996) compare the internal dynamics of the win set in direct democracies with formal ratification processes. Risse-Kappen (1995b) acknowledges the importance of transnational relations and proposes a third level of transnational and transgovernmental bargaining in addition to Putnam's two levels. He thus tries to describe the complex dynamics of international and national social interactions, yet does not sufficiently clarify the interconnectedness of these three levels.

The two-level-games approach does not contradict former integrative approaches and models but complements them. For example, it is possible to apply the two-level-games approach to a liberal interdependent model and traditional theories of foreign policy. Yet, the two-level-games approach is different inasmuch as it goes beyond the artificial division of levels of analysis and emphasizes the interactive elements between diplomacy and domestic politics. It incorporates all three images into one coherent framework. It brings in the human component and accounts for national and international institutions, coalitions and organizations. The two-level-games approach explains systemic as well as subsystemic variables in one analytical framework. Therefore, it provides a foundation for a balanced analysis of foreign policy.

### ***3 The Promises and Limitations of Rational Choice as an Approach to Model Social Interactions in Foreign Policy***

The study of social interactions within and between levels I and II is a difficult but also very revealing analysis of social interactions in foreign policy. There are a great variety of factors on both the international and national levels that define the nature of complex, dynamic two-level-games. Unfortunately, there is no elementary recipe to analyze these multidimensional social interactions. Given the complexity of issues it is difficult to select the appropriate dependent and independent variables without creating multicollinearity. Selecting particular variables and disregarding others may cause bias and inconsistency of the analysis. It is important to be as precise as possible about the issues that should be studied. Several approaches of modeling social interactions on or between the two levels exist.

Rational choice is one the most popular approaches in foreign policy analysis for obvious reasons.<sup>22</sup> Rational choice models can be revealing and present complex relationships in relatively simple analytical frameworks.<sup>23</sup> They help clarify basic configurations, relationships and social interactions and have thus become a benchmark approach for many foreign policy models (Hopmann, 1991). Traditional rational choice models of social interactions are controlled simplifications in the development of a rule book of behavior and decision making (Young, 1975). The underlying assumption is that "reality is both fundamentally orderly and empirically available" (Steiner, 1983, 375). The goal is to

<sup>22</sup> See Kremenjuk (1991), Raiffa (1982), Rubin & Brown (1975), Schelling (1960), Young (1990), and Young (1975). Allison (1969) provides a survey of the rational policy paradigm that is based on the kind of model just mentioned.

<sup>23</sup> The ratification process and other social interactions between the two levels can be described as iterated mixed motive games with asymmetric international and incomplete domestic information. See, for example, Iida (1993), McGinnis & Williams (1993), Mo (1994), Zangl (1994) and references therein.

predict human behavior. Clearly, there is no *one* rational choice model that achieves this because there are many deviations from simple models of rationality.<sup>24</sup> “The most crucial concept of rationality is that it is a process of means-end analysis” (ibid., 107). In other words, it is assumed that a simple objective for a decision can be defined, and that preferences and values can easily be identified and listed in order of importance.<sup>25</sup> The decision maker then chooses the optimal strategy that will realize his or her objective. Underlying this concept is the belief that humans will do the correct thing that leads to the best outcome as they exploit all available information, apply sound reasoning and behave in an intelligent and sensible way.<sup>26</sup> Because of these restrictive and simplifying assumptions, solutions to decision problems can easily be found and generalized statements about human behavior described.

Game theory serves as an example for an approach that is based on the traditional concept of rationality.<sup>27</sup> Game theory seeks to explain strategic interactions assuming that the elements of choice of the decision makers are “determined by the structure of the values at stake” (Zartman, 1976, 26). Similar to tastes and preferences, values are taken to be exogenous, consistent, precise and invariable over time (ibid.). Maximizing their expected utility players will choose the optimal strategy out of a set of strategies that is determined by the structure of the game (ibid., 7).<sup>28</sup>

Game theory has provided many insights into negotiations and other strategic, social interactions. It has explained the “design of negotiation and bidding mechanisms, has uncovered some powerful competitive dynamics, has usefully analyzed many “fairness” principles” (Sebenius, 1992b, 18-19) and “has been especially useful for understanding repeated negotiations in well-structured situations such as various financial markets” (Sebenius, 1992a, 347). Applying game theory to the analysis of diplomatic negotiations we recognize that negotiations consist of interactions of different parties with different values, objectives, interests, benefits and costs. The goal of negotiation is an eventual, definitive outcome that is not known at the beginning and sometimes well into the negotiation process. During this process the players attempt to change the structure of the game in their favor and move closer or further away from the best possible joint outcome.<sup>29</sup> Differing values between the parties do not necessarily imply impasses of opinions, but can actually lead to cooperative outcomes provided there is linkage of the different issues at stake and a trade-off between interests takes place. The mixed-motive nature of the process<sup>30</sup> and the imperfect information as well as variable values<sup>31</sup> make the negotiation process an incompletely

<sup>24</sup> March (1978) lists seven alternatives to the traditional rationality meaning (cf. ibid., 591-93).

<sup>25</sup> Theories of choice assume present and future preferences to be exogenous, stable and known. Similarly, tastes are taken to be absolute, consistent, relevant, precise and exogenous (cf. March, 1978, 595-96).

<sup>26</sup> Hybel (1993) describes the tradition of rationality in Western civilization that is rooted in Greek and Roman philosophies (cf. ibid., 11-12). In neoclassical economics behavior is interpreted as rational if the decision maker maximizes his or her expected utility subject to one or more known constraints. In an approximately perfect competitive economy the decision maker views the world as it really is, i.e., his rational choices are transitive and complete. Denzau and North (1994) list conditions for such clear-cut decision models such as transparency of decision problem, clearly defined motivation of decision makers, quality and frequency of information (cf. ibid., 9).

<sup>27</sup> For a comprehensive introduction into game theory see, for example, Rasmusen (1989).

<sup>28</sup> For a critical discussion of expected utility theory see Schoemaker (1982).

<sup>29</sup> In other words, neither side knows the exact location of the Pareto frontier of the negotiation outcome (cf. Sebenius, 1992a, 337).

<sup>30</sup> George (1994) illustrates the effects of asymmetry of motivation, credibility and determination during the Cuban missile crisis.

<sup>31</sup> I.e., the negotiation process will alter each sides' respective values, so that a new reality is shaped (cf. Zartman, 1976, 14).

determined game that can be difficult to describe analytically.<sup>32</sup>

Traditional game theory and rational choice models are not without flaws and leave many questions unanswered. When discussing and applying rational choice models we have to be aware of their inherent limitations (cf. Verba, 1961, 117). They cannot adequately explain deviations from optimal strategies, non-equilibria outcomes and which outcome is the most likely in multi-equilibria situations. Furthermore, diplomatic negotiations seldom resemble each other exactly, but usually have unique characteristics. This makes it difficult to apply generalized predictions about decision making processes and outcomes. One of its most problematic assumptions is that all involved players know the structure of the game. Considering different perceptions and interests of the values at stake and the changing nature of the structure of the game the common knowledge assumption is difficult to justify (ibid., 349).<sup>33</sup> It is unrealistic to treat preferences, tastes and values as invariable, known, exogenous, precise and consistent. Rational choice models may describe the structure of a game but “[ignore] the dynamic flavor of the social interaction” (Neale and Bazerman, 1991, 9) and [have] difficulties explaining organizational decision making and the nature of coalition forming within a group (cf. Verba, 1961, 112). Rational choice is less interested in the dynamics of social interactions than identifying the best strategies for players (Bercovitch, 1984, 138). It is questionable however whether or not it is always possible to identify the best strategy without taking the dynamics of social interactions into account.

We do not live in a homogeneous, static world where every decision maker follows the same decision rule. Irrational behavior is quite common and an accurate behavioral model of social interactions should account for deviations from generally accepted decision rules.<sup>34</sup> Time pressure, emotional and social constraints, changes of taste and preferences do not play a role in the classical concept of rationality. This, of course, is highly unrealistic. A human being does not exist in a social vacuum, but is influenced by his environment and vice versa. Myths, dogmas, ideologies and institutions play a much larger role in decisions than the traditional rationality interpretation implies (Denzau & North, 1994, 4).<sup>35</sup> Social behavior is a function of psychological, cultural, situational, and strategic influences. Thus, in order to

<sup>32</sup> This is at the heart of Homan's theorem which states that “the more the items at stake can be divided into goods valued more by one party than they cost to the other and goods valued more by the other party than they cost to the first, the greater the chances of successful outcome” (Zartman, 1976, 10).

<sup>33</sup> The common knowledge assumption implies that behavior of adversaries becomes predictable. Bartos (1976) doubts that this is possible. He writes, “... negotiations can be readily conceptualized as games having optimal strategies only if the behavior of the opponent is predictable, and ... the behavior of the opponent in such games cannot be predicted” (ibid., 486).

<sup>34</sup> Schoemaker (1982) criticizes expected utility (EU) theory along the same lines: “As a descriptive model seeking insight into how decisions are made, EU theory fails on at least three counts. First, people do not structure problems as holistically and comprehensively as EU theory suggests. Second they do not process information, especially probabilities, according to the EU rule. Finally, EU theory, as an “as if” model, poorly predicts choice behavior in laboratory situations. Hence, it is doubtful that the EU theory should or could serve as a general descriptive model. However, there may be exceptions. For well-structured repetitive tasks, with important stakes, and well-trained decision makers, EU maximization may well describe the actual decision process, e.g. oil-drilling decisions” (ibid., 552).

<sup>35</sup> Denzau and North (1994) question the core of the traditional rationality idea wondering “if individuals really know their self-interest and act accordingly or if they base their choices on myths, dogmas, ideologies and ‘half-baked’ theories” (ibid., 3). They argue that uncertainties and not risks characterize most choices. Instead of calculating their expected utility and choosing optimal strategies decision makers base their decision on some mental models. “Mental models are the internal representations that individual cognitive systems create to interpret the environment” (ibid., 4). Zartman (1974) comes to a similar conclusion in the context of diplomatic negotiations. Probabilities denoting chances of the occurrence of certain situations are not really relevant to negotiators. In addition, “the notion that bargainers balance payoff against chance of occurrence is an exceptional one, not a reference to a general characteristic” (ibid., 389).

elucidate social interactions in foreign policy, we have to take a larger number of variables into account.<sup>36</sup> We have to look at the social environment of decision makers and assess possible influences of their surrounding and of hidden players of the decision making project. They live in an interdependent environment and their behavior always has to be viewed in the context of a set of premises that comprises the current situation they are in. When we try to understand social interactions in foreign policy we must not neglect the framework in which they take place, namely the underlying institutions of a society, its culture, ideologies, and history. While a decision maker eventually makes his own choices we have to put this decision making process, i.e., learning and shared mental models, into the greater framework of individual experience they are derived (Denzau & North, 1994, 14). Individual and social learning complement each other. Communication of ideas help create shared mental models, ideologies and institutions. "Mental models are, to some degree, unique to each individual. Ideologies and institutions are created and provide more clearly shared perceptions and ordering of the environment. ... institutions are clearly a reflection of the evolving mental models" (ibid., 21-22). Thus, incorporating the study of institutions and ideologies into our analysis can provide valuable insights into the decision making process when uncertainties are involved. Furthermore, intelligent behavior is not a static phenomenon but is adaptive. Depending on the environment, intelligent behavior takes on strikingly different forms (cf. Kaplan and Simon, 1989, 38). Hence whatever invariance in an adaptive system we might find, we have to take the time, space and circumstances in which intelligent behavior takes place into account. Combining this finding with the nature of the constantly changing environment of diplomacy we conclude that reality consists of a whole continuum of equilibria. By considering institutions and ideologies the analysis comprises the study of inner, subjective and outer, "objective" environment as well as rationality.<sup>37</sup>

One should be aware, though, that rational choice models are merely approximations of social interactions. As a mathematical model rational choice identifies basic conceptual issues and provides information about the predominant features of social interactions. It is based on axioms and a set of postulates that interpret these axioms (Nicholson, 1989). The restrictive nature of the rationality assumption limits the scope and flexibility of rational choice. Initial conditions of social interactions can be difficult to establish; preference orderings and utility functions may not always be well defined. Information about the other actors is not always readily available. Bargaining issues are seldom clearly defined and difficulties may arise in the assignment of values to parameters. It is helpful to acknowledge the inherent problems and prospects of rational choice (Young, 1975). Nevertheless, rational choice is characterized by a consistent and coherent theoretical structure and offers general solution techniques (Holland & Miller, 1991). It may be based on unrealistic assumptions, but it still provides us with information and explanations about the nature of strategic, social interactions. Furthermore, we should be aware that "game theory as a normative theory is neither true nor false. It cannot be tested empirically and hence we must look for compelling intuitive arguments in its defense as a normative theory of rationality" (Siebe, 1991, 200). It is a different question whether or not these arguments are always persuasive and plausible. What is needed is a methodology as elegant and powerful as rational choice that incorporates psychological, cultural, situational, and strategic variables into the description of social interactions.

It is feasible to describe complex interaction relationships in a rational choice

<sup>36</sup> There is a huge amount of literature that criticizes the rationality assumption and their implications. See, for example, Bazerman & Sondak (1988) and references therein.

<sup>37</sup> See Brubaker (1984, 5) on Weber's distinction between subjective and objective rationality.

framework and relax its usually restrictive assumptions. Kim and Bueno de Mesquita (1995), for example, incorporate situational perceptions into a game theoretical framework. Evolutionary game theory seeks to explain the emergence of certain equilibria and outcomes over others (Binmore & Samuelson, 1992; Linster, 1992; Mailath, 1992). Sebenius (1992b) categorizes his negotiation analysis approach as "non-equilibrium game theory with bounded rationality and without common knowledge" (ibid., 19). The players seek to move toward the Pareto frontier of negotiation outcomes but do not know the exact location of the frontier. Eventual negotiation outcomes can but do not have to lie on the frontier; indeed, it is feasible that because of the involved uncertainties and different perceptions of the values at stake as well as the prospects of specific payoffs and their distribution, outcomes can be Pareto inferior.<sup>38</sup> Dynamic social interactions can result in a variety of equilibria depending which solution ideas build a foundation for the parties involved. While the structure of a game can have significant impacts on the outcomes of the negotiation process, it merely bounds possible outcomes (cf. Sebenius 1992a, 339). The analysis becomes more complicated but also more realistic, when we account for the fact that players seek to change the structure of the game in their favor (ibid.).<sup>39</sup> Consequently, preferences, values and interests can change during the game and are not treated as exogenous.<sup>40</sup>

It would be premature to judge rational choice and game theory as inadequate in analyzing social interactions in foreign policy. "The game-theoretic perspective lacks many of the features required for a valid theory of international negotiations, but it does offer some fundamental axioms on which most other work is based" (Hopmann & with the collaboration of Daniel Druckman, 1991, 273). Rational choice is a simple approach to model complex interactions. It requires the researcher to identify key actors, their objectives and constraints, as well as their relationships to other actors and their environment. This becomes the prerequisite for any coherent analysis of the dynamics of social interactions. One of the primary objectives of rational choice is to identify those strategies that help players maximize their expected utility. The structure of the game determines the set of possible strategies. However, rational choice lacks an adequate explanation of how social interactions affect not only the choice of strategies but also the eventual outcome of the game. Whether or not other approaches fill this gap will be discussed next.

#### 4 Alternative Models of Social Interactions

Foreign policy analysis is interdisciplinary in nature. Thus, the relatively high number of perspectives to study social interactions in foreign policy does not come as a surprise (Bercovitch, 1984). We can broadly distinguish between prescriptive, practical approaches and theoretical studies. Prescriptive and practical approaches provide advice to negotiators and other foreign policy actors<sup>41</sup> and emphasize mostly personality variables in diplomacy.<sup>42</sup>

<sup>38</sup> Causes of inefficiencies can be commitment tactics, internal bargaining, issue linkages, and compliance failures (cf. Sebenius, 1992a, 331). Lax & Sebenius (1986) show that the process of creating and claiming values in negotiations tends to lead to Pareto-inferior outcomes. Their hypotheses is supported by Chatterjee (1982), Cramton (1984), Cramton (1985), Fudenberg & Tirole (1983), and Myerson (1985).

<sup>39</sup> Putnam (1988) and Young (1991) have also pointed this out.

<sup>40</sup> In this context Sebenius (1992b) praises the epistemic approach because it "admirably avoid taking a set of exogenously determined interests as a starting point of analysis" (ibid., 335).

<sup>41</sup> See, for example, Mautner-Markhof (1989) as well as Berman & Zartman (1982), Fisher & Ury (1981), Nierenberg (1968), Raiffa (1982), and Mastenbrock (1989) and Mastenbrock (1987).

<sup>42</sup> Writers as early as de Callières (1716) wrote extensively about the personal qualities diplomats should possess, and there can be no doubt that personality characteristics do play an important role in the negotiation process and outcome. See Berman and Zartman (1982, 23-24), Watson (1982, 52) and Rubin (1991, 43). However, compared to other variables such as culture or perceptions it is doubtful that personality variables are

Our emphasis will be on theoretical models of diplomatic negotiations. Understanding the dynamics of diplomatic negotiation processes promises to provide general insights into the essence of social interactions in foreign policy. In order to explain the causes of social interaction outcomes we have to look at the dynamics, i.e., the process, of social interactions on the domestic as well as the international levels. The analysis of diplomatic negotiations is not limited to the international level. Diplomats face both international and domestic constraints in their strategic environment. It is often difficult to clearly separate international and domestic issues because the boundary between these two levels become blurred. Analyzing negotiation processes provides insights about social interactions and develops approaches that are applicable to other levels of analysis.

There are a number of approaches to guide the analysis of negotiations. Kremenychuk (1991) distinguishes eight analytical perspectives. The *historical* approach provides valuable comparisons of the structure and lessons of negotiations over time. This mainly descriptive approach is ideographic in character and offers unique and particular insights into social interactions in foreign policy. *Legal* approaches focus on the legal contents and circumstances of negotiations. Diplomacy is defined as the management of international relations by negotiations. While this perspective explains certain characteristics of social interactions, its scope is fairly limited and it does not leave room for behavioral explanations. *Organizational* theory interprets diplomacy as the management of complex interdependence. Scholars like Kahn (1989; 1991) apply organization theory to explain the understanding of formal decision making and the organizational embeddedness of negotiators, and conceptualize the interdependence between firms, organizations, and states. *Economic* and *game theoretical* approaches stress the strategic character of negotiations.<sup>43</sup> The *negotiation analysis* approach by Sebenius (1992a; 1992b) outlined in the previous section complements the economic and game theoretical perspectives. *Psychological* approaches focus on relationships and personality factors as well as attitudes, perceptions, and expectations. Communication variables are at the center of *cognitive* approaches. They analyze underlying knowledge structures and judgmental heuristics and emphasize interactional factors on the

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the most significant. Hermann (1980) investigates the relationship between personal characteristics and foreign policy behavior and finds out that "the personal characteristic account for a larger percentage of the variance in the foreign policy behaviors for head of government with little interest or with little training in foreign affairs than for the whole sample of heads of government" (ibid., 44). Neale and Bazerman (1991) come to the same conclusion. Their findings are consistent with Verba's (1961) hypotheses about the significance of variables. They appear to play a more important role the greater the individual decision makers is involved in negotiations, the more the ambiguous the situation is. They seem less significant if a great amount of information is available to an individual, the higher his or her level of negotiation skills is, the more influence and responsibility he or she has over events and the more detailed and complex a situation is (cf. ibid., 102). Yet, in spite of the relative significance of personality and attitudes for shaping actions and reactions of negotiators the consensus of most writers in international affairs seems to be that these variables have less value in explaining or predicting outcomes in international affairs. Zartman, for example, acknowledges that creativity and personality of the negotiator is important, but he is skeptical of the theoretical explanatory value of the psychological-behavioral approach because "by analyzing the agent rather than the process [these theories] focus on the secondary rather than the primary element of [negotiation] (Zartman quoted in Habeeb (1988, 13)). They deal more with the characteristics of the agent than with the actions of the agent.

<sup>43</sup> See, for example, Brams (1985), Mautner-Markhof (1989), Neale & Bazerman (1985), Snyder & Diesing (1977), and Zagare (1990). The most important features of economic models are (Cross, 1991; Young, 1975): There is a distinct range of possible outcomes. Equilibrium outcomes are Pareto optimal. Utility functions are assumed to be well defined and stable over time. Payoff possibility sets as well as bargaining issues are clearly identifiable for any given interaction. Bargaining processes converge to equilibria outcomes. Expectations and preferences are known. Enforceability, punishment, analysis of expected payoffs, and insurance are central issues in models of contracts.

micro level of analysis. Psychological and cognitive approaches explain important underlying factors of negotiations, but remain limited to the micro level of analysis. Finally, theoretical studies of *content analysis* seek to reveal the structure and nature of negotiations and develop techniques that facilitate agreements.

Next to *strategic* approaches (Raiffa, 1982; Schelling, 1960) as well as *process* and *behavioral* analyses (Burton, 1968; Ikle, 1964), Mautner-Markhof (1989) and Zartman (1988) discuss *structural* perspectives (Bacharach & Lawler, 1981; Habeeb, 1988; Schelling, 1960). They are based on the realist tradition of international relations theory and treat power and resource distributions as some of the most important elements affecting negotiations. Unfortunately, they often provide only ad hoc explanations of complex negotiation processes and outcomes. Therefore, they are of rather limited explanatory value for the analysis of the dynamics of social interactions in foreign policy. Bercovitch (1984) favors the *social-psychological* approach<sup>44</sup> as it is the only perspective that integrates personal, role, interactional, situational<sup>45</sup>, and goal variables.<sup>46</sup> He criticizes most other approaches for their limitations to usually only one set of factors.<sup>47</sup>

Bercovitch explains that the interdependence of personal, role, interactional, situational, and goal variables determines the outcomes of negotiations. Social interactions take place in one coherent system. This system is determined by *input* in form of personal, role, interactional, situational, and goal variables, *throughput*, i.e., interactions during

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<sup>44</sup> See also Druckman (1971), Druckman (1991), Katz & Kahn (1978), and Kelman (1965b) for overviews of the social-psychological approach.

<sup>45</sup> Situational characteristics are usually external and beyond control of the players (cf. Neale and Bazerman, 1992, 6). For example, time pressure or information excess can limit the strategy options of a negotiator and the astuteness of judgment may suffer. Framing effects can have similar effects. For a detailed discussion of framing effects see Tversky and Kahneman (1987) as well as Young (1990). Ruben (1991) mentions the unique role of the media that can be an important factor in negotiations and their outcomes. It can frame negotiation issues, help present parties' positions and affect how final agreements are reached, if any. Last but not least, it can have a tremendous effect on the presentation of negotiations and their outcomes. Allison (1969; 1971) looks at the external decision environment and the relationship between organizations and bureaucracies and decision makers. Krasner (1972) criticizes Allison's view that bureaucratic and organizational processes have significant influence on foreign policy decision makers on higher levels. "Neither organizational necessity nor bureaucratic interests are the fundamental determinants of policy. The limits imposed by standard operating procedures as well as the direction of policy are a function of the values of decision makers" (ibid., 426). He explains that "a reformulation and clarification of objectives, not better control and direction of the bureaucracy, is critical. ... Objectives are ultimately a reflection of values, or beliefs concerning what man and society ought to be" (ibid., 432). Kahn (1991) believes that organizational theory provides important insights into international negotiations. Other writers (Fauré & Sjøstedt, 1993; Hofstede, 1991) stress the importance of cultural variables. Culture can influence the behavior and decision making processes and explain differences in styles and languages of the negotiators. Berman and Zartman (1982) contest the significance of cultural variables pointing to the established diplomatic culture which "socializes its members into similar behavior" (ibid., 226). This also applies to non-Western nations who adapted the Western diplomatic culture well (cf. ibid.).

<sup>46</sup> Each cluster of variables contains several features. Common goals and specific disagreements through time characterize goal variables. Personal factors include the identity of parties, attitude between parties, cognitive differences, and personality variables. Interactional factors influence the nature of communication, tactics and strategies, rewarding or coercive social influence, and phases and concessions. Role factors encompass pressures towards an agreement, partisan pressures, and presence of audience. The number of parties and issues, tensions and complexity, presence of third parties, openness and informality versus secrecy, other situational conditions, nature of issues, timing, and the agenda are all features of situational factors. (Bercovitch, 1984, 141 (figure 1)).

<sup>47</sup> Bercovitch (1984, 135) points out that "the starting point and criterion of relevance should be a concern with the study of the relative potency of the *individual*, *situational*, *role*, and *interactional* factors, and not limit itself to one set of factors only" (emphases in original).

negotiations, and *output*, i.e., the outcome of negotiations, which may affect future negotiations. The description of social interactions as a system characterized by input, throughput, and output relates the social-psychological approach to open systems theory (Katz & Kahn, 1978) and cybernetics. The idea of cybernetics is to describe systems as machines or automata and analyze how the organization of these machines determine the state, behavior, and output of such systems. While it is possible to employ cybernetics in negotiation analysis it has also been applied in more general models of policy analysis and strategic interactions. The next section introduces cybernetics and discusses whether or not it is suitable to analyze social interactions in foreign policy.

### 5 Cybernetics

Cybernetics is the theory of communication and control in the living organism and machine (Wiener, 1957; Wiener, 1965; Wiener, 1967). It assumes that reality is highly structured and organized and can thus be described in mechanical terms.<sup>48</sup> In order to quantify communication and steering<sup>49</sup> processes in organisms within a discrete analytical framework<sup>50</sup>, cybernetics describes them as machines or automata.<sup>51</sup> An automaton is a simple, formal description of a system. The performance of a system is specified by a finite set of inputs, outputs, states as well as transition functions which determine future states and outputs. Information about past performance guides future action. This process allows systems to learn from past behavior and evolve through time.<sup>52</sup> “The principle of adjusting behavior on the basis of past performance is known as feedback” (Wiener in Masani, 1985, 805). Such adjustment, control or steering mechanisms can be the nervous system and the brain function in human beings or a thermostat that regulates the temperature of a furnace.<sup>53</sup> Without such a control mechanism a system may end in complete disorganization and chaos. If a control mechanism does not exist or does not process information about the results of actions, it may be impossible for a system to perform effectively and reach its intended goal. Consequently, no purposive system can exist without an inherent control mechanism.

One of the greatest advantages of a discrete cybernetic approach is that it is possible to model complex systems as simple finite automata.<sup>54</sup> Cybernetics has been applied in fields

<sup>48</sup> “Communication and control in living organisms and machines are considered analogous systems in cybernetics” (Wiener in Masani, 1985, 805).

<sup>49</sup> Control and steering are treated as synonymous terms in cybernetics. “Control” refers to the internal process within a system whereas “communication” refers to the external process between systems.

<sup>50</sup> Cybernetics allows for both discrete and continuous analyses. For the purpose of this dissertation the continuous approach is irrelevant and we focus on the discrete instead. This means that whenever we speak of cybernetics we are referring to the discrete analytical framework.

<sup>51</sup> For a good introduction into automata theory see Hopcroft & Ullman (1979). See also Arbib, Kfoury & Moll (1981), Arbib (1987), and Ashby (1952).

<sup>52</sup> Technically speaking this is analogous to the principle of a Markov chain. The state in time  $t+1$  is the same as in time  $t$  and the product of a transformation function, i.e.,  $x(t+1)=x(t)E$  where  $E$  is the transformation function.

<sup>53</sup> A controller is a natural or constructed assembly which interacts with its environment to bring about a particular stability called the ‘goal’ or ‘objective’ (Pask, 1961, 49).

<sup>54</sup> When there are only a finite number of states, the automaton is finite (Arbib, 1987, 24). The simple structure and organization of finite automata does not limit the scope and explanatory value of cybernetics. Keeping a model simple and including only a very limited number of variables and parameters does not imply that the model lacks explanatory value. Suppose, a simple machine consists of only ten parts and each part can have eight different attributes, this yields 100 million different machines. The simple yet very practical structure of finite automata facilitates the construction of machines that replicate thinking processes and complex logic. “The behavior of automata has been shown to be capable of far greater variability and flexibility than had been imagined” (Rapoport, 1959, 1749). For example, computer hard- and software are written in simple binary code

such as engineering, computer programming, artificial intelligence, neurophysiology, psychology, and political analysis. Deutsch (1966), for example, analyzes the functioning of the government within a cybernetic framework. Government is characterized as a process of communication and control and resembles a living organism or machine. The task of the government becomes to steer this complex social system in order to avoid disorganization and chaos. Easton (1965) resembles Deutsch’s approach insofar as he compares the political system with an organism that is characterized by distinct input, throughput, output, and feedback mechanisms.<sup>55</sup> Forrester (1971) goes a step further and models the whole world as a complex system. His work later became the foundation for the highly publicized Club of Rome studies. The fact though that the predictions of the Club of Rome turned out to be inaccurate and incomplete, indicates flaws in modeling highly complex systems within a cybernetic framework. Cybernetics is not applicable to all levels and units of analysis. The larger and the more complex a system, the more difficult it becomes to isolate parameters and include all significant variables into one model. This is true in the natural science and especially in social science research. Wiener (1965, 164) explains that “in the social sciences we have to deal with short statistical runs, nor can we be sure that a considerable part of what we observe is not an artifact of our own creation. ... We are too much in tune with the objects of our investigation to be good probes.” Consequently, he doubts the applicability and viability of cybernetics in the social sciences.<sup>56</sup>

Wiener’s criticism and mentioned caveats of social science research remain valid today. However, if the researcher takes these obvious caveats into account cybernetics can successfully be applied in social science. The works by Beer (1959) and Steinbruner (1974) serve as examples. Beer (1959) explains how cybernetics helps understand the functioning of effective management and the organization of a factory. Compared to Deutsch, Easton, and Forrester, the scope of Beer’s analysis is more limited. It consequently overcomes some of the problems of the isolation of parameters that characterize Deutsch’s, Easton’s, and Forrester’s works. Steinbruner (1974) focuses on the decision making processes in foreign policy. His study is intriguing because he compares the cybernetic approach with the analytic paradigm, i.e., rational choice, and cognitive theories. Unfortunately, his analysis is largely historical and similar to Beer remains descriptive. While the comparison of cybernetics and rational choice is revealing, Steinbruner does not expand his cybernetic framework by sketching a quantitative analysis of foreign policy decision making. This is a common deficiency of most applications of cybernetics in political analysis.

and hardly anyone seriously questions the practical value of computer programs. Furthermore, it is possible to explain complex problems with the help of binary logic. Indeed, Boolean logic has become the foundation of complex algorithms and models in the natural as well as social sciences (Beer, 1959; Holland, 1992).

<sup>55</sup> Bryen (1971) modifies Deutsch’s approach to the analysis of international relations, but does not provide any new insights.

<sup>56</sup> Another reason for Wiener’s skepticism was the lack of computational power to isolate parameters and overcome the problem of time scale. Since then the development of computers solved Wiener’s reservation.

Wiener was well aware of the possibility of abusing cybernetics. History has shown that cybernetics can be misused. Some socialist countries, for example, used cybernetics to justify the intervention into the market process and society. Dialectical and historical materialism were assumed to provide the necessary information about the most effective control of social and economic processes. See Altar (1986), Bilcin (1979), Florescu (1984), Manescu (1975), and Negoita (1981) for examples of the so-called Romanian School of Economic Cybernetics. Of course, the economic application of cybernetics is not necessarily limited to socialist regimes. For example, it can be applied in industrial organization and policy (Pask, 1961). It is an interesting question whether or not industrial cybernetics is an example for the misuse of cybernetics. If we understood free competition as a self-steering and -organizing system which is characterized by a homeostatic process, this would indeed be the case. The same conclusion would apply to the interpretation of social systems as self-steering and self-regulating systems (Baumgartner, 1986; Geyer & Zouwen, 1986).

The idea of cybernetics modeling human behavior as automata or machines has also been applied in rational choice models of strategic interactions. For example, Abreu & Rubinstein (1988), Banks & Sundaram (1990), Flueckiger (1979), Gilboa (1988), Johnson (1995), Kalai & Stanford (1988), Piccione (1992), Piccione & Rubinstein (1993), and Rubinstein (1986) incorporate the notion of automata in their game theoretic models. They describe simple infinitely repeated games in which players choose *Moore machines* to play their strategies that will yield the highest payoffs. A player's Moore machine consists

of (i) a finite set of states, one of which is identified as the initial state, (ii) an output function determining the action taken at the  $t^{\text{th}}$  stage of the game as a function of the  $t^{\text{th}}$  state, and (iii) a transition function describing the  $(t+1)^{\text{th}}$  state as function of the  $t^{\text{th}}$  state as well as the action by the other player at the  $t^{\text{th}}$  stage of the game" (Banks & Sundaram, 1990, 97-98).

Given the correspondence between strategies in infinitely repeated games and automata (Kalai & Stanford, 1988, 397), Moore machines are a convenient tool in formalizing the behavior of players in such supergames (Rubinstein, 1986, 84). Yet, there are a number of caveats that raise questions about the viability of Moore machines to model social interactions in foreign policy. Similar to other game theoretic approaches, the above cited models assume that the players share common knowledge of the game structure, know their expected payoffs, and that their behavior is rational. The right choice of a Moore machine reflects their optimizing behavior. The objective is to identify the optimal strategy that is least costly and easiest to follow based upon the initial condition. However, while it may be possible to describe individual payoff functions (Linster, 1992, 886), the game theoretic models do not say much about the emerging overall outcome which, of course, could change the structure of the game. The mentioned game-theoretic models limit themselves in describing the strategies of the players and the desired payoffs. They do not address the different natures and processes, i.e., the dynamics, of social interactions. It is reasonable to assume that social behavior is situational. In other words, different initial conditions result in different outcomes. Yet, Moore machines consider only *one* initial condition at a time and it remains unclear how to describe and evaluate this initial condition. Furthermore, in the real world players evaluate external input idiosyncratically. The resulting output and eventual outcome of the game are a function of this evaluation which depends on both the external environment (i.e., the input) *and* the internal state. While it is acknowledged that the internal state of the players may have an impact on their actions, the game theoretic models do not explain how this influence differs from external input. The analysis is inherently static inasmuch as it does not allow for changes of the internal states of the players.<sup>57</sup> Therefore, while the analytical approach of the Moore machine is a convenient "tool for formalizing a player's behavior in a supergame" (Rubinstein, 1986, 84), it remains incomplete. This undermines its explanatory value for an analysis of social interactions in foreign policy.

*Sociocybernetics*, the quantitative study of the interactions of social systems, can overcome some of the just discussed shortcomings.<sup>58</sup> It too models social systems as finite automata. However, its definition of finite state automata (FSA) differs from Moore machines. Probably most significantly, it drops the assumption of optimizing behavior and constant preferences and constraints. It describes general behavior patterns and explains how they affect the process and outcome of games that are linked by a continuous internal and

<sup>57</sup> Expressed in psychological language, the players are assumed to be purely extrovert.

<sup>58</sup> Busch & Busch (1992) and Geyer & Zouwen (1986) define sociocybernetics as the cybernetics of social systems. While their definition is not wrong, we adopt Howard's and Kuncce's definition which will be explained in detail in the next section.

external feedback mechanism among the actors. The next section introduces the sociocybernetic approach and explains why and how it is suitable to analyze social interactions in foreign policy.

## 6 Sociocybernetics

Every coherent and consistent theory is based on plausible behavioral and philosophical assumptions. They define the thrust of analysis and thus help construct the understanding of reality (Zalewski & Enloe, 1995). In order to assess the explanatory value of sociocybernetics it is necessary to have a look at its underlying conceptual foundation. The first assumption of sociocybernetics is that "human behavior is dynamic" (Sociocybernetics Inc., 1995). It "is treated as discrete, stochastic, fuzzy, or adaptive" (ibid.). This implies that it can be constantly changing and evolving. Consequently, sociocybernetics rejects the rational choice assumption of constant preferences and values. Second, the discrete nature of behavior makes it possible for "system behavior [to] be classified" (ibid.). Third, "system behavior is a function of the interaction components" (ibid.). This assumption is significantly different from cybernetics because sociocybernetics places the emphasis on the dynamics, i.e., the process and changing nature, of social *interactions*. The fourth assumption of sociocybernetics is that "there are appropriate mathematical models for components in the system" (ibid.) and that consequently 'behavior can be simulated by a computer' (ibid.). Machines or finite state automata represent social systems and can be described mathematically.

Sociocybernetics was first applied to the analysis of individual, social interactions (Hiebsch, 1982; Kuncce & Kuncce, 1977; Kuncce, Kuncce, Moore & Lavin, 1981; Kuncce, Moore & Kuncce, 1984), and in recent years, it has been successfully utilized in the study of international relations.<sup>59</sup> However, it has not been applied to model the interconnectedness of social interactions on the international and domestic levels in foreign policy. This thesis fills this gap. The second part of the thesis (i.e., Section 3.) applies a discrete model of sociocybernetics and represents the main actors of the 1994-1996 US-Chinese negotiations on intellectual property rights (IPRs) by *Finite State Automata* (FSA). An FSA is a system of a finite number of internal and external states and a finite set of mappings. In other words, an FSA receives and interprets input, processes this information and weighs it with its own internal state and produces an output which becomes the input to another FSA.<sup>60</sup> The behavior of one FSA is then linked to the behavior of another FSA. "[This] sequence of [the resulting] interactions can be simulated mathematically" (Kuncce & Kuncce, 1977, 761). For example, when we look at two interacting FSA, say the US Trade Representative (USTR) and Chinese delegation during the initial IPR negotiations in 1994, both actors observe the external environment and note the actions of the other actor. The actions of one actor become the input to the other actor. The actors then evaluate the *perceived* external input and their own internal state or constraints, produce a new output, i.e., an observable action, and enter into a new, though not necessarily different internal state. The internal state of an actor incorporates its constraints as well as its mood or attitude.

<sup>59</sup> Hamman (1993) applies a discrete model in his analysis of the Persian Gulf War. Singh (1996) adapts a continuous model to explain the political economy of the post Cold War world.

<sup>60</sup> Formally, an FSA is defined as a quintuple consisting of  $\langle I, O, S, f, g \rangle$ , wherein  $I$  = finite (external) input alphabet,  $O$  = finite output alphabet,  $S$  = finite internal state alphabet, and  $f: I \times S \rightarrow O, g: I \times S \rightarrow S$ . Often  $I=O$ , and as long as we remember that the functions  $f$  and  $g$  operate in the given sequence, we can condense and rewrite the definition of the FSA in the simpler form: An FSA is a triplet  $\langle I, S, h \rangle$ , wherein  $I$  = finite external state alphabet,  $S$  = finite internal state alphabet,  $h$  = transformation function,  $h: I \times S \rightarrow I \times S$ .

The simplest, non-trivial sociocybernetic set-up is a system of two interacting 2x2 FSA; i.e., two internal and two external states characterize the FSA. For example, the USTR either faces internal opposition or support for a tough stance against China and either threatens China to impose economic sanctions unless China promises to improve its IPR regime or the USTR drops its threats. China, on the other side, either faces internal support or opposition to make any concessions to the US and either concedes to the US demands or not. The principal behavior pattern or nature of the two delegations can be summarized in so called *transition tables*. For example, the following transition table may describe the behavior pattern of the USTR:

Table 1 a

## Transition Table of US

<i>Input I</i>	<i>Internal State S</i>	<i>Output O</i>	<i>New Internal State S'</i>
no concessions	support for tough stance	retaliation	opposition to tough stance
no concessions	opposition to tough stance	retaliation	opposition to tough stance
concessions	support for tough stance	no retaliation	support for tough stance
concessions	opposition to tough stance	no retaliation	support for tough stance

The first row of the US transition table suggests that if China makes no or hardly any concessions and credible promises of stricter and more effective IPR protection in China and the USTR is pressed by internal support for a tough stance against China, it will threaten economic sanctions against China. However, every involved party in the US does not favor sanctions. This is why internal opposition characterizes the new internal state  $S'$ . The second row tells us that if China does not make any concessions, the USTR will threaten to retaliate even though it does not enjoy the internal support for such a tough stance. The third row indicates that if China comes around and concedes to the US, the USTR will drop its threat of retaliation even though internal pressure for a tough stance against China continues to exist. Finally, the fourth row describes a situation where China does make concessions and there is weak support for a tough stance against China. Under these circumstances the US discontinues its threats against China but remains skeptical about China's sincerity.

The transition table of China may look like this:

Table 1 b

## Transition Table of China

<i>Input I</i>	<i>Internal State S</i>	<i>Output O</i>	<i>New Internal State S'</i>
retaliation	opposition to concessions	concessions	opposition to concessions
retaliation	support for concessions	concessions	support to concessions
no retaliation	opposition to concessions	concessions	opposition to concessions
no retaliation	support to concessions	concessions	opposition to concessions

The first row of China's transition table portrays the scenario where the US threatens China to retaliate. China still lacks the political will to improve its IPR regime, but the American threat is credible enough and China concedes. In the second row the Chinese delegation enjoys internal support for possible concessions to the US. Faced with possible sanctions, China promises to improve its IPR regime. The third row describes the scenario where the US chooses a more cooperative approach to China. But, it is unlikely that it will

do so unless it is certain that China will make credible concessions. China does indeed concede but internal opposition to improve the IPR regime remains. Finally, the fourth row tells us that if the US drops its threats against China and there is internal support for concessions, China concedes to the US but skepticism about these actions remains.

Note that each of the two transition tables describes only one possible behavior pattern. While the four initial conditions (input  $I$  and internal state  $S$ ) always remain the same, the responses (output  $O$  and new internal state  $S'$ ) can differ. Since there are four initial conditions and two sets of response elements in each transition table, there is a total of  $256 (2^8)$  different types of transition tables for each actor. Thus even the simple structure of a 2x2 FSA yields a vast amount of combinations of behavior patterns.

Choosing a binary code for the values of the different parameters, the value of the input  $I$  of the US government is 1 if China promises to grant better IPR protection and 0 if it makes no concessions. If the US faces internal opposition to a tough stance against China its internal state  $S$  is 1, otherwise it is 0. Finally, the American output  $O$  equals 1 (0) if it does (not) lift its threats of sanctions against China. Similarly, China's input is 0 (1) if it is (no longer) faced by threats of sanctions. If China confronts internal opposition to more effective IPR protection, its internal state is 0; otherwise it is 1. If China does (not) make concessions to the US, this is reflected in the value of 1 (0) of China's output.

Applying a binary code for the values of all variables, we can rewrite the transition tables for both countries in abbreviated form:

Table 2 a

USA				
Row	I	S	O	S'
1	0	0	0	1
2	0	1	0	1
3	1	0	1	0
4	1	1	1	0

Table 2 b

China				
Row	I	S	O	S'
1	0	0	1	0
2	0	1	1	1
3	1	0	1	0
4	1	1	1	0

The transition tables describe the principal behavior pattern of the actors, but they do not provide information about the resulting outcomes of their actual social interactions. In order to get this information we have to combine the two transition tables. This produces the following *connection matrix* where *I1, S1* belong to the US government and *I2, S2* to the Chinese government.

Table 3

Connection Matrix

Situation	Initial Conditions				Responses			
	I1	S1	I2	S2	O1	S1'	O2	S2'
0	0	0	0	0	0	1	1	0
1	0	0	0	1	0	1	1	1
2	0	0	1	0	0	1	1	0
3	0	0	1	1	0	1	1	0
4	0	1	0	0	0	1	1	0
5	0	1	0	1	0	1	1	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	0
8	1	0	0	0	1	0	1	0
9	1	0	0	1	1	0	1	1
10	1	0	1	0	1	0	1	0
11	1	0	1	1	1	0	1	0
12	1	1	0	0	1	0	1	0
13	1	1	0	1	1	0	1	1
14	1	1	1	0	1	0	1	0
15	1	1	1	1	1	0	1	0

Note that the connection matrix above does not yet include the resulting situations of the next stage. We do know that the output of one actor affects the input of the other actor and vice versa. The actors interpret the input and process the newly gained information. This means that it is not merely the input that affects the output and new internal state, but the *perceived* input. For example, China might not care too much about the output of the US and considers its own action more significant. In other words, China weighs the US actions with its own. It interprets the output of the other party and uses this perceived input in deciding about its next action.

The sociocybernetic model uses the following *control or steering mechanism* to compute the *perceived* input:<sup>61</sup>

<sup>61</sup> See Arbib, Kfoury & Moll (1981, 126-127). This is also known as the McCulloch-Pitts Neuron or Threshold Logic Unit.

$$I(US) = I1 = Int \left\{ \frac{w_{11}O1 + w_{21}O2}{w_{11} + w_{21}} + 0.5 \right\}$$

$$I(China) = I2 = Int \left\{ \frac{w_{12}O1 + w_{22}O2}{w_{12} + w_{22}} + 0.5 \right\}$$

*I(US)* and *I(China)* denote the perceived input of the US and China respectively. *w*'s represent weights (*w*>0); specifically, *w*<sub>11</sub> (*w*<sub>21</sub>) is the weight the US attributes to its action *O1* (the output of China *O2*); on the other hand, *w*<sub>22</sub> (*w*<sub>12</sub>) is the weight China attributes to its action *O2* (the output of the US *O1*). Adding 0.5 assumes that the actors are "equally dominant optimistic."<sup>62</sup> This means, if the computed weighted sum of a resulting internal state is 0.5, the value is rounded upwards and the value of the perceived input is 1.

While it is possible to allow for a high number of weights, say, between 1 and 10, we facilitate the analysis and select only two parameters. The immense complexity of the interactions will still become evident. A weight *w* of 1 signals that the external input or internal state do not matter significantly, whereas a 2 indicates that they play a significant role. This leaves us with a total of 16 combinations of weights:

- 1) 1,1,1,1    5) 1,2,1,1    9) 2,1,1,1    13) 2,2,1,1
- 2) 1,1,1,2    6) 1,2,1,2    10) 2,1,1,2    14) 2,2,1,2
- 3) 1,1,2,1    7) 1,2,2,1    11) 2,1,2,1    15) 2,2,2,1
- 4) 1,1,2,2    8) 1,2,2,2    12) 2,1,2,2    16) 2,2,2,2

For example, the weights 2,1,2,1 (line 11) indicate that the actors care more about their own actions than the observed, external input. Weights 1,2,1,2, on the other side, describe a situation where the actors value the external input more than their own actions. Weights 1,1,1,1 and 2,2,2,2 mean that the actors evaluate both their own and the other's action as equally significant.

Applying this control mechanism for the interactive weights 2121 yields the following connection matrix of the suggested transition tables of the US and China:

<sup>62</sup> This term is borrowed from psychology.

Table 4

**Connection Matrix for the 1994/95 IPR Negotiations With Interactive Weights 2121**

Situation	Initial Conditions				Responses				Resulting Situations				Map
	I1	S1	I2	S2	O1	S1'	O2	S2'	I1	S1	I2	S2	
0	0	0	0	0	0	1	1	0	0	1	1	0	6
1	0	0	0	1	0	1	1	1	0	1	1	1	7
2	0	0	1	0	0	1	1	0	0	1	1	0	6
3	0	0	1	1	0	1	1	0	0	1	1	0	6
4	0	1	0	0	0	1	1	0	0	1	1	0	6
5	0	1	0	1	0	1	1	1	0	1	1	1	7
6	0	1	1	0	0	1	1	0	0	1	1	0	6
7	0	1	1	1	0	1	1	0	0	1	1	0	6
8	1	0	0	0	1	0	1	0	1	0	1	0	10
9	1	0	0	1	1	0	1	1	1	0	1	1	11
10	1	0	1	0	1	0	1	0	1	0	1	0	10
11	1	0	1	1	1	0	1	0	1	0	1	0	10
12	1	1	0	0	1	0	1	0	1	0	1	0	10
13	1	1	0	1	1	0	1	1	1	0	1	1	11
14	1	1	1	0	1	0	1	0	1	0	1	0	10
15	1	1	1	1	1	0	1	0	1	0	1	0	10

This connection matrix can be used to explain the dynamics of the social interactions of the two actors. Suppose for example the relationship and initial conditions between the two actors are described as in situation 4 (I1, S1, I2, S2 = 0100). Given the interactive behavior of the actors the resulting situation is 0110 which is equivalent to the initial condition recorded in line 6. That is, the resulting situations of one stage become the initial conditions of the next stage and so on. The MAP column on the far right tells us what condition a resulting situation maps into. Situation 4, for example, maps into the final outcome 6 (0110) in the next stage. This means we initially start in situation 4 where the US does not interpret China's actions (I1=0) as sufficient to lift its threat of sanctions (O2=0) even though the US lacks the support for a continued tough stance against China (S1=S1'=1). China faced with the US threat of sanctions (I2=0) concedes to the US demands (O2=1). However, the Chinese delegation still does not enjoy any internal support for any further concessions (S2=S2'=0). Eventually, this scenario leads to the final outcome 6. China's concessions do not satisfy the US (I1=0) which consequently does not lift its threats against China. China, on the other side, perceives the actions of the US in a more positive light (I2=1) and continues to make concessions (O2=1). Unfortunately, these concessions are not significant enough to move the US to lift its threats of retaliation. Under these circumstances a mutual agreement (O1=O2=1) does not seem to be a possible final outcome.

Given that the sociocybernetic game has only a finite number of possible outcomes but the interactions of the FSA can be played infinitely, the social interactions have to end in terminal cycles. The number of possible outcomes is still very high. Recall that there is a total of 256 different types of transition tables for each actor. Combining the transition tables of two interacting 2x2 FSA in a connection matrix yields a total of  $256 \times 256 = 65,536$  combinations of the two actors "for each connection matrix and a total of  $[256 \times 256 \times 256 =]$  16,777,216 systems possible from all different connection matrices" (Kunze & Kunze, 1977, 761). In other words, the simplest, non-trivial design of two interacting 2x2 FSA yields  $2^{24}$

distinct systems, i.e.,  $2^{24}$  bounded sets of interrelated elements.<sup>63</sup> Therefore, the limitation of an analysis to two interacting 2x2 FSA sufficiently reveals the enormous complexity and variety of data structures and outcomes. Of course, it is possible to modify the initial game descriptions further and compare the generated results. For example, we can include additional actors and variables. The downside of an extension of the model is the exponential growth of the number of possible systems. Instead, it is advisable to limit the analysis to 2x2 or 3x3 FSA and run sequential simulations.

Impressive as the high number of resulting interrelated elements of simple interacting FSA is, it can become an obstacle, if we do not use a selection criterion and structure the outcomes. Theoretically it may be possible to analyze all  $2^{24}$  or more interrelated elements. Practically this is not feasible. Applying a sociocybernetic model to a real case requires knowledge of the main actors, their objectives and constraints, their decision environment, and relationships with other actors. We have to be able to identify and select significant variables and parameters and interpret the simulation results within a coherent framework. In order to provide an accurate game description of a case study, we first need to undertake an institutional analysis of the case. A thorough institutional analysis comprises historical, political, and economic factors as well as an investigation of formal institutions such as laws and regulations and informal institutions like culture and ideologies.

There are obvious caveats of sociocybernetics. The limitation to the most simple and non-trivial FSA makes the model necessarily incomplete and subject to selection bias. It poses unique challenges because we have to be very careful about choosing the right variables. The dynamics and outcomes of social interactions are completely determined by the nature of the actors, i.e., their principle behavior and interaction patterns. If we change the organization of the system, the results will be different. This indicates the significance of an accurate game description.

Describing FSA as closed systems, i.e., without exogenous input or effluent output during interactions<sup>64</sup>, does not deteriorate the explanatory value of sociocybernetics. The organization of systems is not assumed to be permanent as long as the analysis includes only a short period of time. This is why in the case study we distinguish and analyze five separate phases of the 1994-1996 IPR negotiations. The actors do not function in a social vacuum. Their social environment influences the behavior patterns. As much as they shape their environment, the environment affects their objectives, constraints, and selected strategies. The portrayal of the nature of the actors in form of a transition table inherently includes a description of the outer environment. When we interpret the parameters of the model, it is important to take the overall context of the social interactions into account. Therefore, applying sociocybernetics to the analysis of social interactions in foreign policy requires an institutional analysis of the actors and their interactions over time.

One of the greatest advantages of the sociocybernetic model is that it is possible to simulate social interactions with the help of a computer. *In vitro* experimentation overcomes the problem of time scale and the isolation of parameters that confronts *in vivo*

<sup>63</sup> A social system is any bounded set of interrelated, social elements (Geyer & Zouwen, 1986, 218). Real-world systems evolve through time and are time dependent. Whenever there is some kind of input and output, they are dynamic. If both the input and output are endogenous we are dealing with closed systems. If the input is exogenous and the output endogenous, or if the input is endogenous and the output is effluent, systems are semi-open. Open systems are characterized by exogenous input and effluent output. If additionally they have recursive inputs and inputs from the larger environment we speak of cybernetic systems. (Hamman, 1996, 24-26).

<sup>64</sup> This is equivalent to the *ceteris paribus* clause in economic and other social science models. It means that we assume that all those variables and parameters that are not explicitly incorporated in a model remain unchanged.

experimentation. This special feature makes sociocybernetics attractive to both the theoretical researcher and the policy practitioner. "An internal model allows a system to look ahead to the future consequences of current actions, without actually committing itself to those actions" (Holland, 1992, 25). It becomes possible to vary the components of the social interactions of the actors and describe the resulting system behavior. Given an accurate game description, sociocybernetics unravels the logic of social interactions in foreign policy. Sociocybernetics can assist in the identification of constellations that lead to desired outcomes the quickest and outline the most promising strategies. Sociocybernetics is a dynamic analysis because it enables us to trace changes in behavior through time. Just like other simulations in foreign policy<sup>65</sup> sociocybernetics can be a learning device to conceptualize complex system processes in foreign policy. Furthermore, sociocybernetic simulations can help develop and explore propositions about social interactions in foreign policy and test them *in vitro* (Druckman, 1971). However, it is essential that we do not overlook the principal caveats of simulations. A "simulation is an operating representation of central features of reality" (Guetzkow, 1963, 25). It cannot include *all* significant variables and necessarily remains incomplete. Consequently, we have to be cautious when we interpret generated hypotheses of simulations. We have to understand the underlying assumptions, the aim, and the scope of the simulation. Revisions and modifications of simulations will most likely lead to different results and conclusions. If we acknowledge these caveats and put the hypotheses we can derive from sociocybernetic simulations into a greater perspective, sociocybernetics can be of exceptionally high explanatory, evaluative, prescriptive, as well as predictive value.

### 7 Conclusion

We started this part of the dissertation with a discussion of the significance of social interactions in foreign policy. The modern international world is characterized by complex interdependent relationships of a variety of actors. As the boundary between international and domestic politics becomes blurred it is increasingly important to study domestic and international foreign policy issues simultaneously. Putnam's (1988) description of the interconnectedness of domestic and international politics as a two-level game is one of the most widely used analytical approaches. Often, rational choice provides the analytical framework for applications of the two-level games approach. Rational choice is a simple and powerful tool to structure basic configurations and relationships. Unfortunately, it does not sufficiently explain the dynamics of social interactions in foreign policy. Rational choice is primarily interested in identifying optimal strategies to achieve well defined goals. Tastes, preferences and other internal constraints are held constant. However, in order to elucidate social interactions in foreign policy, we have to take other variables into account. Social interactions are a function of many interrelated variables. Therefore, we need a methodology that incorporates strategic as well as psychological, situational, institutional, and other variables in one coherent framework. This leads us to the discussion of alternative approaches. Understanding the dynamics of diplomatic negotiation processes promises to

<sup>65</sup> Cunningham (1984) provides a comprehensive overview of the assumptions underlying the use of different kinds of simulations. Guetzkow et al. (1963) and Druckman (1971) discuss the utility of simulation in international relations. Coplin (1966), Guetzkow et al. (1963), and Hermann & Hermann (1967) include presentations and applications of Guetzkow's classical Inter-Nation Simulation. Bracken (1984) distinguishes between gaming and game theory. Mahoney & Druckman (1975) contrast contextual particularity with general laws and theory in simulations. Winham & Bovis (1978) explains some of the lessons learned from simulating negotiations at the US Foreign Service Institute. Sebenius (1981) assesses four computer models and simulations of foreign policy. See also Kelman (1965a), Bonham (1971), and Winham (1991).

provide general insights about the essence of social interactions in foreign policy. Among the approaches to negotiation analysis discussed were historical, legal, organizational, strategic, psychological, cognitive, behavioral, structural and social-psychological models. The social-psychological perspective integrates personal, role, interactional, situational, and goal variables. Similar to the concept of a system, variables are interrelated. This relates the social-psychological approach to open systems theory and cybernetics. Cybernetics is the theory of communication and control in the living organism and machine. The idea of cybernetics is to describe systems as machines and analyze how the organization of these machines determines the state, behavior, and output of the systems. One of the goals is to find the most efficient control mechanisms that allow the machines to fulfill their tasks. Cybernetics has been applied to the field of political analysis, but failed to offer an alternative to rational choice approaches. Other approaches combine elements of cybernetics with rational choice. Unfortunately they are based on the same simple and restrictive assumptions of rational choice. Hence, they do not address issues of the dynamics of social interactions. Sociocybernetics overcomes this flaw. It drops the assumption of rational and optimizing behavior. It allows us to describe general behavioral patterns and explain how they affect the process and outcomes of games. Similar to cybernetics, sociocybernetics describes systems of machines or finite state automata (FSA). However, whereas cybernetics treats only one system at a time, sociocybernetics analyzes *interacting* cybernetic systems. It thus places greater emphasis on the processes and changing nature of social interactions than cybernetics. Internal states such as constraints, mood or attitude of an actor are as important as external actions. They can both change over time. Consequently, even the simplest, non-trivial sociocybernetic set-up, a system of two interacting FSA that are both characterized by two internal and two external states, yields a vast amount of combinations of behavior patterns and interrelated elements. One of the greatest advantages of sociocybernetics is that it is possible to simulate the social interactions of foreign policy actors with the help of a computer. It thus becomes possible to vary the components of the social interactions of the actors and describe the resulting system behavior. In order to interpret the results of computer simulation we have to make a thorough institutional analysis of the case study. We have to be able to identify the main actors, their objectives and constraints, their decision environments, and relationships with their social environment. This knowledge allows us to select realistic behavior patterns and explain the simulation results. Given an accurate game description, sociocybernetics unravels the logic of social interactions in foreign policy. This makes it a valuable tool in foreign policy analysis.

Sociocybernetics does not replace, but rather complements rational choice as a tool in foreign policy analysis. Rational choice convinces by its analytical simplicity and elegance in clarifying basic configurations, relationships and social interactions in foreign policy. However, it does not shed enough light on the dynamics of social interactions and their effects on foreign policy. In addition, unrealistic behavioral assumptions limit the practical explanatory value of rational choice in modern foreign policy analysis. Sociocybernetics too is an approximation of reality. Similar to rational choice, sociocybernetics is a quantitative model that identifies basic conceptual issues and features of social interactions. Yet, in contrast to rational choice, it is based on more plausible assumptions. It is a dynamic analysis because it enables us to trace changes in behavior through time. Applying sociocybernetics to foreign policy analysis requires a prior institutional analysis of the specific case. There are no restrictions to the depth and nature of this institutional analysis. Sociocybernetics is applicable to a wide range of approaches in foreign policy analysis. The next part demonstrates the viability of sociocybernetics in modeling complex social interactions in

foreign policy. In particular, it analyzes the 1994-1996 US-Chinese negotiations on intellectual property rights. This negotiation process comprises social interactions on both the domestic and international levels and involves government as well as non-governmental actors. This makes the case study an excellent example of modern foreign policy.

### **3. The 1994-1996 US-Chinese Negotiations on Intellectual Property Rights**

#### ***1 Introduction***

This part of the dissertation demonstrates the practical use of sociocybernetics in a case study. In particular, it develops a discrete sociocybernetic model of the 1994-1996 US-Chinese negotiations on intellectual property rights (IPRs). In order to quantify the negotiating process it is necessary to identify the main actors, their objectives and constraints, decision environments and relationships. This requires an analysis of the institutional environment of the negotiation process and the involved actors. Institutions are the humanly devised constraints and spontaneous, natural, and self-producing social orders that shape social interactions and vice versa. They structure and organize incentives in social exchange, whether political, social, or economic (North, 1990; Sadowsky, 1991; Zeleny, 1991). Formal institutions are comprised of laws, regulations, and organizational structures. Culture, tradition, and ideology are examples of informal institutions.

The IPR negotiation process involved actors on the domestic and international levels of the two countries. The two main actors in the US are the US Trade Representative (USTR) and the intellectual property (IP) industry. The USTR is the principal negotiator with other countries and coordinates US international trade, commodity, and foreign direct investment policies. The negotiation agenda of the USTR for the IPR consultations with China is a product of dynamic, domestic formal as well as informal procedures. Several trade laws require the cooperation of the USTR with Congress and the private sector. The private sector, in our case the IP industry, assists the USTR in monitoring compliance with trade agreements, helps develop US trade policy, and consults on negotiations and agreements. By law, the USTR has to defend US commercial interests. It thus functions as a spokesperson for the private sector and US economy during international negotiations.

There is a high amount of uncertainty about the internal decision making process in China. Given the complex domestic structures that influence China's negotiating agenda and implementation efforts of the IPR agreements we focus on the central and provincial governments as the key actors. The relationship between the central and provincial governments has a significant effect on the enforcement of existing and new IPR laws and regulations. China had a complete IPR legal regime before the IPR negotiations. However, the performance under these laws left much to be desired and gave rise to the dispute with the US. Chinese IPR laws are often inconsistent with basic informal institutions and foundations of the Chinese legal system, culture, and society (cf. Fung, 1996, 630).

The sociocybernetic model describes the actors as simple 2x2 finite state automata. This obviously limits the number of variables we can include in the model. The selected variables and parameters have to be fairly general and still describe the atmosphere of the social interaction dynamics sufficiently. The institutional analysis of the negotiation process facilitates this selection.

The remainder of this part of the thesis is outlined as follows: The next section provides a chronological summary of the IPR negotiations. It is followed by an introduction of the main actors, their objectives and constraints, decision environment and relevant relationships. Section 3.4 explains the analytical framework of the sociocybernetic model. Since the IPR negotiations extended over a fairly long time, we divide them into five phases and analyze them separately. Putnam's (1988) two-level games approach provides the conceptual framework for this analysis. Section 3.5 includes a detailed discussion of the results of two simulation series of the negotiation process. The two series differ in their description of the initial behavior patterns of the main actors. Section 3.6 summarizes the

generated hypotheses and concludes with a brief discussion of the value of sociocybernetics to this particular case study. This discussion paves the way to the concluding assessment of the value of sociocybernetics in foreign policy analysis.

## 2 Chronology

China's ineffective intellectual property rights (IPR) regime has been the subject of many bilateral negotiations between the US and China since 1986. Discussions have covered all aspects of IPRs, namely, copyright, patent, trade marks, trade secrets, market access of IP industries, and the enforcement of IPR laws in China. In January 1992 the two countries signed a Memorandum of Understanding on Intellectual Property Rights (MOU). China vowed to improve protection of US IPRs in China and the development of an effective IPR legal structure. It joined the Bern Convention for the Protection of Literary and Artistic Works and the Geneva Phonograms Convention. In addition, it amended its copyright and patent laws and promised to improve the protection of trade secrets. In spite of the improved legal structure, infringement of IPRs continued to be a major problem in China. The enforcement of IPR laws was sporadic at best and virtually non-existent with regard to copyrighted works. Among many other deficiencies, the United States Trade Representative (USTR) lamented the lack of transparency in China's IP laws and regulations, administrative problems throughout the central, provincial, and local governments, and the absence of an effective border control mechanism.<sup>66</sup> According to the International Intellectual Property Alliance (IIPA)<sup>67</sup> US firms lost almost \$1 billion in trade from piracy of copyrighted material in China in 1994 alone. The infringement of trademarks and patents caused additional trade losses. China's ineffective enforcement of its IPR laws and regulations and its lack of actions to curb piracy led the USTR in June 1994 to identify China as a "priority foreign country" under the Special 301 provision of the amended 1974 Trade Act.<sup>68</sup> Special 301 requires the USTR to investigate of the IPR regime and enforcement practices of the priority foreign country. If consultations with a priority foreign country do not lead to any acceptable agreement with the US, Special 301 allows the USTR to impose punitive trade sanctions against the priority foreign country.<sup>69</sup> China refuted the US allegations and criticism of its IPR regime. It pointed out that since the 1992 MOU it had undertaken significant reforms that created a strong legal framework for the protection of IPRs. Furthermore, it cracked down on a number of pirating factories. It did not however admit the multifaceted problems of the ineffective enforcement of IPR laws. By the end of 1994 the US threatened to impose punitive sanctions of about \$1 billion in annual imports from China unless an acceptable agreement could be reached by February 26, 1995. China refused to make any significant concessions until the very last minute but finally conceded. The threat of US sanctions was dropped. The IPR Enforcement Agreement concluded the Special 301 investigation. China was no longer a designated priority foreign country even though its implementation of the agreement would be closely monitored according to Section 306 of the 1974 Trade Act.

<sup>66</sup> See *Report to Congress on Section 301 Developments Required by Section 309(a)(3) of the Trade Act of 1974 (January 1995 - June 1996)* at <http://www.ustr.gov/reports/301report/report.html>.

<sup>67</sup> The International Intellectual Property Alliance is a major trade organization representing most of the US copyright industry.

<sup>68</sup> The Omnibus Trade and Competitiveness Act and the 1994 Uruguay Round Agreement Act (URAA) amended the Trade Act of 1974 in 1988. See Bayard & Elliott (1994) and Bhagwati & Patrick (1990).

<sup>69</sup> Special 301 requires the USTR to identify "foreign countries that deny adequate and effective protection of intellectual property rights or deny fair and equitable market access to United States persons that rely upon intellectual property protection" (Section 182 of the Trade Act of 1974, 19 U.S.C. 2242). The worst offenders are designated "priority foreign countries." See section 3.3.1 for a more detailed discussion of the Special 301 and Section 301 provisions of the amended Trade Act of 1974.

Under the IPR Enforcement Agreement, China agreed to develop an effective IPR enforcement structure, crack down on rampant piracy throughout China, and provide US IP industries enhanced market access to the Chinese market.

Both governments and the US private sector were pleased with the agreement. However, by the fall of 1995 it became evident that China was not implementing significant parts of the agreement. China did crack down on piracy on the retail level, but production and distribution of pirated audiovisual and computer software products continued. The US criticized China's customs border enforcement as inadequate allowing pirated products to leave China and enter third-country markets. US intellectual property (IP) firms complaint about unfair restrictions on market access. Indeed, pirate production of US copyrighted works increased in 1995. The IIPA estimated a trade loss by US firms in copyrighted material of at least \$2.3 billion in 1995 alone. An increase of about \$1.4 billion from 1994. Furthermore, the IIPA lamented the absence of deterrent penalties for IPR violations in China.

In April 1996 the USTR re-designated China a priority foreign country. It threatened to impose sanctions unless China took actions to satisfactorily implement the 1995 IPR Agreement and satisfy US concerns. Tensions between the two countries increased when China threatened to counter-retaliate. A trade war was avoided only in the last minute. On June 17, 1996 the US and China signed an IPR Accord that outlined China's past actions against piracy and its future commitments. Since then China has "made significant progress in combating IPR violations" (United States, Office of the U.S. Trade Representative, 1997b, 53). China has closed or cleaned up additional pirate CD factories, reinstated special IPR enforcement efforts, and eased market access for US firms.<sup>70</sup> Structural problems in China's IPR regime are slow to resolve. Piracy has not vanished overnight, but China has expressed its willingness for structural reform and effective IPR protection in the near future. In the meantime USTR continues to monitor China's implementation efforts of the 1995 IPR Agreement and the 1996 Accord.

## 3 The Main Actors

### .1 United States Trade Representative (USTR)

There are a number of obvious reasons that justify the identification of the United States Trade Representative (USTR) as one of the main actors in our case study. The USTR is the principal negotiator with other countries and develops and coordinates US international trade, commodity, foreign direct investment policies. As a cabinet member the USTR functions as the principal trade advisor to the President and spokesperson on trade related issues. It does not operate in competition with other departments or federal agencies. Instead it tries to coordinate trade policy, resolve agency disagreements, and frames trade issues for Presidential decisions. It achieves interagency coordination through various channels: The Trade Policy Review Group, the Trade Policy Staff Committee, and the National Economic Council coordinate and develop a coherent US trade policy agenda.

Several trade laws outline the administrative responsibilities of the USTR. For our case study, the handling of Section 301 complaints of the Trade Act of 1974 and the Special 301 provisions of the 1988 Trade Act carry the highest significance.<sup>71</sup> Section 301 outlines

<sup>70</sup> Cf. *Report to Congress on Section 301 Developments Required by Section 309(a)(3) of the Trade Act of 1974 (January 1995 - June 1996)* at <http://www.ustr.gov/reports/301report/report.html>.

<sup>71</sup> Other important administrative responsibilities of the USTR are the General System of Preferences (GSP), Section 337 and Section 201 (import relief) and many others. Bayard & Elliott (1994) and Bhagwati & Patrick (1990) give an excellent account of Section 301.

how the USTR ought to respond to “unreasonable, unjustifiable, or discriminatory foreign government practices that burden or restrict US commerce” (United States. Office of the U.S. Trade Representative, 1995, <http://www.ustr.gov/reports/annualrpt/1994/section301.html>). Enterprises, individuals, or the USTR can initiate a Section 301 investigation into unfair foreign trade practices that affect US exports of goods and services. Section 301 calls for consultations with the other government to settle the dispute. If no settlement can be achieved, the USTR has to take actions against the disputed practices. If the practice is unjustifiable, i.e., violates an existing trade agreement, the USTR must take action within 18 months of initiation of the Section 301 investigation. If the USTR deems the trade practices unreasonable it has to take further actions against the other government. Constitutionally, Congress solely decides and regulates trade issues. Over the years, various trade acts expanded the discretionary authority of the USTR. The 1934 Reciprocal Trade Agreements Act gave the President the authority to lower tariffs in bilateral trade agreements if the US received tariff concessions in return. Section 252 of the Trade Expansion Act of 1962 expanded the Presidential authority to retaliate against unfair foreign market practices that had an adverse impact on US commerce. Section 301 of the Trade Act of 1974 is an example of the continuing effort of Congress to defend US commercial interests in an increasingly competitive global market place. While Section 301 demands actions by the President and USTR against unfair foreign market practices, it provides the President and USTR with significant discretion in deciding what actions to take. In case the commercial dispute cannot be settled, the President and USTR can suspend trade agreement concessions, or retaliate by imposing duties and other import restrictions. On the other side, USTR can refrain from retaliatory actions if the other government enters into an acceptable agreement or if other political issues and interests are at stake.

*Special 301* addresses foreign IPR piracy. 30 days after the publication of the National Trade Estimates, an annual report that lists unfair foreign market practices, the USTR has to identify those countries that deny adequate IPR protection to US enterprises and individuals. Priority foreign countries are the worst IPR offenders. Section 302(b) of the 1988 Trade Act requires the USTR to initiate a Section 301 investigation into the unfair foreign practices or policies of the designated priority foreign country within 30 days after identification. This investigation can last up to 18 months after which the USTR has to take mandatory retaliatory actions against the priority foreign country. However, similar to Section 301 the USTR has discretionary authority to initiate a Section 301 investigation and decide whether and how to retaliate. In particular, the USTR does not have to initiate an investigation or take retaliatory actions if such measures could be detrimental to US economic interests. In that case it has to justify its inaction to Congress. The decision mechanism of Special 301 require the cooperation of the USTR, Congress, and the private sector. Understanding that the negotiation agenda of the USTR for the IPR consultations with China was a product of dynamic, domestic procedures, allows us to select the USTR as one of the main actors in the case study. It is not, however, a unitary actor.

Intellectual property rights are only one out of many commercial issues of US foreign policy towards China. The US-Chinese relationship is of a very complex and multifaceted nature. That is why it is crucial to understand the greater foreign policy context of the IPR negotiations and the guiding principles of US foreign policy towards China. The Clinton Administration follows a China policy of *comprehensive engagement*. Key elements in this policy are that the US pursues its interests appropriately, the two countries resolve differences through peaceful dialogue and build mutual confidence and agreement.<sup>72</sup> The goal of engagement is to build long term economic and business ties and build a stable, prosperous,

<sup>72</sup> See the comments by Peter Tomsen in United States House of Representatives (1995, 48-51).

open, and strong relationship. Such a relationship contributes to long term regional and global peace and security.<sup>73</sup> The 1995 and 1996 IPR agreements had positive spill-over effects on the debate concerning the renewal of China’s MFN status and other bilateral negotiations like the textile or market access disputes. Hence, the IPR agreements and their positive political and economic impacts showed that the policy of comprehensive engagement is working. The IPR issue is significant because the dispute revealed China’s willingness to comply with international norms on IPR protection and implement bilateral trade agreements effectively. Success in the IPR consultations could cast a positive light on future World Trade Organization accession talks with China and improve China’s chances of becoming a member of this global trade organization. Furthermore, the IPR dispute is significant because it affected an important sector of the US economy. This will be elaborated in the next subsection.

## .2 US Intellectual Property Industry

The private sector plays a key role in the work of the USTR. It assists the USTR in monitoring compliance with trade agreements, helps develop US trade policy, and consults on negotiations and agreements. Formal advisory committees consisting of representatives of the private sector and the government meet once every few months. They assist in developing long-term strategies and policy formulations. Informal consultations with the private sector also play a significant role in providing USTR with up-to-date and first-hand information. Such was the case before, during, and after the IPR negotiations with China from 1994 until 1996. In addition, the USTR asks the private sector and the public to comment on policies and procedures that should be considered in the annual National Trade Estimate report. The IP industry regularly consults with USTR and provides information about the scope of the problem in international markets. Major trade organizations such as the Software Publishers Association (SPA) and the International Intellectual Property Alliance (IIPA) submit annual reports about worldwide copyright infringement and recommend specific actions against the worst offenders.

The American intellectual property (IP) industry is one of the leading industries in the US economy. It comprises enterprises in computer software, sound recordings, motion pictures, pharmaceuticals, agrochemical products, books, and others. In 1995, 5% of the US work force were employed in copyrights based enterprises.<sup>74</sup> In the same year, the copyright industry produced approximately 6% of annual GDP or about \$350 billion worth of goods and services. The IP industry is also one of the fastest growing industries in the US. While the US economy grew 1.5% in 1993, the copyright industry for example grew 4.2%. Employment in the copyright industry grew by 3% in the same time period (nationally only 0.97%). Its foreign sales amounted to \$36.2 billion in 1991. The US software industry is the world leader with a 75% global market share. In 1995, it created 60,000 new jobs.<sup>75</sup>

The obvious objective of every IP enterprise is to maximize its profits and expand its international market share. Due to the globalization of markets, it is in its best interest that its IPRs are protected internationally. Ineffective enforcement of IPRs can reduce profits and lead to loss of market shares, both domestically and globally. It weakens the competitiveness

<sup>73</sup> Comprehensive engagement is an integral part of the Clinton Administration’s five economic goals. These goals are to “(1) increase investment and reduce budget deficit, (2) make trade a priority element of national security, (3) improve coordination with other major economies to promote global economic growth, (4) promote the steady expansion of growth in the developing world, and (5) encourage market reform in Russia and the former Soviet Union” (United States International Trade Commission, 1992-1996, XV).

<sup>74</sup> This is equivalent to the number of people working in the US auto industry.

<sup>75</sup> All data come from International Intellectual Property Alliance (1997) and several press releases of the IIPA.

of firms, distorts trade flow, diminishes incentives and funds for new research and development as well as innovation. It addition, it causes lost sales in third markets.<sup>76</sup> The lack of effective IPR enforcement in China has negative effects on the overall foreign investment climate, holds back high-tech innovation in China, and casts a long shadow of doubt on the bona fides of China's goal to enter the WTO. It undermines the development of close business ties of high tech industries between the two countries. The industry can try to influence the Chinese central, provincial, and local governments and request the development of a more effective IPR regime, but its means are certainly limited. Consequently, it relies on the assistance and leverage of the USTR in international negotiations involving IPRs.

The nature of Special 301 highlights the significance of the relationship between USTR and the private sector. The importance of that relationship cannot be emphasized enough. By law, the USTR has to defend US commercial interests. It thus functions as a spokesperson of the US IP industry and the US economy during international negotiations. The USTR has greater leverage in negotiations with China than the private sector. It can threaten to retaliate against China with economic sanctions and link the continuation of other negotiations and support of China's accession to the WTO and renewal of its MFN status to concessions of China in the IPR dispute. This indirect linkage may have increased the negotiation leverage of the US, but it also put additional pressure on both parties to reach an agreement and not spoil the overall bilateral relationship. Still, because other commercial and noncommercial issues affecting the bilateral relationship were not central parts of the dispute and, consequently, the bilateral negotiations were mostly very focused. The unanimous and strong support of the IP industry for a tough stance by the USTR against China strengthened the USTR leverage during the IPR negotiations. Internal opposition within the private sector did exist, but did not have significant influence. Consequently, the private sector spoke with one voice. IP issues such as patents and trademarks were sufficiently covered in the 1992 MOU and were not the prime topic of the consultations between the two governments.

Between 1994 and 1996 a number of trade organizations were involved in informal consultations with the USTR. The most influential and outspoken organizations were the IIPA and SPA. The IIPA and SPA represent most of the US copyright industry. Other major organizations such as the US-China Business Council and companies like Boeing and General Motors that are not core copyright firms supported the IIPA and SPA. Since copyright related issues were the primary subject of the bilateral dispute the activities and statements of the IIPA and SPA between 1994 and 1996 are an adequate mirror of the IP industry's viewpoint. They are representative of the US IP industry.

### 3 The People's Republic of China<sup>77</sup>

It is an understatement to interpret the US-Chinese relationship as complex and multidimensional. China has strong commercial interests in a stable relationship with the US. It runs a large trade surplus with the US. Each year 40% of China's exports go to the US.

<sup>76</sup> It is beyond the scope of this thesis to provide an analysis of trade related IPRs (TRIPs). On the economic effects of IPR infringement see, for example, Deardorff (1992), Feinberg & Rousslang (1990), Ferrantino (1993), Kotabe (1992), Walker & Bloomfield (1988), Wilkins (1992), and other sources in the bibliography.

<sup>77</sup> It is beyond the scope of the thesis to provide an in-depth institutional analysis of China's IPR regime. Instead, this section presents a brief picture of China that emerges from selected literature, internet sources, and personal interviews. For an in-depth analysis of China's institutional environment, the interested reader may be referred to the bibliography. See, for example, Benewick & Wingrove (1995), Birden (1996), Brahm & Daoran (1996), Butterton (1996), Chen (1992), Duvanel (1996), Fung (1996), Graham (1996), Kolton (1996), Lardy (1994), Laufer (1989), Potter (1995), Ramjerdi & D'Amato (1995), Wu (1989), Yabuki (1995), Zhang & Wang (1995), and Zhou (1992).

This huge trade surplus has initiated a number of investigations into its causes. On the one hand, China exports primarily goods in which it enjoys a comparative advantage to the US. On the other hand, China imposes numerous tariff as well as non-tariff trade barriers to US imports into China. The resulting disputes involve issues of general market access, transparency of laws regulating trade, trade in textiles, services, banking, and insurance, civil aviation, and, last but not least, the ineffective protection of IPRs in China. Since 1979, China has undertaken several steps to solve these disputes and has passed several new laws and regulations. Responding to the international criticism of its ineffective IPR regime, China has made efforts to conform to international standards of IPR protection. It joined major international IPR organizations and conventions such as the World Intellectual Property Organization (1980), the Paris Convention for the Protection of Intellectual Property and the Madrid Agreement for the International Regulation of Trademarks (1989), the Bern Convention (1992), and the Geneva Phonogram Convention (1993). It fundamentally reformed its domestic laws and regulations governing the protection of IPRs.<sup>78</sup> Consequently, it is fair to say that, at least on first sight, China has a complete law enforcement system for IP protection. This impression is enhanced by China's non-legislative efforts to strengthen IPR protection. The Chinese government has established IP courts and other support groups. After the 1995 IPR Enforcement Agreement, China initiated a special enforcement period and a joint task force and cracked down on IP piracy. It has enforced its border controls and custom enforcement measures.

Unfortunately, the positive first impression of China's IPR regime portrays only partial reality. Reports of continued infringement and piracy of IP products show that it still has a long way to go. There is still a wide gap between the content of IP legislation and its enforcement. Official Chinese government documents such as the *White Paper on Intellectual Property Rights*<sup>79</sup> fail to mention that the performance of laws lags behind their intended content. Chinese IP laws are often inconsistent with basic informal institutions and foundations of the Chinese legal system, culture, and society (cf. Fung, 1996, 630).<sup>80</sup>

Recent improvements in China's IPR protection indicate the development of a more effective IPR regime, but this is a slow and gradual process. While it can be relatively easy to reform formal rules and regulations, it may take generations to develop the underlying institutions that can guarantee enforcement of the formal legal framework. Confucianism and Marxism/Leninism still influence the daily political and social life of China today. Confucianism stresses the importance of social relationships and the interest of the social community. It is characterized by a distrust of formal law. Laws provide mere guidance and suggest only voluntary compliance. This is reflected in the vague language used in laws and regulations that give room to loopholes and lax interpretations. Transparency of laws and regulations are obscured and result in the unpredictability of regulations (Potter, 1995).<sup>81</sup> In Confucian tradition, the personal good and interest is subject to the greater social good. Individual inventions are deemed social products (Marx) or property of the state (Mao) that ought to be shared with greater society (Ramjerdi & D'Amato, 1995). Personal gains are secondary to national pride and community gains (Fung, 1996).<sup>82</sup> The communist tradition of

<sup>78</sup> A trade mark law was passed in 1983, the patent law in 1985, and copyright laws in 1986 and 1991.

<sup>79</sup> See [www.chinanews.org/WhitePapers/IntellectualPropertyProtectionE.html](http://www.chinanews.org/WhitePapers/IntellectualPropertyProtectionE.html).

<sup>80</sup> "The new intellectual property laws are ... not consistent with the Chinese legal system, which is based on a set of assumptions different from those of Western legal systems" (Fung, 1996, 630).

<sup>81</sup> Chen (1992) points out that "many legal textbooks in China today still portray, and many officials still regard, law as an instrument for class rule, and laws in the socialist society - before social evolution into the classless communist society of the distant future - as a tool for the dictatorship of the proletariat and for suppression of the enemies of socialism" (ibid., 38).

<sup>82</sup> "Enforcement of intellectual property rights was traditionally motivated by a desire to maintain the state's

the rejection of private property makes it difficult to interpret IPRs as economic assets rather than public goods.<sup>83</sup> This is especially true for the protection of intangible assets such as software. While people may view hardware as an asset, they may not understand the invisible asset of software (Zhang & Wang, 1995, 65).

Confucian values are also reflected in the Chinese negotiation style.<sup>84</sup> The strong emphasis on social relations in Confucianism plays a central role in how the Chinese perceive dispute resolution. Negotiations are process-oriented and conciliation is non-binding. This stands in contrast to the goal-oriented orientation of the US where negotiations are interpreted as a process to reach a number of objectives and lead to a binding contract. During the IPR negotiations, the Chinese tried everything to save their face and defend their current IPR regime. Win-Win outcomes were suspect insofar as they may have suggested that the other party has won a greater part of the pie. Concessions were made only in the last minute. In contrast, the US delegation was interested in a mutual IPR agreement (a win-win outcome) right from the beginning of the negotiations.

One of the prerequisites for a functioning national IPR regime is its enforcement and the administrative cooperation between and among the central, provincial, and local governments in China. This is precisely what is lacking in China (Kolton, 1996). Prior to 1949 the central government did not have control over the provincial governments. This has changed over the years, but administrative challenges remain. Conflicts on the horizontal level, i.e., within governments or agencies on the same level, and vertical levels, i.e., between governments on different levels, are common. Inter-provincial economic and political rivalry and competition for preferential central treatment characterize a heterogeneous government structure. They impede the effective enforcement of national IPR laws and regulations (Benewick & Wingrove, 1995). In addition, economic and political differences vary across provinces. Often, parochial interests are at odds with national interests. Broad discretion of interpretation and implementation of IPR regulations allow local interests to supersede national policies and can thus undermine the development of an effective, national IPR regime. "The critical role of local officials in administering the intellectual property system represents a significant obstacle to effective enforcement" (Potter, 1995, 48). China does have IP courts, but they often lack enforcement and delegation power because of vertical and horizontal rivalries in other departments and agencies.<sup>85</sup> Imposed penalties against IP infringement are seldom severe enough to stop continuing piracy.<sup>86</sup> In addition, the legal training among judges is generally insufficient and IPR laws and regulations vague and confusing (Butterton, 1996; Kolton, 1996).

There is a great cloud of uncertainty concerning the internal policy decision making process of China. Given the complex domestic structure that influence China's negotiation agenda before and during the IPR episode, it is reasonable to select the central government, represented by the Ministry of Foreign Economic Relations and Trade (MOFERT), and the provincial governments as key actors. Faced with the largest, and still growing population the Chinese government seeks to control the masses and achieve stability and political and economic integration (Fung, 1996). In this respect, "law is not a limit on state power; it is a

power, not to promote original authorship" (Kolton, 1996, 456).

<sup>83</sup> See also Potter (1995, 49).

<sup>84</sup> For a more comprehensive discussion of the Chinese negotiation style see Brahm & Daoran (1996) and Graham (1996).

<sup>85</sup> Chen (1992) explains that courts "are bound to apply and enforce the law, but whether a document is to be applied or enforced by them depends on the circumstances and is not governed by a uniform or universal rule" (ibid. 78).

<sup>86</sup> Until 1994, IP infringement was only a civil but not a criminal offense (Butterton, 1996; Zhang & Wang, 1995).

mechanism by which state power is exercised" (Potter, 1995, 5). However, national legislation does not automatically translate into control of the provincial governments. Provincial governments can be relatively independent from Beijing, both politically and economically. For example, unlike other provinces Guangdong and Fujian provinces retain locally generated income. National enforcement of IPR laws and regulations rely on the cooperation between and among national and provincial departments and agencies. Because provincial governments interpret and enforce the national laws and regulations according to their own interests they have greater influence on the IPR pirates on the local level. The central government exercises major control over state-owned enterprises; provincial governments can apply additional pressure and influence private enterprises. This is why the provincial governments become major actors. Of course, there are other important actors in China.<sup>87</sup> However, it is particularly the relationship between the central and provincial governments that significantly affects the enforcement of existing IPR laws and regulations and the implementation of the IPR agreements. This sufficiently justifies the selection of the central and provincial governments as the main actors in our case study.

#### 4 The Analytical Framework of the Sociocybernetic Model

We now apply a discrete model of sociocybernetics to the analysis of the 1994-1996 IPR negotiations. We introduced the main actors and their objectives in the previous section. Each of them is now represented by simple 2x2 FSA whose precise structures will be explained further below. Since the IPR negotiations comprised a fairly long time, we divide them into five phases and analyze them separately. The first phase covers the period from the recommendation of a Section 301 investigation of China's IPR regime in 1994 until the first formal negotiations. The second phase incorporates the negotiations that eventually led to the 1995 IPR agreement. The third phase includes the reaction of the US IP industry and USTR to China's implementation efforts of the agreement. The fourth phase comprises the time from the new Section 301 investigation in early 1996 until the Enforcement Agreement in the summer of 1996. Finally, the fifth phase encompasses the period immediately after the signing of the Enforcement Agreement.

The model is embedded in a two-level games framework originally introduced by Putnam (1988). Similar to Putnam we distinguish two levels of interactions: a domestic and an international level. The two-level games approach allows us to explain the interconnectedness of the domestic and international level of social interactions before, during, and after the negotiations in one coherent framework. Putnam's metaphor is expanded insofar as we identify several sequential stage games that describe the interconnectedness of these two levels. Each stage game corresponds to the phases of the negotiations. They analyze the events and developments before, during, and after the 1995 and 1996 IPR agreements with China. The analysis starts with the initiation of a Special 301 investigation of China's IPR regime and concludes with a discussion of the chances for implementation of the second agreement in 1996.

The *first stage game* describes the domestic dynamics in the two countries that help define the negotiating agenda for bilateral trade negotiations with China involving intellectual property rights (IPRs). For simplicity reasons the analysis is limited to two actors in each country. This is the IPR industry and the US government in the US and the provincial

<sup>87</sup> The army of the PRC also plays a significant role and can restrict the range of actions of the central and provincial governments. However, as long as we keep in mind that the army constitutes an important constraint especially to the actions of the central government, it suffices to limit the analysis to the political relationship between the provincial and central governments. This way we can include the army indirectly as a third major actor.

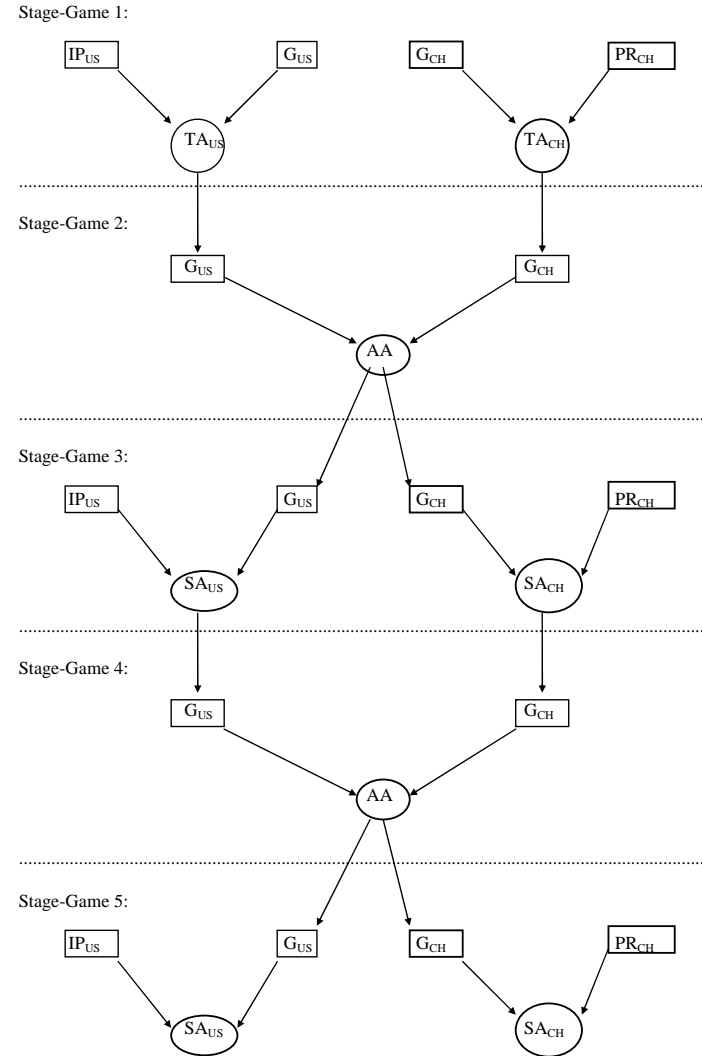
governments and central government in China. In the US the social interactions between the industry and the USTR were mostly informal consultations before the beginning of the bilateral negotiations. The outcome of the interaction dynamics on this domestic level help define the negotiating agenda and strategy of the USTR in the next stage game. The interaction between the central Chinese and its provincial governments take place in the daily political landscape. While this explanation may not be very accurate, it suffices for the purposes of this study. The outcome of these social interactions indicates the level of support for an effective IPR regime in China. It influences the negotiating strategy of the Chinese government in the next stage game. The *second stage game* looks at the series of IPR negotiations in 1994/95 after the USTR designated China a priority foreign country and initiated a Section 301 investigation of China's IPR regime. The US is represented by the US Trade Representative (USTR) and China by the Ministry of Foreign Economic Relations and Trade (MOFERT). The outcome of the second game results in an atmosphere that affects the wording and content of the IPR agreement. The domestic reaction to the agreement in the US and the implementation of the agreement in China are subject of the *third stage game*. The US IP industry continued to lose millions of dollars because of persisting piracy in China. As a consequence the USTR started a new investigation of the matter. The social interactions of this game are again informal consultations between the industry and USTR. The outcome of these interactions inform us whether or not the IP industry and USTR were satisfied with China's efforts to implement the agreement. The efforts of the central Chinese government were constrained by the interactions with its provincial governments. The outcomes of those interactions reveal the likelihood for effective compliance with the bilateral IPR accord. The *fourth stage game* describes the resulting new IPR negotiations between the two countries in 1996. Its structure resembles the second stage game of the first series of negotiations. Finally, the *fifth stage game* elaborates on the domestic support of the agreement in the US and the chances for its successful implementation in China.

Figure 1 illustrates the interconnections of the five stage games. The nodes with rectangles refer to the finite state automata (FSA), i.e., the actors, of the stage games. Circles represent the results of their interactions. The arcs connecting the rectangles and the circles represent the responses of the actors.

Figure 1

**Legend**

- IP intellectual property industry
- PR provincial governments that have an impact on local IP pirates
- G government
- US index for the US
- CH index for China
- TA trade atmosphere
- AA agreement atmosphere
- SA supporting atmosphere for successful implementation of the IPR agreement



It is important to note that the analysis of the stage games can principally start at any stage depending on the research question. The sociocybernetic model resembles Putnam's two-level games approach as far as it analyzes the interconnectedness of domestic politics and diplomacy on two levels. However, the sociocybernetic model adds a dimension to the analysis because it explains how the interactions on the domestic and international levels are linked with each other.

Treating the interactive games as sequential facilitates the analysis. Of course, the actual social dynamics are much more complex than the model suggests. Yet, we should not forget that the simplest, non-trivial design of two interacting 2x2 FSA yields a huge number of distinct systems. This is why the analysis is limited to two series of simulations. They differ in the description of the nature of the main actors, i.e., the structure of their transition tables, in the first stage game. In spite of this limitation, the following analysis will reveal the immense complexity of the resulting social interactions and outcome possibilities.

### 5 Simulations and Results of the Sociocybernetic Model

This section is more technical than others. Unfortunately, technical jargon cannot always be avoided. In order to facilitate understanding, each discussion of a stage game concludes with a brief summary of the main findings of the simulation results. Section 3.6 reviews all generated hypotheses and evaluates the value of sociocybernetics to the case study.

#### .1 Simulation Series ONE

##### Stage Game 1: The Domestic Dynamics in the US and China Before the IPR Negotiations in 1994/95

###### • US

We can summarize this first stage game and define the variables and parameters as follows:

###### Actors:

IP industry and USTR

###### Interactions:

Mostly informal consultations before the bilateral negotiations.

###### Outcome of social interactions:

Definition of the negotiating agenda and strategy.

###### Internal states/constraints:

*IPR Industry: binary value 1* - Internal opposition or reservation across relevant and influential industries to an outspoken and expressed stance against China.

*value 0* - Internal support across relevant and influential industries for an outspoken and expressed stance against China.

*USTR: value 1* - Lack of internal support for a thorough and meticulous Special 301 investigation and tough stance against China.

*value 0* - Internal support for a thorough and meticulous Special 301 investigation and tough stance against China (including public threats of sanctions and other forms of retaliation).

###### Actions/output:

*IPR Industry: value 1* - Public statements against a tough stance against China supported by information made available to USTR.

*value 0* - Explicit and strong, public support for a tough stance against China and a very thorough, highly publicized investigation of China's IPR regime under Special 301.

*USTR: value 1* - Advocates a more cooperative and cautious approach in publicly stigmatizing China's ineffective IPR regime.

*value 0* - Highly publicized investigation of China's IPR regime under Special 301. Public threats of retaliation

and sanctions against China.

The main actors of this phase are the USTR and the IP industry. The IP industry seeks better IPR protection in China. Special 301 of the Trade Act defines the objectives of the USTR. The goals of the actors are reflected in their behavior patterns and internal states. The internal opposition against or support for an outspoken and expressed tough stance against China characterizes the internal state of the industry. Applying a binary code for the internal state, a "1" connotes an internal reservation across relevant and influential industries for an expressed tough stance against China. If in contrast, the industry enjoys strong internal support for a tough stance the parameter is "0." The consultations between the IP industry and the USTR were mostly informal. The actions of the IP industry in these meetings were its statements supporting or opposing a tough stance against China. In particular, the industry's action assumes the value "0" if it demands a tough stance against China and a very thorough, highly publicized investigation of China's IPR regime under Special 301. However, if it cautions USTR and suggests greater reservation in the Special 301 investigation, the parameter of the industry's output is "1." Analogous to the industry, the USTR's internal state is 0 if it enjoys internal support for a thorough and meticulous Special 301 investigation and stance against China including public threats of sanctions or other forms of retaliation. If, on the other hand, the USTR is constrained by the lack of such support, its internal state assumes the value "1." For example, during the informal consultations between the USTR and industry, the USTR either advocates a more cooperative and cautious approach in publicly stigmatizing China's ineffective IPR regime or pushes for a highly publicized investigation of China. In the first case, the USTR output is "1", in the second case it is "0."

The variables and parameters are fairly general and at first sight might not yield too much room for interpretation. This will prove not to be the case. The variables and parameters sufficiently describe the atmosphere of the social dynamics. They thus leave ample room for interpretation. The selection of the variables and parameters requires an institutional analysis of the actors and their actual interactions. The previous section provided this analysis. Thus, the game description is an adequate approximation of reality.

The behaviors of the two actors are summarized in the following transition tables:

Table 5a

Table 5b

Industry					USTR				
Row	I	S	O	S'	Row	I	S	O	S'
1	0	0	0	0	1	0	0	0	0
2	0	1	1	1	2	0	1	0	1
3	1	0	0	0	3	1	0	1	0
4	1	1	1	1	4	1	1	1	1

Note that the internal states of the actors (i.e., S') remain unaffected by their input and output. This suggests that the internal states are beyond the direct control of the actors. Interpreting the internal states as internal constraints to the actions of the actors makes sense. The USTR may face internal opposition to a tough stance against China for various political reasons. This need not restrict the actions of the USTR. On the other side, the industry may articulate support for a tough stance against China even though this view is not shared by the whole industry. The transition tables of the two actors differ insofar as the industry's actions are reflections of its internal state, whereas the output of the USTR mirrors the observed actions of the industry. In other words, the industry's actions are introvert and the actions of the USTR extrovert.

Merging the two transition tables yields the following connection matrix:<sup>88</sup>

Table 6

I-US									
Initial Conditions				Responses					
Situation	I1	S1	I2	S2	O1	S1'	O2	S2'	Situation
0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1	1
2	0	0	1	0	0	0	1	0	2
3	0	0	1	1	0	0	1	1	3
4	0	1	0	0	1	1	0	0	4
5	0	1	0	1	1	1	0	1	5
6	0	1	1	0	1	1	1	0	6
7	0	1	1	1	1	1	1	1	7
8	1	0	0	0	0	0	0	0	8
9	1	0	0	1	0	0	0	1	9
10	1	0	1	0	0	0	1	0	10
11	1	0	1	1	0	0	1	1	11
12	1	1	0	0	1	1	0	0	12
13	1	1	0	1	1	1	0	1	13
14	1	1	1	0	1	1	1	0	14
15	1	1	1	1	1	1	1	1	15

This connection matrix is similar to the matrix in table 3 in section 2.6. It does not yet provide information about the dynamics of the social interactions because we have not included the various interactive weights. It is thus incomplete.<sup>89</sup> A run of the sociocybernetic program<sup>90</sup> reveals the data structure that can be illustrated in directed graphs or *digraphs* in figure 2 below. The nodes refer to the line numbers of the connection matrix and denote the respective initial conditions, i.e., *I1,S1,I2,S2*. The arcs connecting the nodes represent the responses of the players (*O1,S1',O2,S2'*) and lead to the succeeding node that denotes the new initial condition. Note, that once a path is taken, it is not possible to return to the preceding node.<sup>91</sup> This characterizes the deterministic nature of the moves. Since the infinitely repeated game has only a finite number of possible outcomes, the reversed trees have to end up in terminal cycles.<sup>92</sup> Terminal nodes are depicted by the closed arcs around their number.

Figure 2

Colony A (interactive weights 1,1,1,1; 1,1,2,2; 2,2,1,1; 2,2,2,2):

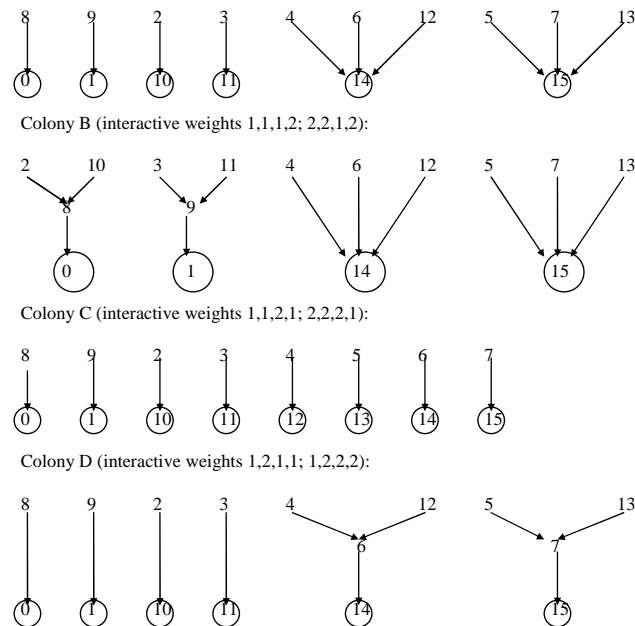
<sup>88</sup> The roman numerals and abbreviations in the top left corner of the connection matrices, e.g., I-US, refer to the respective stage game.

<sup>89</sup> Recall, that it is not merely the observed input that affects the resulting action and new internal state of an actor, but the *perceived* input. Rather than listing all complete connection matrices that result from the various interactive weights, we will later summarize the outcomes of the social interactions and the structure of the whole stage game in form of a table.

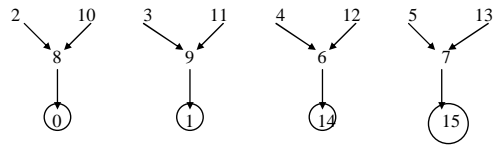
<sup>90</sup> See the appendix for a copy of a sample run of the program.

<sup>91</sup> This holds true except in the case of multiple terminal cycles introduced in section 3.5.2.

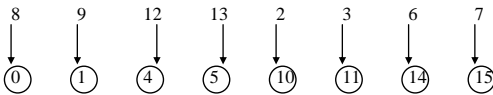
<sup>92</sup> This is an important difference to game theory. In game theory, extensive games are illustrated as game trees with a unique root node and unique paths to every other node. Nodes denote the players, and arcs indicate their chosen strategies. The end node describes the payoffs for each player (Rasmusen, 1989, 46). The digraphs produced by the sociocybernetic model, reverse the arc directions and attach different meanings to the nodes and arcs than game theory. Thus, the term *reversed tree*.



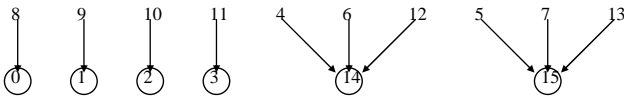
Colony E (interactive weights 1,2,1,2):



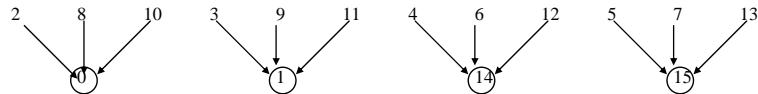
Colony F (interactive weights 1,2,2,1):



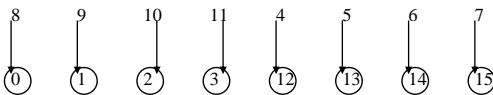
Colony G (interactive weights 2,1,1,1; 2,1,2,2):



Colony H (interactive weights 2,1,1,2):



Colony I (interactive weights 2,1,2,1):



The variety of the digraphs underlines the significance of the initial conditions and the dynamics of the interactions represented by the different weights. Given the initial conditions there is a wide variety of transitory and final outcomes. Different initial conditions and weights lead to different outcomes. This is illustrated by the partition of the set of all possible outcomes, so called *colonies*, into disjoint subsets or *clusters*. For example, the interactive weights 1,2,1,2 in colony E yield four distinct clusters. In other words, if both actors value the output of the other actor higher than its own actions, there are four clusters depending on the initial conditions. Suppose the initial condition is situation 5 in colony E in figure 2. Both the industry and the USTR face internal opposition to a tough stance against China ( $S1=S2=1$ ) and interpret the actions of each other as a call for a tough stance ( $I1=I2=0$ ). Given the nature of the actors the industry will next qualify its public support for a tough stance ( $O1=1$ ) in accordance with its internal opposition to a tough stance ( $I1=I1'=1$ ). On the other side, the USTR favors tough actions against China ( $O2=0$ ) even though its internal constraint has not changed yet ( $I2=I2'=1$ ). The USTR interprets the newly observed action of the industry in situation 7. We know that it values the actions of the industry higher than its own output (interactive weights 1,2,1,2 in colony E). In addition the USTR actions are extrovert. Consequently, the USTR revises its action and eases its tone against China

( $O2=1$  in situation 7). In contrast to the USTR the industry's actions are introvert. It values the output of USTR higher than its own, but the internal constraints weigh heavier than the perceived input and the industry continues to suggest a more diplomatic stance against China during the upcoming negotiations ( $O1=1$ ). Situation 7 thus results in situation 15. Both the industry and USTR advocate a more cautious and cooperative strategy in the upcoming negotiations with China.

There are nine distinct colonies. It is interesting that when we perform computer simulations of this and all other stage games the simulations always yields nine equivalence classes of colonies. This can be summarized in the following table:

Table 7

Colony Weights	A	B	C	D	E	F	G	H	I
	1111	1112	1121	1211	1212	1221	2111	2112	2121
	1122	2212	2221	1222			2122		
	2211								
	2222								

A closer analysis of the interactive weights reveals that this partition is not a coincidence. Colonies C, F, and I have in common that the second actor always values its own action higher than the output of the other actor (interactive weights \*\*21). Colonies B, E, and H symbolize the opposite. The second actor weighs the output of the other actor heavier than its own (interactive weights \*\*12). Similarly, colonies G, H, and I contain information about the outcome whenever the first actor cares more for its own actions whereas in colonies D, E, and F it is the reverse scenario. Finally, Colony A includes interactive weights that signal that both actors are “indifferent” in their evaluation of their own and the other’s output.

The illustration of the structure of the social interactions between the industry and USTR conveys a first impression about the various possible outcomes. However, it can quickly become tedious to use this kind of illustration for further interpretation and comparison of transitory and final outcomes. Instead, we can summarize the results of the simulations as a table that includes additional information about the social interaction dynamics.

Table 8

[See table 1-I US(a) of the simulation results of stage game I-US in the appendix 5.1, page 165]

The column *System Simulation* contains all situations that lead to the various terminal cycle arrays ( $TCA_i$ ) in the next column. If a situation leads directly to the terminal cycle this is illustrated by a semi-colon. If it first leads to another situation that is not a final outcome, this is denoted by a dash. For example, situation 8 in the first row leads directly to the terminal cycle 8, whereas situation 2 in colony B first goes into situation 8 and then becomes situation 0. The column  $Colony_i$  lists the respective colony where the index  $i$  goes from A through I. The column *Cluster* lists the number of clusters and *Nodes* contains information about the number of nodes in each cluster.

Ranking the outcomes of all scenarios within a stage game according to their levels or atmosphere of support for a tough stance against China, we can utilize a special index. It is computed as the sum of binary 1’s from each initial condition through each terminal cycle (the so called *cumulative node value* or  $CNV$ ) multiplied by 250 and divided by the total number of nodes on the path from each initial condition to the terminal cycle (the so called *weighted number of nodes* or  $WNN$ ).<sup>93</sup> Rather than choosing different names for this index in each stage game, we call this index *trade index* in all stage games. The exact interpretation of the trade index will be explained in the various stage games. In this first stage game a trade index of 1000 specifies an atmosphere of total opposition to a tough stance against China. A trade index of 0 on the other side describes the strongest possible domestic support for a tough stance against China.

It is important to understand that a high trade index of a specific system does not necessarily imply an outcome that is characteristic of total domestic opposition against a tough stance against China. A *system trade index*  $STI$  accounts for the whole system while a

<sup>93</sup> There can be a maximum of four binary 1’s in each situation. Multiplying the number of binary 1’s by 250 we get something like a “batting average” which facilitates later computations. We can thus avoid decimal fractions.

*terminal cycle trade index*  $TCI$  considers only the final outcomes in that system. Given that a system can be a cluster, a colony, or the whole stage game, we distinguish system and terminal cycle trade indices for clusters, colonies, and the whole stage game. Whenever the system trade index of a system is lower than the terminal cycle trade index of that system, it may indicate a deterioration of the atmosphere.

Specifically, let  $i$  denote the index for the colonies A through I,  $j$  the index for the number of clusters. We can then summarize:

$CNV$	Cumulative node value; sum of binary 1’s from each initial condition through each terminal cycle.
$WNN$	Weighted number of nodes; total number of nodes on the path from each initial condition to the terminal cycle.
$CTI_{ij}$	Cluster trade index, $\frac{250 * CNV_{ij}}{WNN_{ij}} = CTI_{ij}$
$TCI_{ij}$	Cluster terminal cycle trade index, 250 * number of binary one’s in the terminal outcome (resulting situation in the connection matrix)
$CNV'_i$	Cumulative node value of colony $i$ , $\sum_j CNV_{ij} = CNV'_i$
$WNN'_i$	Weighted number of nodes of colony $i$ , $\sum_j WNN_{ij} = WNN'_i$
$STI_i$	System trade index of colony $i$ , $\frac{250 * CNV'_i}{WNN'_i} = STI_i$
$TCI_i$	Terminal cycle trade index of colony $i$ , $\frac{\sum_{ij} TCI_{ij}}{j} = TCI_i$
$STI$	Combined system trade index of the whole stage game, $\frac{250 * \sum_i CNV'_i}{\sum_i WNN'_i} = STI$
$TCI$	Combined terminal cycle trade index of the whole stage game, $\frac{250 * \sum_i TCI_i}{\sum_i j} = TCI$

We can combine the additional information of the various indices with table 8 and get the following table:

Table 9

[See table 1-I US(b) of the simulation results of stage game I-US in the appendix 5.1, page 167]

Table 9 contains all relevant information necessary for a thorough analysis of the social interactions between the industry and USTR. If we are primarily interested in the final outcomes of certain situations, the following *terminal cycle table* provides a helpful overview:

Table 10

[See the terminal cycle table of stage game I-US in the appendix 5.2, page 186]

This table does not provide any information about transient outcomes. It sheds light only on final outcomes. The first column lists the initial situations of the connection matrix. The following columns contain the terminal cycle arrays the various situations lead to. If a situation leads to a specific outcome in all sixteen simulations, the final outcome is listed in the column *TC* (terminal cycle). The column *TCSum* summarizes the frequency of the terminal cycle arrays. Finally, the column *One's* tells us the total number of binary 1's in the terminal cycle arrays. Its explanatory value will be explained later on.

The summary of the simulation results in tabulated form constitutes a foundation for the further analysis of the social dynamics. Each stage game allows for at least 256 different interpretations. Obviously, it is beyond the scope of the thesis to discuss each and every one of these possibilities. Henceforth we will address the following points: First, we will focus on a select number of interesting and realistic, initial situations. Second, we will have a closer look at the interactive weights and their implications. In addition, we may analyze various trade indices. Third, we will look for interpretations that support or qualify the findings of the first two points. Finally, we will summarize the main findings of the stage game and if possible derive policy recommendations.

In the first stage game, initial situations 0, 1, 4, and 5 of the connection matrix (table 6) are of particular interest because they are good approximations of reality. In all four cases the industry notices that the USTR suggests a tough stance against China and vice versa ( $I1=I2=0$ ). The four situations differ in the selection of the parameters of the internal states. Thus, it becomes possible to learn what difference the internal constraints of the actors can make in the final outcome of the social interactions.

Situations 0 and 1 are always terminal outcomes. The industry and USTR stick with their tough stance against China even though the USTR cannot overcome its own internal opposition in situation 1. Additional informal consultations between the two actors will not change these outcomes. Situation 4 characterizes a scenario where both the industry and USTR interpret the actions of the other actor as a call for a tough stance against China ( $I1=I2=0$ ). The internal state of the USTR signals support for a tough stance and the USTR acts accordingly ( $O2=0$ ). The industry, on the other side, is faced with internal opposition against a tough stance. Consequently, the industry cautions the USTR against a tough stance ( $O1=1$ ). In twelve out of sixteen simulations this scenario leads to outcome 14, three times it results in situation 12 (colonies C and I) and once it is a terminal cycle itself (colony F). Outcome 14 indicates that the USTR does not enjoy the support of the industry for a tough stance against China. Consequently, it does not follow an aggressive strategy against China even though it would have the internal support. Outcome 12 is interesting insofar as the USTR insists on a tough stance against China, but the industry offers only qualified support for this strategy ( $O2=1$ ). However, the USTR *perceives* this support of the industry as strong enough to justify a tough stance against China ( $I2=0$  and hence  $O2=0$ ). Initial situation 5 is similar to situation 4 except that the USTR does not enjoy internal support for a tough stance ( $S2=S2'=1$ ). Twelve times this scenario leads to outcome 15, three times to situation 13 (colonies C and I) and once it is terminal outcome itself (colony F). Outcomes 15 and 13 differ from outcomes 14 and 12 in the internal state of the USTR. Except in colonies D and E, initial situations 4 and 5 always lead directly to the respective final outcome. In colonies D and E situation 4 first leads to situation 6 and then to 14. In this particular case the industry faces internal opposition to a tough stance against China and express their concern in consultations with the USTR. The USTR modifies its stance and suggests a more cautious and diplomatic approach towards China even though it enjoys the internal support for a tough stance. The change of action of the USTR thus reflects the extrovert character of its actions. Situation 5 in colonies D and E are similar to situation 4. The only difference is that the

internal state of the USTR signals opposition to a tough stance.

It is noteworthy that the USTR advocates a tough stance ( $O2=0$  in situations 4, 5, 12, or 13) against China whenever it values its own actions higher than the output of the industry (interactive weights  $**21$ ). Indeed, unless the USTR cares less for the actions of the industry than its own (interactive weights  $**21$  in colonies C, F, and I) the USTR will eventually choose more cautious actions whenever there is internal opposition ( $S1=1$ ) within the industry (situations 4, 5, 6, 7, 12, 13, 14, 15). The reverse is not always true. If there is internal support across relevant and influential industries for an outspoken and expressed stance against China ( $S1=0$ ), the USTR will eventually choose tough actions only if it weighs the industry's actions heavier than its own (interactive weights  $**12$  in colonies B, E, and H). Otherwise, it chooses a more cautious stance. Evidently, these two findings may not be too helpful to a USTR that seeks strong domestic support for a tough stance against China because it cannot observe the internal state of the industry.<sup>94</sup>

Let us have another look at the interactive weights.<sup>95</sup> Whenever the USTR cares more for the actions of the industry than its own (interactive weights  $**12$  in colonies BEH) the following clear picture emerges: If initially there is opposition within the industry for a tough stance ( $S1=1$ ), the USTR will eventually suggest a more cautious and diplomatic stance against China; otherwise, i.e., if  $S1=0$ , the USTR will choose a tougher stance. Given the assumed extrovert behavior of the USTR and introvert industry, this is not too surprising. If the industry does not care too much for the actions of the USTR (interactive weights  $21**$  in colonies G, H, and I) the following picture emerges: If  $I1=1$  the final outcome will either be 14 or 15 except in colony I (interactive weights  $2121$ ) where the USTR eventually chooses a tough stance in situations 4, 5, 12, and 13. If  $I1=0$  both the industry and the USTR adopt a tough stance in colony H, but not so in colonies G and I. This underlines the previous finding that unless the USTR cares for the industry's output, the domestic support for a tough stance against China will not be very strong. If the industry values the actions of the USTR higher than its own (interactive weights  $12**$  in colonies D, E, and F) but the USTR is indifferent about the value of any actions as in colony D, the USTR will ultimately choose a cautious stance against China. The same applies in colony F except in situations 4, 5, 12, and 13 where the USTR advocates a tough stance. Colony E is "straightforward." If  $S1=0$ , both actors will eventually demand strong actions against China; if  $S1=1$  the opposite is the case.

Last but not least, it is worthwhile to compare the system and terminal cycle trade indices of various systems. Colony B yields the lowest terminal cycle trade index (453) whereas colony A has the highest index (644). In other words, if both actors are indifferent about their own and the other's actions, it is unlikely that the industry and USTR jointly demand a tough stance against China (except in situations 0, 1, 8, and 9). The combined terminal cycle trade index of colonies B, E, and H (interactive weights  $**12$ ) is 477 and thus lower than the combined index of colonies C, F, and I (interactive weights  $**21$ ) which is 532. This implies that the USTR is well advised to value the actions of the industry higher than its own if it wants to enjoy strong domestic support for a tough stance against China. Considering all possible situations and outcomes and measuring the overall level of support for a tough stance against China, it might be somewhat surprising to find a relatively high combined terminal cycle trade index of 571. This does not reflect the actual situation in 1994. However, we have to take into account that the combined terminal cycle trade index includes all possible situations even if they are rather unlikely.

*In summary*, if the USTR values the actions of the industry higher than its own and

<sup>94</sup> This holds true unless we relax the assumption that the internal state of an actor is not observable and known by the other.

<sup>95</sup> For the analysis of the effects of interactive weights the terminal cycle table becomes helpful.

there is no internal opposition within the industry against a tough stance, the USTR will likely enjoy strong domestic support for a tough stance against China. On the other side, the USTR will eventually choose more cautious actions whenever there is internal opposition within the industry unless it cares less for the actions of the industry than its own. The reverse is not always true. If there is internal support across relevant and influential industries for an outspoken and expressed stance against China, the USTR will eventually choose tough actions only if it weighs the industry's actions heavier than its own; otherwise it chooses a more cautious stance. If both actors are indifferent about their own and the other's actions, it is unlikely that the industry and USTR will jointly demand a tough stance against China.

- *China*

The first stage game of China is described as follows:

Actors:

Provincial governments and the central government in Beijing.

Interactions:

Daily political relationship.

Outcome of social interactions:

Willingness and/or actions in China for effective IPR protection.

Internal states/constraints:

*Provinces: value 1* - Changing interpretation of IPR as economic assets rather than public goods. Political will to comply with IPR laws and regulations to protect IPRs slowly developing.

*value 0* - Lack of political will to comply with IPR laws and regulations to protect IPRs. Strong provincial interests in piracy.

*Beijing: value 1* - Political will to formally enforce IPR protection. Internal support (including the army), commitment, confidence in law enforcement ability, reserved willingness to embrace capitalist values and beliefs (in the framework of a socialist market economy).

*value 0* - Lack of political will to formally enforce IPR protection. Internal opposition (including the army), lack of commitment, lack of confidence in law enforcement ability, unwillingness to give up old values and beliefs.

Actions/output:

*Provinces: value 1* - Serious and credible efforts to improve IPR protection, e.g., closing or transforming factories that pirate US IPR products.

*value 0* - No compliance of national IPR rules and regulations, exploiting loopholes, total blocking of directions. Continuation of IPR piracy in provincial and local firms. No crack-down of IPR piracy.

*Beijing: value 1* - Steps toward a more effective IPR regime as outlined in the 1992 Memorandum of Understanding about IPRs.

*value 0* - No serious actions undertaken against IPR piracy in China. No transparency of laws and regulations, creation of hidden obstacles.

It is assumed that that both actors are introvert. Their own internal state generally determines their choice of actions.<sup>96</sup> Hence, the following two transition tables and resulting incomplete connection matrix may summarize the behavior patterns of the actors.

**Table 11a**

**Table 11b**

<sup>96</sup> Remember that the transition table does *not* account for the dynamics of social interactions. The dynamics of social interactions enter this game only when we take the various interactive weights into account.

<i>Provinces</i>					<i>Beijing</i>				
Row	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>	Row	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	0	1	0	0	0	0
2	0	1	1	1	2	0	1	1	1
3	1	0	0	0	3	1	0	0	0
4	1	1	1	1	4	1	1	1	1

Incomplete connection matrix:

**Table 12**

I-CH									
Initial Conditions					Responses				
Situation	I1	S1	I2	S2	O1	S1'	O2	S2'	Situation
0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	1	1	1
2	0	0	1	0	0	0	0	0	2
3	0	0	1	1	0	0	1	1	3
4	0	1	0	0	1	1	0	0	4
5	0	1	0	1	1	1	1	1	5
6	0	1	1	0	1	1	0	0	6
7	0	1	1	1	1	1	1	1	7
8	1	0	0	0	0	0	0	0	8
9	1	0	0	1	0	0	1	1	9
10	1	0	1	0	0	0	0	0	10
11	1	0	1	1	0	0	1	1	11
12	1	1	0	0	1	1	0	0	12
13	1	1	0	1	1	1	1	1	13
14	1	1	1	0	1	1	0	0	14
15	1	1	1	1	1	1	1	1	15

Situations 0, 1, 8, 9, and 10 are the most realistic and interesting initial situations. Situation 0 assumes that there is no effective IPR protection in China at all. Neither the provinces nor the central government cares to undertake any necessary actions that help develop a more effective IPR regime ( $I1=S1=I2=S2=O1=S1'=O2=S2'=0$ ). Consequently, it comes as no surprise that situation 0 is always a terminal cycle array.<sup>97</sup> Situation 1 starts out with no actions by the actors ( $I1=I2=0$ ), but there is support within the central government to protect and enforce IPR ( $S2=1$ ). Given the introvert nature of the central government, it tries to undertake concrete action ( $O2=1$ ). Nine times situation 1 results in outcome 11, three times it leads to outcome 9 (colonies B and E), three times to outcome 3 (colonies G and I), and once it is a terminal outcome itself (colony H). The provinces show serious and credible efforts to improve IPR protection too ( $I2=1$  in situations 3 and 11), but their efforts are not long-lasting ( $O1=0$  in all terminal outcomes). Situations 1, 3, 9, and 11 differ in the structure of their initial conditions, but the responses of the actors are always the same. While the central government shows the political will to formally enforce IPR protection and acts accordingly ( $O2=S2'=1$ ), it lacks the support of the provinces ( $O1=S1'=0$ ). For an IPR regime to evolve it takes the joint efforts of both the central and provincial governments. This indicates that the social interactions between the central and provincial governments do make a difference in the enforcement of IPR regulations. As long as there is no political will within the provincial governments to comply with IPR laws to protect IPRs, the provinces will not commit to any serious efforts to improve IPR protection. Thus, central legislation is not sufficient for an effective IPR regime to develop. It is the political will and the interpretation of IPR as economic assets rather than public goods that make a difference. Only if there is internal support on both the central and provincial levels, can an effective IPR regime evolve. A look at the connection matrix reveals that this is the case in initial situations 5, 7, 13, and 15. They all lead to the final output 15. Evidently, this has never been the case in China. If it had been the US would not have had any cause to complain

<sup>97</sup> See the tables of the simulation results and terminal cycles in the appendix.

about IPR piracy in China. We conclude that informal institutions supporting IPR protection are essential in developing an effective IPR regime. This insight is confirmed in situations 8 and 10. The central government has taken actions to protect IPRs ( $I1=1$ ), but there is no internal support on the provincial or central levels ( $S1=S2=O1=S1'=O2=S2'=0$ ). Widespread IPR piracy is the result. Situations 8 and 10 constantly leads to outcome 0. Considering that China did take some actions after the 1992 Memorandum of Understanding and passed legislation to protect IPRs but then, according to US sources, did not enforce these laws, situation 8 and 10 seem to be an excellent approximation of the actual situation in 1994. Situation 9 portrays a central government that is willing to comply with the 1992 MOU ( $I1=S2=O2=S2'=1$ ). Unfortunately, the provincial governments do not share this willingness and block any central legislation on the provincial level ( $S1=I2=O1=S1'=0$ ). The resulting outcomes of this initial situation are identical with initial situation 1.

Thus far we have not discussed the consequence of the interactive weights on the outcome of the social interactions in this stage game. An analysis of the terminal cycle table reveals that an effective IPR regime ( $O1=O2=1$ ) is only possible in situations 5, 7, 13, and 15. This is regardless of the various interactive weights. This does not mean that the interactive weights are less significant in this stage game than in the stage game of the US. Remember, that the structure of the transition tables of the central and provincial governments is identical. We have assumed that both actors are introvert. If the nature of the actors and thus their transition tables differ, the various interactive weights may cause more diversified outcomes. This will become evident as we go along with the analysis of other stage games.

In summary, there is little or no willingness and/or actions in China for effective IPR protection. Hence, it is somewhat surprising to find relatively high combined trade indices ( $STI=527$ ,  $TCI=563$ ) that suggests the contrary, i.e., a good chance for an effective IPR regime to evolve. We have seen that there are only four situations (5, 7, 13, and 15) that ensure effective IPR protection on both the provincial and central levels. Recalling the composition of the trade indices this discrepancy does not come as a big surprise. A trade index is based in part on the cumulative node value regardless if the binary value 1 is the internal state or output of the actors. In this stage game, it does make a difference whether the binary value 1 is the internal state or output. The internal states of the actors matter a great deal in this stage game. The US has to understand that formal, central legislation alone will not automatically improve the IPR situation in China. It is a much greater challenge to try to influence the internal states of the actors. This is especially difficult for the provinces because the US negotiates only with representatives of the central government. The US has to take actions that reverberate on the Chinese domestic level and influences the political will in the central and provincial governments to enforce IPRs.<sup>98</sup> Indeed, the threatened sanctions by the US did try to do just that. They targeted firms that were concentrated in those provinces where piracy activities were worst. The idea and hope were that these provinces would pressure the central government to accede to US demands during the bilateral negotiations so that sanctions could be avoided. Unfortunately, the reverberation of the US actions did not automatically change the internal states of the provinces. This will become apparent in the following stage games.

*In summary*, there is little or no willingness and/or actions in China for effective IPR protection. For an IPR regime to evolve it takes the joint efforts of both the central and provincial governments. As long as there is no political will within the provincial governments to comply with IPR laws, the provinces will not commit to any serious efforts to improve IPR protection. Thus, central legislation alone is not sufficient for an effective IPR

<sup>98</sup> This, of course, is similar to Putnam's (1988) insight that actors on the international level may have to try to influence the win set of the other actor in order to achieve its own objective.

regime to develop. It is the political will, the interpretation of IPR as economic assets rather than public goods, and other informal institutions supporting IPR protection that make a difference.

### Stage Game 2: The Bilateral IPR Negotiations in 1994/95

The series of bilateral IPR negotiations in 1994 and 1995 are described as follows:

Actors:

US and China.

Interactions:

Series of IPR negotiations in 1994/95 after the designation of China as a priority foreign country.

Outcome of social interactions:

Trade index indicating the chance for an IPR agreement.

Internal states/constraints:

*US: binary value 1* - Internal opposition or only qualified support for a tough stance against China.

*value 0* - Internal support for a tough stance against China.

*China: value 1* - Political will and internal support to improve the IPR protection regime. Weighing political and economic costs.

*value 0* - Internal opposition to make any concessions to the US (win-lose attitude). Lack of political will and internal support to improve the IPR protection regime.

Actions/output:

*US: value 1* - Lifting the threat of economic sanctions against China. China no longer a priority foreign country. OR much more cooperative negotiation style or strategy including statements lauding IPR progress in China.

*value 0* - Expressed and performed tough stance against China. Threat of retaliation and economic sanctions against China.

*China: value 1* - Significant concessions and credible promise of stricter and more effective IPR protection in China.

*value 0* - No or hardly any concessions and credible promises of stricter and more effective IPR protection in China.

The analysis of the stage games can principally start at any stage. Thus, it is possible to describe the nature of the actors of this stage game without taking the previous stage games into account. In our case we link the stage games conceptionally and mathematically. One of the assumptions of this model is that the social interactions of the domestic stage games affect the social interactions on the international stage and vice versa. In other words, the transition table of the actors should reflect the social dynamics of the previous stage game. We can develop an algorithm that manages to incorporate all 256 possible outcomes of the social interactions of the previous stage game into the transition table of the actor that goes on to the next stage game.<sup>99</sup>

The following paragraphs explain this algorithm: Since the selected variables and parameters of the second stage game are related to the first stage game, it is possible to translate the final outcomes summarized in the connection matrix into the new respective transition table. Notice that situations 0, 4, 8, and 12 of the connection matrix reflect the first row of the transition tables of the US and China (I=0, S=0). Similarly situations 1, 5, 9, and 13 determine the second row of the transition tables (I=0, S=1), situations 2, 6, 10, and 14 the third row (I=1, S=0), and situations 3, 7, 11, and 15 the fourth row (I=1, S=1). If the IP industry and provincial governments would move on to the second stage game, situations 0, 1, 2, 3 would determine the first row of their transition tables, situations 4, 5, 6, and 7 the second row, situation 8, 9, 10, and 11 the third row,

<sup>99</sup> Recall the assumption sequential stage games. The outcome of a sequential stage game reflect the dynamics of social interactions of the whole game.

and situations 12, 13, 14, and 15 the fourth row.

Column *One's* in the terminal cycle table contains the total node values of the terminal cycle arrays for each initial situation. We add this sum to the sum of the node values of those situations that determine a specific row of the transition table. For example, the sum of the node values of situation 0 in the terminal cycle table of the first US stage game is 0, the sum of situation 4 is 43, the sum of situation 8 is 0, and the sum of situation 12 is 43. Adding the sums gives 86. We then have to divide this number by 4 and 16, i.e., 64, and get the value of the first row of the transition table of the USTR in stage game two. This is 1.34 which is rounded down to 1. In other words, the value of the first row of the new transition table is 1. This allows for two possible entries in the first row 0,0,0,1 (I,S,O,S') or 0,0,1,0.<sup>100</sup> The values of the remaining three rows are computed analogously. The rounded value of the second row is 2, the third row is 2, and the fourth row is 3. This yields a total of sixteen different transition tables for the US:

<sup>100</sup> I and S are constant; only O and S' can vary.

*I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'*  
 0 0 0 1 0 0 0 1 0 0 0 1 0 0 1 0 0 0 1 0 0 1 0 0 1 0 0 0 1 0 0 1 0  
 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0  
 1 0 0 1 1 0 0 1 1 0 1 0 1 0 1 0 1 0 0 1 1 0 0 1 1 0 1 0 1 0 1 0 1 0  
 1 1 0 1 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 0

*I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'* *I S O S'*  
 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 1 0 0 0 1 0 0 1 0 0 1 0 0 1 0  
 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1  
 1 0 0 1 1 0 0 1 1 0 1 0 1 0 1 0 1 0 0 1 1 0 0 1 1 0 1 0 1 0 1 0 1 0  
 1 1 0 1 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 0

Out of these sixteen transition tables we select the highlighted transition table because it is a good approximation of the actual behavior of the US during the negotiations. Theoretically, we can work with each generated transition table at a time and compare the results. This is a very tedious and time consuming task. It is questionable whether or not we will gain additional insights by doing this. An alternative is to select those transition tables that are most consistent with an objective set of the actor. This selection can be done a priori or a posteriori. If it is a posteriori we work with each generated transition table at a time and decide afterwards which behavior pattern is most conducive to the objectives. If we select a transition a priori we choose the one transition table that is most consistent with the objective set of the actor. The problem with this approach is that an objective set is not always well defined. Recall, that unlike rational choice sociocybernetics does not have to identify an objective function of the actors. Instead, it describes general behavior patterns. The behavior pattern of an actor can but need not reflect its objectives. The objective set enters the sociocybernetic model only indirectly. Therefore, rather than selecting a transition table on the ground of a possibly diffuse objective function it is much easier to base the selection on our knowledge of the actual situation.

Applying the same algorithm for the Chinese transition table we get the following rounded values for the transition table: 1 for the first row, 3 for the second row, 1 for the third row, and 3 for the fourth row of the transition table. This yields four different transition tables.

*I S O S'* *I S O S'* *I S O S'* *I S O S'*  
 0 0 0 1 0 0 0 1 0 0 1 0 0 0 1 0  
 0 1 1 1 0 1 1 1 0 1 1 1 0 1 1 1  
 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0  
 1 1 0 1 1 1 1 0 1 1 0 1 1 1 1 0

The highlighted, fourth transition table is a realistic description of China. However, it is unlikely that the US would lift its threats against China unless it is certain that China will make credible concessions. Therefore, we replace the third row with 1, 0, 1, 0 (I, S, O, S').

It is important to note that we have to check the suggested transition tables of the algorithm for their plausibility and may have to modify them so that they adequately describe reality. This does not undermine the consistency of this approach. Indeed, it is common practice to interpret and if necessary manipulate simulation results so that they are consistent with the analytical framework and reality. Considering the transition algorithm and the institutional analysis of the previous part, we get the following transition tables for the US and China:

Table 13a

USA				
Row	I	S	O	S'
1	0	0	0	1
2	0	1	0	1
3	1	0	1	0
4	1	1	1	0

Table 13b

China				
Row	I	S	O	S'
1	0	0	1	0
2	0	1	1	1
3	1	0	1	0
4	1	1	1	0

The first row of the US transition table suggests that if China makes no or hardly any concessions and credible promises of stricter and more effective IPR protection in China and

the USTR is pressed by internal support for a tough stance against China, it will threaten economic sanctions against China. However, every involved party in the US does not favor sanctions. This is why the new internal state assumes the binary value 1. The second row tells us that if China does not make any concessions, the USTR will threaten to retaliate even though it does not enjoy the internal support for such a tough stance. The third row indicates that if China comes around and offers a hand to the US, the USTR will drop its threat of retaliation even though internal pressure for a tough stance against China continues to exist. Finally, the fourth row describes a situation where China does make concessions and there is weak support for a tough stance against China. Under these circumstances the US discontinues its threats against China but remains skeptical about China's sincerity (S'=0).

The first row of China's transition table portrays the scenario where the US threatens to retaliate. China still lacks the political will to improve its IPR regime, but the American threat is credible enough so that China concedes. In the second row the Chinese delegation enjoys internal support for possible concessions to the US. Faced with possible sanctions (I=1), China promises to improve its IPR regime. The third row describes the scenario where the US chooses a more cooperative approach to China. It is unlikely that it will do so unless it is certain that China will make credible concessions. China does indeed concede but internal opposition to improve the IPR regime remains. Finally, the fourth row tells that if the US drops its threats against China and there is internal support for concessions, China concedes to the US but skepticism about these actions remains. The third and fourth row serve as examples of China's win-lose attitude in negotiations. While the US lifts its threat of retaliation, China remains highly skeptical of the honesty of the US.

Combining the two transition tables yields the incomplete connection matrix:

Table 14

Situation	Initial Conditions				Responses				Situation
	I1	S1	I2	S2	O1	S1'	O2	S2'	
	0	0	0	0	0	0	1	1	
1	0	0	0	1	0	1	1	1	1
2	0	0	1	0	0	1	1	0	2
3	0	0	1	1	0	1	1	0	3
4	0	1	0	0	0	1	1	0	4
5	0	1	0	1	0	1	1	1	5
6	0	1	1	0	0	1	1	0	6
7	0	1	1	1	0	1	1	0	7
8	1	0	0	0	1	0	1	0	8
9	1	0	0	1	1	0	1	1	9
10	1	0	1	0	1	0	1	0	10
11	1	0	1	1	1	0	1	0	11
12	1	1	0	0	1	0	1	0	12
13	1	1	0	1	1	0	1	1	13
14	1	1	1	0	1	0	1	0	14
15	1	1	1	1	1	0	1	0	15

One of the most intriguing features of this simulation is that situations 8 through 15 all lead to the final outcome 10.<sup>101</sup> This means whenever China's concessions satisfy the US, the US will lift its threat of sanctions and a mutual agreement becomes possible. In addition, unless the US cares more for its own actions than China's (colonies G, H, and I), all other situations lead to outcome 10 as well. In other words, no matter what the initial scenario, the

<sup>101</sup> See the simulation results table and terminal cycle table of this stage game in the appendix.

chances for an eventual agreement are always good. Whether or not the agreement is stable has yet to be found out. Notice that China can make concessions even though it still lacks the political will to improve its IPR regime ( $S2=S2'=0$ ). The US remains skeptical too ( $S1=S1'=0$ ), but lifts its threats anyway. The skepticism of the US can be explained by the fact that in accordance with Section 306 of the Trade Act the US has to continue monitoring China's implementation of the agreement. If China does not comply with the agreement, the USTR has to undertake a new investigation into China's IPR regime. Thus, while the US no longer considers China a designated priority foreign country this does not mean that the conflict is resolved. In fact, the USTR re-designated China a priority foreign country in early 1996. The skepticism of the US reflected in the final outcome 10 seems to be well founded.

The simulation results can create the impression that a mutual agreement is more or less a certain outcome. Unfortunately, this is not the case. As we know a trade war between the countries was barely avoided. China did not make any significant concessions until hours before the US deadline after which the US would have imposed sanctions against China. Unfortunately, the sociocybernetic model does not provide any information about the exact duration of single situations or scenarios. This does not mean that simulation results do not accurately describe reality. It is reasonable to say that outcome 10 reflects the actual outcome of the bilateral negotiations. Situations 8 through 15 which directly lead to outcome 10 may not have played a role for most of the actual negotiations. The simulation results hint at the possibility that the negotiating parties were stuck in a suboptimal situation for an extended period of time. China might have refused to make any concessions even though the US offered an olive branch (win-lose attitude of China). Or, China's concessions did not satisfy the US and the USTR did not lift its threats until it became apparent that China would or could not yield further. The simulation results of this stage game show that the path to the final outcome is not necessarily smooth and instantaneous. The length of a transient path provides information only about the relative duration of moving from an initial situation to the final outcome. Take, for example, situation 5 in colonies B or E. It first leads to situation 13 and 11 and finally results in outcome 10. Initially, both country representatives face internal support for a cooperative strategy ( $S1=S2=1$  in situation 5). It is China that makes the first move and offers concessions to the US ( $O2=1$ ). The US observes China's action and responds accordingly in situation 13 ( $O1=1$ ). However, the move of the US creates skepticism about the rightness of the action or the honesty of China ( $S1'=0$  in situation 13). We move to situation 11, where both countries still receive positive input from the other party. This could very well be the final stage of the negotiations when the two parties came close to an agreement. The US promises to take China off the priority foreign country list but points out that it will continue to closely monitor China's implementation efforts of the agreement. The US explains that it will retaliate against China if China does not satisfactorily comply with the accord. This potential scenario raises new discontent in the Chinese delegation ( $S2'=0$ ), but eventually both countries sign the accord (situation 10).

Colony H has the lowest system and terminal cycle trade indices (476 and 411 respectively). This indicates that if the US cares more for its own actions and China values the actions of the US, the chances for a mutual agreement are lower compared to the other colonies. An analysis of the terminal cycle table confirms this finding. A possible trade war is most likely to result if the US does not value China's actions at least as high as its own (colonies G, H, and I). If both actors are egotistical as in colony I (interactive weights 2,1,2,1) or China is indifferent about either actions and the US cares more for its own actions, situations 0 through 7 all lead to the final outcome 6. This outcome 6 is characterized by China's internal opposition to any changes of its IPR regime and the lack of internal support of the USTR to continue a tough stance against China. China receives a positive input from

the US ( $I2=1$ ), i.e., the USTR has become more cooperative or welcomes China's past or present efforts. Initially, China does not make any concessions to the US ( $I1=0$ ), but then responds positively to the input from the US ( $O2=1$ ). Since the US, on the other side, has initially not received any positive input ( $I1=0$ ), it returns to a tough stance against China. This scenario repeats itself unless the US modifies its interpretation of China's actions. Until then it is not entirely clear whether a trade war can be avoided or not. A mutual agreement ( $I1=I2=O1=O2=1$ ) is rather unlikely. If China cares more for the actions of the US, but the USTR still does not value China's actions (colony H), situations 0 through 7 lead to the final outcomes 4 or 5. China does make concessions to the US ( $O2=1$ ), but still does not satisfy the US ( $I1=0$ ). Consequently, the US sticks to its threats and ultimately imposes sanctions. This, of course, can lead to a bilateral trade war.

Outcomes 4, 5, and 6 are suboptimal since they do not constitute a mutual agreement. This does not mean that they did not happen during the 1994/95 negotiation process. It is feasible that an actor changes its interpretation of the observed actions in the course of the game. For example, the US may have initially cared more for its own actions than China's but then changed its perception. This modification could have paved the way to a mutual agreement. It is reasonable to rule out a change of the transition table because it is rather unlikely that the nature of an actor transforms significantly in such a short time period. *In summary*, unless the US does not value China's actions at least as high as its own, a mutual agreement is always a possible outcome. In other words, if the structure of the game does not change during the course of negotiations, the chances for an eventual, mutual agreement are good. One of the useful features of this model is to predict certain outcomes and direct the negotiation process into a desired direction. Hence, whenever the parties are stuck in a suboptimal situation and are aware of the logic of their social interactions described in this model, it is possible to move the negotiations to the next stage and thus move closer to an agreement.

**Stage Game 3: Implementation Phase of the 1995 IPR Agreement**

• *US*

This stage game specifies the social interactions between the IP industry and the USTR. In particular it sheds light on the level of support for the IPR accord with China and reveals the conditions for a new Special 301 investigation of China's IPR regime. We can describe the structure of the game as follows:

Actors:

IP industry and USTR.

Interactions:

Mostly informal consultations and public statements.

Outcome of social interactions:

Level of domestic support for the IPR agreement.

Internal states/constraints:

*Industry: binary value 1* - Interpretation of the IPR agreement as sufficient.  
*value 0* - IPR agreement is perceived as insufficient.

*USTR: value 1* - Satisfaction and optimism about the achieved IPR agreement.  
*value 0* - Dissatisfaction and pessimism about the achieved IPR agreement.

Actions/output:

*Industry: value 1* - Publicly accepting and endorsing the agreement.  
*value 0* - Only qualified endorsement of the agreement. Lobbying activities for more effective IPR protection in China continues. Industry recommends to re-designate China as a priority foreign country.

*USTR: value 1* - Closing of Special 301 investigation. Removing China from priority watch list.  
*value 0* - Continued monitoring and scrutiny of IPR protection in China and potential launch of a new investigation under Special 301. Expressed skepticism about effective implementation of the agreement in China.

We assume that the nature of the industry has not changed since the first stage game. Therefore, its transition table remains unchanged. The USTR seeks domestic support for the IPR accord. The outcome of the previous stage game influences the behavior pattern of the USTR. Hence, we apply the transition algorithm to compute the new transition table of the USTR and combine it with the insights of the institutional analysis of this phase.

Using the transition algorithm to determine the transition table for the USTR results in the rounded value of 2 for all rows of the transition table. This yields a total of four possible transition tables out of which the following is a good description of reality:

*I S O S'*  
 0 0 1 1  
 0 1 0 1  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the first and fourth row of this transition table.

We get the following transition tables for the actors:

**Table 15a**

Row	Industry			
	I	S	O	S'
1	0	0	0	0
2	0	1	1	1

**Table 15b**

Row	USTR			
	I	S	O	S'
1	0	0	0	1
2	0	1	0	1

3	1	0	0	0	3	1	0	1	0
4	1	1	1	1	4	1	1	1	0

The Accord and Section 306 of the Trade Act dictate the behavior pattern of the USTR. The USTR keeps its promise and takes China off the priority foreign country list (O=1 in the third and fourth row of the transition table). Section 306 of the Trade Act requires the USTR to closely monitor China's implementation efforts (S'=0) and take necessary action if China does not comply with the accord. The perceived input by the USTR serves as an indicator whether or not China complies or not. For example, if the industry recommends re-designating China as a priority foreign country, it is most likely a sign that China does not implement the accord effectively and IPR piracy prevails. In that case, the USTR will start a new Special 301 investigation. However, all involved parties do not necessarily support such actions. This is indicated by the parameter of the new internal state (S'=1). On the other side, if the industry lauds the accord and China's implementation efforts, the USTR does not see any reason to start a new Special 301 investigation of China's IPR regime. It continues to closely watch China's implementation efforts though (S'=0). In summary, the actions of the USTR can still be characterized as extrovert whereas the industry remains introvert.

Combining the two transition tables yields the incomplete connection matrix:

**Table 16**

Situation	Initial Conditions				Responses				Situation
	I1	S1	I2	S2	O1	S1'	O2	S2'	
0	0	0	0	0	0	0	0	1	0
1	0	0	0	1	0	0	0	1	1
2	0	0	1	0	0	0	1	0	2
3	0	0	1	1	0	0	1	0	3
4	0	1	0	0	1	1	0	1	4
5	0	1	0	1	1	1	0	1	5
6	0	1	1	0	1	1	1	0	6
7	0	1	1	1	1	1	1	0	7
8	1	0	0	0	0	0	0	1	8
9	1	0	0	1	0	0	0	1	9
10	1	0	1	0	0	0	1	0	10
11	1	0	1	1	0	0	1	0	11
12	1	1	0	0	1	1	0	1	12
13	1	1	0	1	1	1	0	1	13
14	1	1	1	0	1	1	1	0	14
15	1	1	1	1	1	1	1	0	15

We start the analysis of the simulation results with a look at the trade indices of the colonies. It is interesting that none of the trade indices, either system or terminal cycle trade indices, falls below 500. This suggests a fairly good chance for domestic support of the IPR accord and no further action by the USTR. The combined terminal cycle trade index of colonies B, E, and H, i.e., those colonies with the interactive weights \*\*12 where the USTR values the actions of the industry higher than its own, is the lowest with 500. In comparison, the combined terminal cycle trade index of colonies G, H, I (interactive weights 21\*\*) is 519, that of colonies C, F, and I (interactive weights \*\*21) is 532 and of colonies D, E, and F (interactive weights 12\*\*) is 546. The comparison of the trade indices hints that overall the IPR accord will have the strongest domestic support if the industry values the actions of the

USTR higher. The relatively high trade indices are intriguing when we consider that the USTR launched a new Special 301 investigation into China's IPR piracies in early 1996 after it had become evident that China did not comply with the accord and that the IPR piracy situation in China worsened. This seeming contradiction leads to the investigation of the transient and final situations of the stage game.

Initially, the industry welcomes the agreement. It is lauded as a step into the right direction. The initial situations which reflect this positive echo are 10, 11, 14, and 15. All of these situations have in common that the industry publicly endorses the agreement and the USTR removes China from the priority foreign country list ( $I1=I2=1$ ). The situations differ in the parameters of the internal states of the actors ( $S1$  and  $S2$ ). Situations 14 and 15 are characterized by the support of the agreement by the industry ( $S1=O1=1$ ). In all sixteen interactive cases, situations 14 and 15 lead directly to the terminal cycle array 14. The USTR does not undertake any new actions against China ( $O2=1$ ), but continues to monitor China's implementation efforts ( $S2'=0$ ). The initial situations 10 and 11 are different from 14 and 15 insofar as the industry faces internal skepticism and dissatisfaction about the IPR agreement even though it publicly endorses the accord. The difference in the industry's internal constraints proves to be decisive for the resulting outcomes. In nine out of sixteen simulations situations 10 and 11 lead to the final outcome 10. Neither the industry nor the USTR calls for a new investigation of China's IPR regime. Nevertheless, both actors remain skeptical and underwhelmed by the accord. Four times situations 10 and 11 result in outcome 1 (colonies B, E, and H). Notice that in these three colonies the USTR values the output of the industry higher than its own (interactive weights  $**12$ ). This explains the logic of the transient path. Initially the industry lauds the accord, but it is the dissatisfaction within the industry ( $S1=0$  in situations 10 and 11) that leads it to qualify its support and eventually recommend a new investigation into China's IPR regime ( $O1=0$ ). The USTR observes this and launches a new Special 301 investigation ( $O2=0$ ). If the industry values the actions of the USTR at least as high as its own (colonies B and E), situations 10 and 11 lead to situation 8. If the industry cares more for its own actions, situations 10 and 11 result in outcome 0. Situations 0 and 8 differ in the perceived input of the industry ( $I1$ ). Eventually, both situations lead to the final outcome 1. The USTR launches a new investigation and re-designates China as a priority foreign country.

Three times the initial situations 10 and 11 lead directly to outcome 2 (colonies G and I). The interactive weights of colonies G and I tell us that the USTR is indifferent about the industry's actions or cares more for its own. This difference of the interactive weights helps clarify the distinct final output. The USTR does not *value* the industry's qualified praise for the accord as sufficient to initiate a new investigation ( $I2=1$  in situation 2). On the other side, the industry's perceived input is 0. In other words, the USTR apparently takes *some* action that addresses the industry's criticism of the accord. For example, the USTR may remind China that if it does not comply with the accord, the USTR will have to retaliate. Nevertheless, the USTR does not take any further actions against China at that point.

Considering the actual domestic development and provided the USTR values the industry's actions higher than its own actions and internal constraints, initial situations 10 and 11 and their transient paths closely resemble reality. Alternatively, we can divide the third stage game into two phases and interpret them separately. *First*, the industry and USTR were satisfied with the agreement and China's implementation efforts. As time passes, industry sources reveal new cases of IPR piracy in China that question the effectiveness of China's implementation efforts of the accord. This revelation eventually results in a new Special 301 investigation and China's designation as a priority foreign country. The time period from the revelation until the beginning of the new bilateral IPR negotiations constitutes the *second*

phase of the third stage game. Whereas initial situations 14 and 15 as well 10 and 11 in colonies G and I serve as possible approximations of the first phase of the third stage game, situations 8, 9, 12, and 13 may describe the beginning of the second phase. Situations 8, 9, 12, and 13 have in common that the USTR has not yet initiated a new Special 301 investigation ( $I1=1$ ), but the industry is already recommending the USTR to take new actions against China ( $I2=0$ ). Situations 8 and 9 result directly in final outcome 1. Situations 12 and 13 lead to outcome 14 twelve times, outcome 13 three times (colonies C and I), and outcome 5 once (colony F). Outcome 14 does not signal any new actions against China and is thus unrealistic. Outcomes 5 and 13 are surprising insofar as the USTR takes new actions against China, but the industry does not publicly call for further actions. Even if we interpret the industry's action as only lukewarm support for a new tough stance against China, outcomes 5 and 13 do not seem to be very accurate description of reality. The industry did support the USTR's new actions against China. Hence, it is reasonable to conclude that situations 8 and 9 are better descriptions of the beginning of the second phase of the third stage game.

We can *summarize* that given the extrovert character of the actions of the USTR, the industry seems to have a significant influence on whether or not the USTR launches a new Special 301 investigation. This is especially true if the USTR values the actions of the industry higher than its own (colonies B, E, and H). Overall, the chances for domestic support of the IPR accord were good. Unfortunately, China did not implement the agreement effectively and caused the industry to complain and recommend to re-designate China as a priority foreign country. If the industry had been satisfied with China's implementation efforts, a new Special 301 investigation would have been less likely.

- *China*

This stage game sheds light on how the social interactions between the central and provincial governments influence the implementation of the IPR accord in China. The game can be described as follows:

Actors:

Provincial governments and the central government in Beijing.

Interactions:

Daily political relationship.

Outcome of social interactions:

Chance for effective implementation of the IPR agreement in China.

Internal states/constraints:

*Provinces: value 1* - Willingness to implement agreement and follow respective orders from Beijing.

*value 0* - Opposition to crack down of IPR piracy and any changes in the IPR protection regime.

*Beijing: value 1* - Political will and support (including the army), to implement the IPR agreement.

*value 0* - Lack of political will and opposition (including the army), to implement the IPR agreement.

Actions/output:

*Provinces: value 1* - Successful implementation of the IPR agreement. Pirating firms are either shut down or transformed.

*value 0* - Unsuccessful implementation of the IPR agreement. Lack of initiatives to improve IPR protection.

*Beijing: value 1* - Effective crack down of most IPR pirating firms and passing appropriate legislation.

*value 0* - Lack of serious initiatives to improve IPR protection on any level.

We assume that the nature of the provincial governments has not changed since the first stage game. Therefore, their transition tables remain unchanged. The central Chinese

government undertakes efforts to implement the IPR accord. Its behavior is influenced by its promises to the US in the previous stage game. Hence, in order to compute the new transition table of the central government we apply the transition algorithm and combine it with the insights of the institutional analysis of this phase.

Using the transition algorithm to determine the transition table for the central Chinese government results in the rounded value of 2 for all rows of the transition table. This yields a total of four possible transition tables out of which the following is a good description of reality:

*I S OS'*  
 0 0 1 1  
 0 1 1 0  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the first and fourth row of this transition table.

We get the following transition tables for the actors:

Table 17a

Row	Provinces			
	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	0
2	0	1	1	1
3	1	0	0	0
4	1	1	1	1

Table 17b

Row	Beijing			
	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	0
2	0	1	1	0
3	1	0	1	0
4	1	1	1	0

The second, third, and fourth row of the transition table of the central government suggest that Beijing does comply with the IPR accord and undertakes the necessary actions. If, however, Beijing is faced with opposition to the agreement by the provincial governments ( $I=0$ ) and lacks the political will to comply with IPR agreement, it will not take any promised actions.

Combining the two transition tables of the actors yields the incomplete connection matrix:

Table 18

Situation	Initial Conditions				Responses				Situation
	<i>I1</i>	<i>S1</i>	<i>I2</i>	<i>S2</i>	<i>O1</i>	<i>S1'</i>	<i>O2</i>	<i>S2'</i>	
0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	1	0	1
2	0	0	1	0	0	0	1	0	2
3	0	0	1	1	0	0	1	0	3
4	0	1	0	0	1	1	0	0	4
5	0	1	0	1	1	1	1	0	5
6	0	1	1	0	1	1	1	0	6
7	0	1	1	1	1	1	1	0	7
8	1	0	0	0	0	0	0	0	8
9	1	0	0	1	0	0	1	0	9
10	1	0	1	0	0	0	1	0	10
11	1	0	1	1	0	0	1	0	11
12	1	1	0	0	1	1	0	0	12
13	1	1	0	1	1	1	1	0	13
14	1	1	1	0	1	1	1	0	14
15	1	1	1	1	1	1	1	0	15

We begin the analysis of the domestic social interactions in China with an interpretation of the domestic situation from the US perspective. It is unlikely that the US IP industry will complain to the USTR if both the provincial and central governments implement most of the accord effectively. This means that the output of the provincial and central governments in the connection matrix both have to assume the binary value 1. This is the case in situations 5, 6, 7, 13, 14, and 15. It is reasonable to conclude that if these situations are actual outcomes in China, the US will not take any further actions against China based on China's IPR regime. All of these situations have in common that the provincial governments have the willingness to implement the agreement and that the necessary informal institutions for effective implementation exist. A glimpse at the terminal cycle table in the appendix shows that situations 5, 6, 7, 13, 14, and 15 all lead to the final outcome 14. However, given the fact that the USTR re-designated China as a priority foreign country for noncompliance with the agreement these situations are not an accurate reflection of reality. This in turn may suggest that the necessary informal institutions on the provincial

level were mainly absent or insufficient.

In situations 4 and 12 the provincial governments undertake actions to implement the agreement. Pirating firms are either shut down or transformed. Twelve times out of sixteen cases situations 4 and 12 result in the optimal outcome 14. If the central government values its own actions higher than the provinces', situations 4 and 12 lead to the final outcome 12 three times (colonies C and I) and once to outcome 4 (colony F). In neither of these cases does the central government take visible actions to comply with the agreement ( $O2=0$ ) even though in situation 12 the provincial governments interpret the actions of the central government as an implementation effort ( $I1=1$ ). If the provincial governments value the actions of the central government higher than their own and the central government cares for their actions at least as much as its own (colonies D and E), situations 4 and 12 first lead to situation 6 and then to outcome 14. In those cases, the central government "acknowledges" the efforts of the provincial governments ( $I2=1$  in situation 6) and supports the efforts ( $O2=1$  in situation 6). Effective and satisfactory implementation becomes a good possibility.

The US did not question that Beijing complied with the agreement, but criticized the lack of enforcement of new and existing IPR regulation as well as continuing piracy activities in several provinces. Translating this criticism into the connection matrix, the criticism is consistent with those situations where  $O1=0$  and  $O2=1$  or  $O2=0$ . That is, situations 0, 1, 2, 3, 8, 9, 10, and 11 signal an ineffective implementation of the IPR accord. Whereas the initial situations 0 and 8 always lead to outcome 0, situations 1, 2, 3, 9, 10, and 11 result in outcome 0 only four times (colonies B, E, and H). This means that whenever the central government values the actions of the provinces higher than its own and the provincial governments lack the political and economic will to implement the accord or follow respective orders from Beijing, outcome 0 results. If both the central and provincial governments care more for their own actions and interests or the central government is at least indifferent (colonies G and I), situations 1, 2, 3, 9, 10, and 11 result in outcome 2. This is a situation where the government shows some efforts to implement the agreement ( $O2=1$ ) and "believes" that the provincial governments enforce existing and new IPR regulations, but the provincial governments actually continue to support IPR piracy in their provinces ( $O1=0$ ). Indeed, the provincial governments never receive the respective input, i.e., new IPR related legislation, from the central government ( $I1=0$ ). Colonies A, C, D, and F describe a similar scenario except that the provincial governments do receive new IPR legislation. They ignore it anyway and continue to tolerate piracy in their provinces.

Considering the actual developments in China, initial situations 9, 10, and 11 are the most realistic initial situations. The central government passed new legislation to strengthen its IPR regime ( $I1=O2=1$ ), but for the most part IPR piracy continued to prosper in the provinces ( $O1=0$ ). Thus, the actions of the USTR to re-designate China a priority foreign country did not come as a surprise. China, of course, disputed the new allegations and pointed to its demonstrated efforts ( $O2=1$ ) and results ( $I2=1$ ). This would suggest that situations 2, 3, 6, 7, 14, or 15 are good descriptions of reality. But, if situations 6, 7, 14, and 15 had indeed been outcomes, the US would not have launched a new Special 301 investigation. Situations 2 and 3 are unlikely because they assume that the provincial governments does not receive any information about new IPR legislation. This leaves situations 10 and 11 as the most realistic cases. The dispute between the US and China arises because the US cannot observe any significant and long-lasting measures against IPR piracy in all provinces ( $O1=0$ ) whereas the Chinese government interprets the actions of the provincial governments and its own as sufficient and in the spirit of the IPR agreement ( $I2=1$ ,  $O2=1$ ). Since the two countries see the situation differently, the bilateral dispute is inevitable.

*In summary*, the chances for an effective implementation of the IPR accord in China seem to be slim. If it were possible to develop the political and economic will on the provincial level for more effective IPR protection, the likelihood for the evolution of an effective IPR regime in China is significantly higher. Building such informal institutions in the provincial level is a lengthy process. If the US could accelerate this process, chances are that their efforts pay off and future IPR disputes with China can be avoided. Compared to the first stage game, the domestic support for a more effective IPR regime has not grown stronger overall. This is reflected in the trade indices of the various colonies. The only exception can be found in colonies D and F ( $STI_D=540$ ,  $STI_F=518$ ,  $TCI_D=589$ ,  $TCI_F=518$  in the third stage game compared to  $STI_D=527$ ,  $STI_F=500$ ,  $TCI_D=563$ ,  $TCI_F=500$  in the first stage game) when the provincial governments value the actions of the central government higher than their own and the central government cares for their actions at least as much as its own. This, however, underlines the significance of the political relationship and thus the social interactions between the central and provincial governments.

#### Stage Game 4: The Bilateral IPR Negotiations 1996

This stage game describes the IPR negotiations of 1996. Its structure is similar to the second stage game.

Using the transition algorithm to determine the transition table for the US results in the rounded value of 2 for all rows of the transition table. This yields a total of four possible transition tables out of which the following is a good description of reality:

```
I S O S'
0 0 1 1
0 1 0 1
1 0 1 0
1 1 0 0
```

Based on the institutional analysis we change the first and fourth rows of this transition table.

The transition algorithm for China yields the rounded value of 1 for the first row and 2 for the remaining three rows of the new transition table. Thus, there are eight different, possible transition tables out of which the following is a good description of reality:

```
I S O S'
0 0 1 0
0 1 0 1
1 0 1 0
1 1 0 0
```

Based on the institutional analysis we change the fourth row of this transition table.

We get the following transition tables for the actors:

Table 19a

Row	USA			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	1
3	1	0	1	0
4	1	1	1	0

Table 19b

Row	China			
	I	S	O	S'
1	0	0	1	0
2	0	1	0	1
3	1	0	1	0
4	1	1	1	0

Except for the first row, the transition table of the US is identical with its transition table in the second stage game. If the US delegation faces internal pressure for a tough stance against China and it does not get any concessions from China, it will threaten to retaliate or actually impose sanctions against China. Unlike in the second stage game, the internal state of the US does not change in response to the perceived input and to its actions. The strict

guidelines of Section 306 of the Trade Acts give the US less room for compromise. Unless, China concedes the US will have to impose sanctions against China. The transition table of China differs from the transition table in the second stage game in the second row. If the US does not lift its threat to retaliate, China will not make any concessions to the US even though it enjoys the internal support necessary for a more cooperative stance towards the US.

Combining the two transition tables yields the following incomplete connection matrix:

Table 20

IV									
Situation	Initial Conditions				Responses				Situation
	I1	S1	I2	S2	O1	S1'	O2	S2'	
0	0	0	0	0	0	0	1	0	0
1	0	0	0	1	0	0	0	1	1
2	0	0	1	0	0	0	1	0	2
3	0	0	1	1	0	0	1	0	3
4	0	1	0	0	0	1	1	0	4
5	0	1	0	1	0	1	0	1	5
6	0	1	1	0	0	1	1	0	6
7	0	1	1	1	0	1	1	0	7
8	1	0	0	0	1	0	1	0	8
9	1	0	0	1	1	0	0	1	9
10	1	0	1	0	1	0	1	0	10
11	1	0	1	1	1	0	1	0	11
12	1	1	0	0	1	0	1	0	12
13	1	1	0	1	1	0	0	1	13
14	1	1	1	0	1	0	1	0	14
15	1	1	1	1	1	0	1	0	15

Similar to the first negotiations in 1994 and 1995, China did not make any significant concessions until the very last minute. The terminal cycle table reveals that, unless the US does not care for China's actions (colonies G, H, and I), most initial situations result in outcome 10 and thus a mutual agreement. However, compared to the second stage game, the risks of a trade war are higher.

Situations 1 and 5 are always terminal cycle arrays regardless of the interactive weights. Situations 9 and 13 differ significantly from the second stage game in that China does not make significant concessions to the US ( $O2=0$  compared to  $O2=1$  in the second stage game), but the US perceives China's statements, promises, or efforts as satisfactory. Unless China cares less for the actions of the US than its own (as in colonies C, F, and I) situations 8 through 15 lead to outcome 10. In other words, if the US interprets China's efforts as satisfactory ( $I1=1$ ) it will drop its threats against China and a mutual agreement becomes possible ( $I1=O1=I2=O2=1$ ). If China values its own actions higher, situations 9 and 13 result in outcomes 9 (colonies C and I) or 1 (colony F). Whereas outcome 1 is clearly suboptimal ( $O1=O2=0$ ), outcome 9 is intriguing because the US interprets China's still insignificant concessions or promises as satisfactory ( $I1=1$ ) and removes China from the priority foreign country list ( $O1=1$ ). The US may realize that China will not concede any further; therefore the US yields to an agreement rather than imposing sanctions and starting a trade war. In that case China's persistent opposition to any greater concessions pays off.

Situations 0 through 7 are more realistic descriptions of the initial situation at the beginning of the second negotiation process. Notice that, unless we have the rather unrealistic scenario and the US does not care for China's actions (colonies G, H, and I), an

eventual agreement is always a good possibility. However, China does have to make the first step and make at least some concessions to the US ( $O2=1$ ). If it does not, outcome 1 or 5 will result and the US will ultimately impose sanctions against China. Once China yields to the US demands, an agreement becomes possible even though not immediately. For example, situations 4, 6, and 7 do not directly result in outcome 10. They either lead first to situations 12 (colonies B and E) or 14 (colonies A, C, D, and F). Furthermore, even if the US receives a positive input from China ( $I1=1$ ) as in situation 9, this does not mean that an agreement is the immediate result. If China values the actions of the US higher than its own and vice versa, i.e., both parties are well aware of the seriousness of the dispute and the consequences if there is no resolution, situation 9 leads to situation 3. China's receives a positive input from the US ( $I2=1$ ) and makes additional concessions. The US, on the other side, is not satisfied by China's concessions of situation 9 ( $I1=0$  in situation 3) and demands further actions by China ( $O1=S1=0$ ). China is well advised to yield because if it does the US will honor China's actions and respond accordingly ( $I1=O1=1$  in situation 8). A mutual agreement is the next step. Notice, that this is the longest transient path of the fourth stage game. It would be unfortunate, if the negotiations are interrupted along the way. In other words, if both parties are patient enough, an agreement is ultimately imminent.

*In summary*, an eventual agreement is always a good possibility unless we have the rather unrealistic scenario that the US does not care for China's actions. However, compared to the first IPR negotiations, the risk for failure is higher. Due to the restrictions of Section 306 the US is less willing to compromise. The US will lift its threat of sanction if and only China takes the first step and makes at least some concessions to the US ( $I1=1$ ). If it does not, the US will ultimately impose sanctions against China. Once China yields to the US demands, an agreement becomes possible. If the US delegation is not satisfied with China's concessions and efforts ( $I1=0$ ), it will still retaliate and impose sanctions against China. This scenario shows the seriousness of the dispute. It is also reflected in the various trade indices of the colonies. All indices are lower than in the second stage game. The US delegation is well advised to value the actions of the Chinese at least as high as its own. Otherwise, a trade war could result.

**Stage Game 5: The Implementation Phase After the 1996 Accord**

• *US*

The structure of this stage game is identical to the third stage game.

Using the transition algorithm to determine the transition table for the USTR results in the rounded value of 2 for all rows of the transition table. This yields a total of four possible transition tables out of which the following is a good description of reality:

*I S O S'*  
 0 0 1 1  
 0 1 0 1  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the first and fourth row of this transition table.

We have the following transition table and incomplete connection matrix for the two actors:

**Table 21a**

Row	Industry			
	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	0
2	0	1	1	1
3	1	0	0	0
4	1	1	1	1

**Table 21b**

Row	USTR			
	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	1
2	0	1	0	1
3	1	0	1	0
4	1	1	1	0

**Table 22**

V-US										
Situation	Initial Conditions				Responses				Situation	
	<i>I1</i>	<i>S1</i>	<i>I2</i>	<i>S2</i>	<i>O1</i>	<i>S1'</i>	<i>O2</i>	<i>S2'</i>		
<b>0</b>	0	0	0	0	0	0	0	1	<b>0</b>	
<b>1</b>	0	0	0	1	0	0	0	1	<b>1</b>	
<b>2</b>	0	0	1	0	0	0	1	0	<b>2</b>	
<b>3</b>	0	0	1	1	0	0	1	0	<b>3</b>	
<b>4</b>	0	1	0	0	1	1	0	1	<b>4</b>	
<b>5</b>	0	1	0	1	1	1	0	1	<b>5</b>	
<b>6</b>	0	1	1	0	1	1	1	0	<b>6</b>	
<b>7</b>	0	1	1	1	1	1	1	0	<b>7</b>	
<b>8</b>	1	0	0	0	0	0	0	1	<b>8</b>	
<b>9</b>	1	0	0	1	0	0	0	1	<b>9</b>	
<b>10</b>	1	0	1	0	0	0	1	0	<b>10</b>	
<b>11</b>	1	0	1	1	0	0	1	0	<b>11</b>	
<b>12</b>	1	1	0	0	1	1	0	1	<b>12</b>	
<b>13</b>	1	1	0	1	1	1	0	1	<b>13</b>	
<b>14</b>	1	1	1	0	1	1	1	0	<b>14</b>	
<b>15</b>	1	1	1	1	1	1	1	0	<b>15</b>	

Notice, that the transition tables of the actors are identical with the third stage game! This suggests that the overall structure of the domestic dynamics has not changed. Most insights about the social interactions between the industry and the USTR from the third stage game apply in the fifth stage game. This means, that the overall chances for yet another Special 301 investigation are low even if the industry is unsatisfied with China's progress. As of this day, the USTR has not designated a priority foreign country. The industry continues to lament China's ineffective IPR regime. However, China has apparently made enough progress so that a new Special 301 proves unfounded.

The question arises if it is politically feasible to re-designate China as a priority foreign country in the first place. If we assume that this is generally not the case, we may as well describe the nature of the USTR as follows:

Table 23

Row	USTR			
	I	S	O	S'
1	0	0	1	0
2	0	1	1	0
3	1	0	1	0
4	1	1	1	0

The new transition table indicates that the USTR does not launch another Special 301 investigation into China's IPR regime (O=1), but continues to monitor China's implementation efforts (S'=0) in accordance with Section 306 of the Trade Act. This does not mean that the USTR refrains from criticizing China. For example, the USTR can demand a more serious commitment China's to reforms, but its actions will always fall short of re-designating China as a priority foreign country. The industry can nevertheless value this criticism of China as a tough stance against China. This is reflected in situations 0 through 7 (I1=0) in the following modified, incomplete connection matrix:

Table 24

Situation	V- US*				Responses				Situation
	I1	S1	I2	S2	O1	S1'	O2	S2'	
0	0	0	0	0	0	0	1	0	0
1	0	0	0	1	0	0	1	0	1
2	0	0	1	0	0	0	1	0	2
3	0	0	1	1	0	0	1	0	3
4	0	1	0	0	1	1	1	0	4
5	0	1	0	1	1	1	1	0	5
6	0	1	1	0	1	1	1	0	6
7	0	1	1	1	1	1	1	0	7
8	1	0	0	0	0	0	1	0	8
9	1	0	0	1	0	0	1	0	9
10	1	0	1	0	0	0	1	0	10
11	1	0	1	1	0	0	1	0	11
12	1	1	0	0	1	1	1	0	12
13	1	1	0	1	1	1	1	0	13
14	1	1	1	0	1	1	1	0	14
15	1	1	1	1	1	1	1	0	15

Notice that whenever there is internal support within the industry for the new accord (S1=1), the final outcome is 14. If, however, the industry is still not satisfied with the agreement and its achieved results (S1=0), a more diversified picture emerges. Regardless whether or not the USTR interprets the industry's expressed concerns as serious (I2=0 in colonies B, E, and H or I2=1 in colonies A, C, D, G, and I), it will not re-designate China as a priority foreign country. If the USTR values the industry's expressed concerns higher than its own actions (colonies B, E, and H), situations 0, 1, 2, 3, 8, 9, 10, and 11 lead to outcome 8 (colonies B and E) or 0 (colony H). In those cases the USTR is likely to criticize China's implementation efforts and try to push China to further actions. But again, its actions will fall short of a new Special 301 investigation. If the industry cares more for its own expressed concerns than the actions of the USTR (colonies G, H, and I), it will interpret the actions of the USTR as disapproval of China's implementation efforts (I1=0). The USTR notices the concerns of the industry, but unless it values them higher than its own (as in colony H) it does not interpret them as significant enough to take new or additional actions against China (I2=1). Thus, situations 0, 1, 2, 3, 8, 9, 10, and 11 lead to output 2 in colonies G and I.

*In summary*, given the behavior pattern of the USTR it will not launch a new Special 301 investigation. However, if the industry expresses serious concern about China's implementation efforts, the USTR will likely criticize China and try to push China to better compliance. The combined trade indices are lower than in the third stage game (STI=494 and TCI=563 in this stage game compared to STI=546 and TCI=547 in the third stage game). This suggests a lower level of domestic support for the agreement than in the third stage game. The industry concerns and interests continue to influence the actions of the USTR, but the internal political constraints of the USTR are too strong such that it would re-designate China as a priority foreign country.

- *China*

The structure of this stage game is identical to the third stage game of China.

Using the transition algorithm to determine the transition table for the central Chinese government results in

the rounded value of 2 for all rows of the transition table. This yields a total of four possible transition tables out of which the following is a good description of reality:

I S O S'  
 0 0 1 1  
 0 1 1 0  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the first and fourth row of this transition table.

We have the following transition tables and incomplete connection matrix for the two actors:

Table 25a

Provinces				
Row	I	S	O	S'
1	0	0	0	0
2	0	1	1	1
3	1	0	0	0
4	1	1	1	1

Table 25b

Beijing				
Row	I	S	O	S'
1	0	0	1	0
2	0	1	1	0
3	1	0	1	0
4	1	1	1	0

Table 26

V-CH									
Initial Conditions					Responses				
Situation	I1	S1	I2	S2	O1	S1'	O2	S2'	Situation
0	0	0	0	0	0	0	1	0	0
1	0	0	0	1	0	0	1	0	1
2	0	0	1	0	0	0	1	0	2
3	0	0	1	1	0	0	1	0	3
4	0	1	0	0	1	1	1	0	4
5	0	1	0	1	1	1	1	0	5
6	0	1	1	0	1	1	1	0	6
7	0	1	1	1	1	1	1	0	7
8	1	0	0	0	0	0	1	0	8
9	1	0	0	1	0	0	1	0	9
10	1	0	1	0	0	0	1	0	10
11	1	0	1	1	0	0	1	0	11
12	1	1	0	0	1	1	1	0	12
13	1	1	0	1	1	1	1	0	13
14	1	1	1	0	1	1	1	0	14
15	1	1	1	1	1	1	1	0	15

Principally speaking, it is possible to derive the same transition tables as in stage game three. However, in light of China's improved implementation efforts of the accord, it seems to be reasonable to change the first row of the transition table of the central government. It signals Beijing's additional and irreversible actions to improve its IPR regime. Nevertheless, the social interactions between the central and provincial governments have not lost its significance.

Noticeably, the social interactions show the same structure as the second example in the fifth stage game of the US. The overall domestic support for the accord as measured by the trade indices is the same as in the US. However, a closer look at the connection matrix tells us that there are basically only eight out of sixteen situations that would satisfy the US and avoid a new Special 301 investigation. Recall, that for the agreement to be effectively

implemented, we need to have  $O1=O2=1$ , i.e., both the central and provincial governments take the necessary steps to enforce IPR and improve the Chinese IPR regime. Situations 4, 5, 6, 7, 12, 13, 14, and 15 fulfill this requirement; the others do not. In other words, the accord has a chance to be effectively implemented if and only if the provincial governments show the political and economic will to enforce new and existing IPR regulations ( $S1=1$ ). This holds true regardless of the interactive weights. The fact that the USTR has not launched a new Special 301 investigation suggests at least two things. First, China is effectively implementing the agreement. This would mean that the provincial governments follow the respective orders from Beijing and are willing to protect IPR regulations. Second, China has made important strides and mostly complies with most of the accord. However, IPR piracy remains to be a problem in China even though not to the extent prior to the two IPR agreements. The industry is not entirely satisfied with the success of the accord, but the USTR does not re-designate China as a priority country. This could be because concerns and complaints of the industry are not perceived as serious enough and/or a new Special 301 investigation is not politically feasible. The best explanation may lie in between these two interpretations. Unfortunately, it is beyond the scope of the thesis to determine the best interpretation. No matter what the most realistic description is, clearly it is the informal institutions especially on the provincial level in China that are necessary for an effective IPR regime to evolve.

In summary, the accord has a chance to be effectively implemented if and only if the provincial governments show the political and economic will to enforce new and existing IPR regulations. If the central Chinese government is truly committed to implement the IPR accord, it is well advised to develop means to help accelerate the institution building process. Passing the necessary legislation is a necessary step into the right direction. Formal institutions can help set up the framework for informal institutions to evolve. For example, stricter enforcement of IPR laws can cause the costs of IPR piracy to increase and make original and innovative activities more profitable. The US, too, can help assist this process. The US has to follow policies that have positive impacts on this lengthy process. Threatening China with retaliation unless there is institutional change may be one policy, but it is certainly not the only one and not necessarily the most effective one either.

**.2 Simulation Series TWO**

Rather than analyzing the simulation results of the second simulation series in as much detail as the first one, the discussion is limited to the principal insights of the stage games and outlines the main differences between the two series.

**Stage Game 1: The Domestic Dynamics in the US and China Before the IPR Negotiations in 1994/95**

- US

Suggested transition tables:

Table 27a

Industry				
Row	I	S	O	S'
1	0	0	0	0
2	0	1	0	0
3	1	0	0	0
4	1	1	1	1

Table 27b

USTR				
Row	I	S	O	S'
1	0	0	0	0
2	0	1	0	0
3	1	0	0	0
4	1	1	1	1

The two transition tables differ from the first simulation series in their structure of the second row. If the industry interprets the actions of the USTR as negative (I=0), i.e., a call for a tough stance against China, the industry will subsequently support the USTR position (O=0). The actions of the USTR are convincing enough to win the support of the whole industry. This is reflected in the change of the internal state of the industry from a 1 to a 0. The second row of the transition table of the USTR can be explained similarly.

Incomplete connection matrix:

**Table 28**

I-US									
Situation	Initial Conditions				Responses				Situation
	I1	S1	I2	S2	O1	S1'	O2	S2'	
<b>0</b>	0	0	0	0	0	0	0	0	<b>0</b>
<b>1</b>	0	0	0	1	0	0	0	0	<b>1</b>
<b>2</b>	0	0	1	0	0	0	1	0	<b>2</b>
<b>3</b>	0	0	1	1	0	0	1	1	<b>3</b>
<b>4</b>	0	1	0	0	0	0	0	0	<b>4</b>
<b>5</b>	0	1	0	1	0	0	0	0	<b>5</b>
<b>6</b>	0	1	1	0	0	0	1	0	<b>6</b>
<b>7</b>	0	1	1	1	0	0	1	1	<b>7</b>
<b>8</b>	1	0	0	0	0	0	0	0	<b>8</b>
<b>9</b>	1	0	0	1	0	0	0	0	<b>9</b>
<b>10</b>	1	0	1	0	0	0	1	0	<b>10</b>
<b>11</b>	1	0	1	1	0	0	1	1	<b>11</b>
<b>12</b>	1	1	0	0	1	1	0	0	<b>12</b>
<b>13</b>	1	1	0	1	1	1	0	0	<b>13</b>
<b>14</b>	1	1	1	0	1	1	1	0	<b>14</b>
<b>15</b>	1	1	1	1	1	1	1	1	<b>15</b>

Overall, both actors are more aggressive and resolute in their stance against China. Consequently, it is not too surprising that the system and terminal cycle trade indices are lower than in the first simulation series. This indicates a stronger domestic support for a tough stance against China. A look at the terminal cycle table shows that situation 0 is a far more frequent outcome than in the first simulation series. If the USTR values the actions of the industry higher than its own (colonies B, E, and H) all initial situations except 12, 13, 14, and 15 result in outcome 0. Situations 0, 1, 4, 5, 8, and 9 always lead to outcome 0 regardless of the interactive weights.

• *China*

Suggested transition tables:

**Table 29a**

Row	Provinces			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	1
3	1	0	0	0
4	1	1	1	1

**Table 29b**

Row	Beijing			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	0
3	1	0	0	0
4	1	1	1	1

The two transition tables differ from the first simulation series in the structure of the second row. The provinces support stronger IPR protection (O=1) only if the political and economic will for such actions exist (S=1) and they receive a positive input from the central government (I=1). The internal state of the provinces remains unaffected by the input and output. Similar to the provincial governments Beijing does not take any actions to improve the IPR regime unless it observes similar actions by the provinces and enjoys the internal support for such actions (I=S=1).

Incomplete connection matrix:

**Table 30**

Situation	I-CH				Responses				Situation
	Initial Conditions								
	I1	S1	I2	S2	O1	S1'	O2	S2'	
0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	0	1
2	0	0	1	0	0	0	0	0	2
3	0	0	1	1	0	0	1	1	3
4	0	1	0	0	0	1	0	0	4
5	0	1	0	1	0	1	0	0	5
6	0	1	1	0	0	1	0	0	6
7	0	1	1	1	0	1	1	1	7
8	1	0	0	0	0	0	0	0	8
9	1	0	0	1	0	0	0	0	9
10	1	0	1	0	0	0	0	0	10
11	1	0	1	1	0	0	1	1	11
12	1	1	0	0	1	1	0	0	12
13	1	1	0	1	1	1	0	0	13
14	1	1	1	0	1	1	0	0	14
15	1	1	1	1	1	1	1	1	15

In summary, the chances for the evolution of an effective IPR regime in China are slimmer than in the first simulation series. This is also reflected in the lower system and terminal cycle trade indices. Except for the unrealistic, initial situation 15, there are no cases that would result in effective IPR protection (O1=O2=1).

**Stage Game 2: The Bilateral IPR Negotiations in 1994/95**

Using the transition algorithm to determine the transition table for the US results in the rounded value of 1 for the first two rows of the transition table and 2 for the third and fourth row. This yields a total of four possible transition tables out of which the following is a good description of reality:

I S O S'  
 0 0 0 1  
 0 1 0 0  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the fourth row of this transition table.

The transition algorithm for China yields the rounded value of 1 for the first three rows and 3 for the fourth row of the new transition table. Thus, there are four different, possible transition tables out of which the following is a good description of reality:

I S O S'  
 0 0 1 0  
 0 1 0 0  
 1 0 0 0  
 1 1 1 0

Suggested transition tables:

**Table 31a**

Row	USA			
	I	S	O	S'
1	0	0	0	1
2	0	1	0	0
3	1	0	0	0
4	1	1	0	0

**Table 31b**

Row	China			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	1
3	1	0	0	0
4	1	1	1	3

1	0	0	0	1	1	0	0	1	0
2	0	1	0	0	2	0	1	0	0
3	1	0	1	0	3	1	0	0	0
4	1	1	1	0	4	1	1	1	0

Incomplete connection matrix:

Table 32

II										
Situation	Initial Conditions				Responses				Situation	
	I1	S1	I2	S2	O1	S1'	O2	S2'		
0	0	0	0	0	0	1	1	0	0	
1	0	0	0	1	0	1	0	0	1	
2	0	0	1	0	0	1	0	0	2	
3	0	0	1	1	0	1	1	0	3	
4	0	1	0	0	0	0	1	0	4	
5	0	1	0	1	0	0	0	0	5	
6	0	1	1	0	0	0	0	0	6	
7	0	1	1	1	0	0	1	0	7	
8	1	0	0	0	1	0	1	0	8	
9	1	0	0	1	1	0	0	0	9	
10	1	0	1	0	1	0	0	0	10	
11	1	0	1	1	1	0	1	0	11	
12	1	1	0	0	1	0	1	0	12	
13	1	1	0	1	1	0	0	0	13	
14	1	1	1	0	1	0	0	0	14	
15	1	1	1	1	1	0	1	0	15	

One of the most significant difference to the first simulation series is that this second stage game contains several two-, three, and even four-step terminal cycles. This means that in those colonies the system never stabilizes. An agreement (outcomes 10 or 14) may be possible, but it requires good timing of the negotiation parties to figure out the right moment. In other words, similar to the first simulation series a final agreement is possible, but it is less stable. If outcome 10 and 14 symbolize an agreement we can see from the connection matrix that both perceived inputs of these two outcomes are positive (I1=I2=0). However, China does not really make any significant concessions (O2=0) even though the US takes it off the priority foreign country list (O1=1). This may foreshadow China's ineffective implementation efforts of the accord in the next stage game. Only situations 11, 12, and 15 would represent a truly mutual agreement, yet none of these situations is ever a final outcome.

In summary, sanctions or even a trade war are imminent unless China makes significant concessions to the US. This is especially true if the US cares more for its own actions than China's (colonies G, H, and I). If, on the other side, China does make concessions, an agreement becomes much more likely even though correct timing is necessary.

**Stage Game 3: The Implementation Phase of the 1995 IPR Agreement**

• US

Using the transition algorithm to determine the transition table for the USTR results in the rounded value of 1 for the first two rows of the new transition table and 2 for the third and fourth row. This yields a total of four possible transition tables out of which the following is a good description of reality:

I S O S'

0	0	0	1
0	1	0	0
1	0	1	0
1	1	0	0

Based on the institutional analysis we change the second and fourth row of this transition table.

Suggested transition tables:

Table 33a

Row	Industry			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	0
3	1	0	0	0
4	1	1	1	1

Table 33b

Row	USTR			
	I	S	O	S'
1	0	0	0	1
2	0	1	0	1
3	1	0	1	0
4	1	1	1	0

Incomplete connection matrix:

Table 34

III- US										
Situation	Initial Conditions				Responses				Situation	
	I1	S1	I2	S2	O1	S1'	O2	S2'		
0	0	0	0	0	0	0	0	1	0	0
1	0	0	0	1	0	0	0	1	0	1
2	0	0	1	0	0	0	1	0	0	2
3	0	0	1	1	0	0	1	0	0	3
4	0	1	0	0	0	0	0	1	0	4
5	0	1	0	1	0	0	0	1	0	5
6	0	1	1	0	0	0	1	0	0	6
7	0	1	1	1	0	0	1	0	0	7
8	1	0	0	0	0	0	0	1	0	8
9	1	0	0	1	0	0	0	1	0	9
10	1	0	1	0	0	0	1	0	0	10
11	1	0	1	1	0	0	1	0	0	11
12	1	1	0	0	1	1	0	1	0	12
13	1	1	0	1	1	1	0	1	0	13
14	1	1	1	0	1	1	1	0	0	14
15	1	1	1	1	1	1	1	0	0	15

Comparing the system and terminal cycle trade indices with the first stage game it is reasonable to conclude that the accord was interpreted as a step into the right direction. The fact though that none of the indices are higher than 500 indicates dissatisfaction with the results of the agreement. If the USTR values the actions of the industry higher than its own (colonies B, E, and H) and the industry expresses serious concerns about China's ineffective implementation efforts (O1=0), a new Special 301 investigation is the logical outcome (O2=0). Indeed, whenever the USTR interprets the actions of the industry as a signal that China does not comply with the accord (I2=0), the USTR will ultimately re-designate China as a priority foreign country.

- *China*

Using the transition algorithm to determine the transition table for the central Chinese government results in the rounded value of 2 for all rows of the transition table. This yields a total of four possible transition tables out of which the following is a good description of reality:

I S O S'  
 0 0 1 1  
 0 1 1 0  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the first and fourth row of this transition table.

Suggested transition tables:

Table 35a

Row	Provinces			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	1
3	1	0	0	0
4	1	1	1	1

Table 35b

Row	Beijing			
	I	S	O	S'
1	0	0	1	0
2	0	1	1	0
3	1	0	1	0
4	1	1	1	0

Incomplete connection matrix:

Table 36

III- CH	Initial Conditions				Responses				Situation
	I1	S1	I2	S2	O1	S1'	O2	S2'	
<b>0</b>	0	0	0	0	0	0	1	0	<b>0</b>
<b>1</b>	0	0	0	1	0	0	1	0	<b>1</b>
<b>2</b>	0	0	1	0	0	0	1	0	<b>2</b>
<b>3</b>	0	0	1	1	0	0	1	0	<b>3</b>
<b>4</b>	0	1	0	0	0	1	1	0	<b>4</b>
<b>5</b>	0	1	0	1	0	1	1	0	<b>5</b>
<b>6</b>	0	1	1	0	0	1	1	0	<b>6</b>
<b>7</b>	0	1	1	1	0	1	1	0	<b>7</b>
<b>8</b>	1	0	0	0	0	0	1	0	<b>8</b>
<b>9</b>	1	0	0	1	0	0	1	0	<b>9</b>
<b>10</b>	1	0	1	0	0	0	1	0	<b>10</b>
<b>11</b>	1	0	1	1	0	0	1	0	<b>11</b>
<b>12</b>	1	1	0	0	1	1	1	0	<b>12</b>
<b>13</b>	1	1	0	1	1	1	1	0	<b>13</b>
<b>14</b>	1	1	1	0	1	1	1	0	<b>14</b>
<b>15</b>	1	1	1	1	1	1	1	0	<b>15</b>

Similar to the first simulation series, the results of this third stage game confirms the significance of informal institutions on the provincial level. If there is the political and economic will to comply with the accord and protect IPRs and the provincial governments value the legislative actions of Beijing at least as high as their own, the final outcome will be 14 and the agreement achieves its intended objective. For example, initial situations 4, 5, 6, and 7 in colonies B and E describe a scenario where the provincial governments have not received any new legislative orders from Beijing (I1=0). They would however support stronger IPR protection (S1=1). Beijing now initiates new reforms in accordance with the agreement (O2=1 in situations 4, 5, 6, and 7) even though it is still uncertain whether or not the provincial governments will follow its orders (I2=0 in situation 12). The provincial governments observe Beijing's actions and implement the new regulations (O1=1 in situation 12). This prepares the way to complete and satisfactory implementation of the accord as illustrated in the final outcome 14. If, on the other side, the willingness to protect IPRs is absent within the provincial governments, an effective implementation of the accord is not possible. New central IPR legislation may be in place (O2=1), but IPR privacy continues to be a major problem in the provinces (O1=0).

Compared to the first stage game the system and terminal cycle trade indices are higher which indicates that the agreement was a step into the right direction. The ultimate success of the accord depends on the political and economic will within the provincial governments to improve IPR protection. In other words, central IPR legislation is a necessary condition for the agreement to achieve its goals; the existence of the necessary informal institutions on the provincial level is the sufficient condition for the success of the accord.

#### Stage Game 4: The Bilateral IPR Negotiations 1996

Using the transition algorithm to determine the transition table for the US results in the rounded value of 1 for the first two rows of the transition table and 2 for the third and fourth rows. This yields a total of four possible transition tables out of which the following is a good description of reality:

$I S O S'$   
 0 0 0 1  
 0 1 0 1  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the second and fourth rows of this transition table.

The transition algorithm for China yields the rounded value of 2 for all rows of the new transition table. Thus, there are four different, possible transition tables out of which the following is a good description of reality:

*I S O S'*  
 0 0 1 1  
 0 1 0 1  
 1 0 1 0  
 1 1 0 0

Based on the institutional analysis we change the first and fourth rows of this transition table.

Suggested transition tables:

**Table 37a**

<i>USA</i>				
Row	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	1
2	0	1	0	0
3	1	0	1	0
4	1	1	1	1

**Table 37b**

<i>China</i>				
Row	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	1	0
2	0	1	0	1
3	1	0	1	0
4	1	1	1	1

Incomplete connection matrix:

**Table 38**

IV									
Situation	Initial Conditions				Responses			Situation	
	<i>I1</i>	<i>S1</i>	<i>I2</i>	<i>S2</i>	<i>O1</i>	<i>S1'</i>	<i>O2</i>		<i>S2'</i>
<b>0</b>	0	0	0	0	0	1	1	0	<b>0</b>
<b>1</b>	0	0	0	1	0	1	0	1	<b>1</b>
<b>2</b>	0	0	1	0	0	1	1	0	<b>2</b>
<b>3</b>	0	0	1	1	0	1	1	1	<b>3</b>
<b>4</b>	0	1	0	0	0	0	1	0	<b>4</b>
<b>5</b>	0	1	0	1	0	0	0	1	<b>5</b>
<b>6</b>	0	1	1	0	0	0	1	0	<b>6</b>
<b>7</b>	0	1	1	1	0	0	1	1	<b>7</b>
<b>8</b>	1	0	0	0	1	0	1	0	<b>8</b>
<b>9</b>	1	0	0	1	1	0	0	1	<b>9</b>
<b>10</b>	1	0	1	0	1	0	1	0	<b>10</b>
<b>11</b>	1	0	1	1	1	0	1	1	<b>11</b>
<b>12</b>	1	1	0	0	1	1	1	0	<b>12</b>
<b>13</b>	1	1	0	1	1	1	0	1	<b>13</b>
<b>14</b>	1	1	1	0	1	1	1	0	<b>14</b>
<b>15</b>	1	1	1	1	1	1	1	1	<b>15</b>

Chances for a mutual agreement are definitely better than during the previous negotiations. Outcomes 10, 11, 14, and 15 all describe agreements. Given that the responding outputs of both parties are positive, i.e.,  $O1=O2=1$ , gives rise to hope for a better implementation of the agreement than in 1995. The US is still well advised to value China's actions at least as high as its own. As long as China does make some concessions to the US during the course of the negotiations ( $O2=1$ ), chances are good that the parties can come to a mutual agreement. Compared to the second stage game there are less initial situations which end up in multi-step cycles. This means that the system has become more stable.

**Stage Game 5: The Implementation Phase of the 1996 Accord**

• *US*

Using the transition algorithm to determine the transition table for the USTR results in the rounded value of 3 for the first and fourth rows of the transition table and 2 for the second and third rows. This yields a total of four

possible transition tables out of which the following is a good description of reality:

*I S O S'*  
 0 0 1 1  
 0 1 1 0  
 1 0 1 0  
 1 1 1 0

Based on the institutional analysis we change the first row of this transition table.

Suggested transition tables:

**Table 39a**

<i>Industry</i>				
Row	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	0	0
2	0	1	0	0
3	1	0	0	0
4	1	1	1	1

**Table 39b**

<i>USTR</i>				
Row	<i>I</i>	<i>S</i>	<i>O</i>	<i>S'</i>
1	0	0	1	0
2	0	1	1	0
3	1	0	1	0
4	1	1	1	0

Incomplete connection matrix:

Table 40

V-US		Initial Conditions				Responses				Situation
Situation	I1	S1	I2	S2	O1	S1'	O2	S2'	Situation	
0	0	0	0	0	0	0	1	0	0	
1	0	0	0	1	0	0	1	0	1	
2	0	0	1	0	0	0	1	0	2	
3	0	0	1	1	0	0	1	0	3	
4	0	1	0	0	0	0	1	0	4	
5	0	1	0	1	0	0	1	0	5	
6	0	1	1	0	0	0	1	0	6	
7	0	1	1	1	0	0	1	0	7	
8	1	0	0	0	0	0	1	0	8	
9	1	0	0	1	0	0	1	0	9	
10	1	0	1	0	0	0	1	0	10	
11	1	0	1	1	0	0	1	0	11	
12	1	1	0	0	1	1	1	0	12	
13	1	1	0	1	1	1	1	0	13	
14	1	1	1	0	1	1	1	0	14	
15	1	1	1	1	1	1	1	0	15	

The USTR does not re-designate China as a priority foreign country even if it values the expressed concerns by the industry higher than its own actions (colonies B, E, and H) and acknowledges the concerns as justified (I2=0). Only if the industry cares more for its own actions (colonies G, H, and I) and the USTR weighs the expressed concerns by the industry heavier than its own (colonies B, E, and H), is there a disagreement about the success of the accord (I1 does not equal I2 as in outcomes 0, 2, and 8). In all other cases, there seems to be solid domestic support for the agreement. However, given the nature of the industry, it continues to push for further improvements of the IPR regime in China.

• *China*

Using the transition algorithm to determine the transition table for the central Chinese government results in the rounded value of 2 for the first and third rows of the new transition table and 3 for the second and fourth rows. This yields a total of four possible transition tables out of which the following is a good description of reality:

I S O S'  
 0 0 1 1  
 0 1 1 1  
 1 0 1 0  
 1 1 1 0

Based on the institutional analysis we change the first row of this transition table.

Suggested transition tables:

Table 41a

Row	Provinces			
	I	S	O	S'
1	0	0	0	0
2	0	1	0	1
3	1	0	0	0
4	1	1	1	1

Table 41b

Row	Beijing			
	I	S	O	S'
1	0	0	1	0
2	0	1	1	1
3	1	0	1	0
4	1	1	1	0

Incomplete Connection matrix:

Table 42

V-CH		Initial Conditions				Responses				Situation
Situation	I1	S1	I2	S2	O1	S1'	O2	S2'	Situation	
0	0	0	0	0	0	0	1	0	0	
1	0	0	0	1	0	0	1	1	1	
2	0	0	1	0	0	0	1	0	2	
3	0	0	1	1	0	0	1	0	3	
4	0	1	0	0	0	1	1	0	4	
5	0	1	0	1	0	1	1	1	5	
6	0	1	1	0	0	1	1	0	6	
7	0	1	1	1	0	1	1	0	7	
8	1	0	0	0	0	0	1	0	8	
9	1	0	0	1	0	0	1	1	9	
10	1	0	1	0	0	0	1	0	10	
11	1	0	1	1	0	0	1	0	11	
12	1	1	0	0	1	1	1	0	12	
13	1	1	0	1	1	1	1	1	13	
14	1	1	1	0	1	1	1	0	14	
15	1	1	1	1	1	1	1	0	15	

The domestic situation in China has only changed inasmuch as the resulting internal state of Beijing is different in situations 1, 5, 9, and 13. This signals a greater commitment of the central government to implement the agreement. Nevertheless, it still relies on the provinces. If the provincial governments lack the political and economic will to better protect IPRs and undertake appropriate actions, the accord cannot be implemented effectively. If the provincial governments do show this willingness, the chances for success of the accord are good unless the provincial governments do not value Beijing's actions. Initial situations 12, 13, 14, and 15 result in outcome 14 regardless of any differences in the interactive weights. If the central government can convince the provinces of the advantages of improved IPR protection, the second negotiations and agreement have achieved their objectives. Initial conditions 1, 5, 9, and 13 signal Beijing's improved willingness to do so (S2=S2'=1). While problems remain with China's IPR regime, we can conclude that the IPR negotiations and agreements have changed the domestic situation in China for the better. This is reflected in the trade indices that have increased from the first to fifth stage game.

6 *Summary*

The third part of the dissertation applies a discrete sociocybernetic model to the 1994-1996 US-Chinese negotiations on intellectual property rights (IPRs). Describing the main actors on the domestic and international levels as 2x2 finite state automata is an obvious simplification of reality. The selected variables and parameters are fairly general but sufficiently describe the atmosphere of the social dynamics. The institutional analysis of the negotiation process facilitates this selection. We can thus identify the main actors, their objectives and constraints, decision environment and relationships. The main actors in the US are the USTR and the IP industry. The relationship between the central and provincial governments in China has a significant impact on China's negotiation agenda and implementation efforts of the IPR agreement. This is why we focus on the central and provincial governments as key Chinese actors.

China did have an IPR regime before the negotiations and consequently disputed the allegations of the US about IPR piracy. However, the performance of the IPR regulations lagged behind their intended objectives. Central legislation is necessary but not sufficient for an effective IPR regime to develop. Informal institutions supporting IPR protection are essential in developing an effective IPR regime. Unfortunately, these informal institutions were mainly absent or insufficient on the provincial level. The US acknowledged China's legal efforts on the central level but could not observe any significant and long-lasting measures against IPR piracy in the provinces. The situation did not improve after the first IPR Accord of 1995; the new bilateral dispute was inevitable. Whether or not the 1996 reinforcement agreement of the 1995 IPR Accord reached its goal is too early to tell. The USTR has not initiated a new investigation into China's IPR regime. This does not mean that IPR piracy is no longer a problem in China. The US continues to monitor China's implementation efforts of the IPR agreements. However, unless the necessary informal institutions supporting IPR protection develop it is unlikely that the US IP industry will be satisfied by the existing level of IPR protection in China. If the central Chinese government is truly committed to more effective IPR protection, it has to help accelerate the supporting institution building process. The US, too, is advised to assist building formal and informal institutions by following policies that have positive impacts on this lengthy process.

The IPR negotiations comprised a fairly long time. This is why we divide them into five phases and analyze them separately. Following Putnam's (1988) two-level games approach we distinguish a domestic and an international level of interactions. Applying the sociocybernetic model we simulate the interactions on these levels in five stages. The *first stage game* describes the domestic dynamics in the two countries that help define the negotiation agendas for bilateral trade negotiations with China involving intellectual property rights (IPRs). In the US the social interactions between the industry and the USTR are mostly informal consultations before the beginning of the bilateral negotiations. The outcomes of the social interaction dynamics on this domestic level help define the negotiating agenda and strategy of the USTR in the next stage game. The results of the computer simulation imply that the USTR will enjoy strong domestic support for a tough stance against China if it values the actions of the industry higher than its own and there is no internal opposition within the industry against a tough stance. In China, the level of support for an effective IPR regime is strongly influenced by the relationship between the central and provincial governments. It influences the negotiation strategy of the Chinese government in the next stage game. The computer simulation suggests that overall there is little or no willingness and/or actions in China for effective IPR protection. For an IPR regime to evolve it takes the joint efforts of both the central and provincial governments to enforce existing IPR regulations in China. Only if there is internal support on both the central and provincial levels for strict IPR protection and enforcement, can an effective IPR regime evolve. Central legislation is necessary but not sufficient for an effective IPR regime to develop. Informal institutions supporting IPR protection are essential in developing an effective IPR regime. As long as the political will of the provincial governments to comply with central IPR laws is missing, the provinces will not commit to any serious efforts and improve IPR protection.

The US has to understand that formal, central legislation alone will not automatically improve the IPR situation in China. It is a much greater challenge to try to influence the internal states of the actors. This is especially difficult for the provinces because the US negotiates only with representatives of the central government. Therefore, the US is advised to take actions that reverberate on the Chinese domestic level and influence the political will in the central and provincial governments to enforce IPRs.

The *second stage game* looks at the series of IPR negotiations in 1994/95 after the

USTR designated China a priority foreign country and initiated a Section 301 investigation of China's IPR regime. The US is represented by the US Trade Representative (USTR) and China by the Ministry of Foreign Economic Relations and Trade (MOFERT). The outcomes of the second game result in an atmosphere that affects the wording and content of the IPR agreement. The computer simulations show that a mutual agreement is generally a possible though not certain outcome. If China makes no significant concessions during the negotiations, US sanctions are imminent. This is especially true if the US cares more for its actions than China's. If, on the other side, China does make concessions, an agreement becomes much more likely even though correct timing and persistence of the negotiators are necessary.

The domestic dynamics of the reaction to the agreement in the US and the implementation of the agreement in China are subject of the *third stage game*. The computer simulation suggests that overall the chances for domestic support of the IPR accord are indeed good. The industry seems to have significant influence on USTR's decision whether to launch a new Special 301 investigation or not. This is especially true if the USTR values the actions of the industry higher than its own. Whenever the USTR interprets the actions of the industry as a signal that China does not comply with the accord, the USTR will ultimately re-designate China as a priority foreign country. Initially the industry lauds the accord. It is the dissatisfaction within the industry about China's ineffective implementation efforts that leads it to qualify its support and eventually recommend a new investigation into China's IPR regime. If the industry had been satisfied with China's implementation efforts, a new Special 301 investigation would have been less likely. For the case of China, the results of the computer simulation tell us that the agreement is a step into the right direction of a more effective IPR regime even though the domestic support for a stricter IPR regime has not grown overall. The ultimate success of the accord depends on the political and economic will within the provincial governments to improve IPR protection. Unfortunately, this is not the case. Necessary informal institutions on the provincial level are mainly absent or insufficient. Consequently, the chances for an effective implementation of the IPR accord in China are slim. If it were possible to develop the political and economic will on the provincial level for more effective IPR protection, the likelihood for the evolution of an effective IPR regime in China is significantly higher. Building such informal institutions is a lengthy process. If the US could accelerate this process, future IPR disputes with China may be avoided. The new dispute between the US and China arises because the US cannot observe any significant and long-lasting measures against IPR piracy in the provinces. On the other side, the Chinese government interprets the actions of the provincial governments and its own as sufficient and in the spirit of the IPR agreement. Thus, the two countries see the situation differently and the bilateral dispute is inevitable.

The *fourth stage game* describes the resulting new IPR negotiations between the two countries in 1996. Its structure resembles the second stage game of the first series of negotiations. The computer simulation results imply that overall there is a good chance for a mutual agreement. However, compared to the first IPR negotiations, the risks for failure are higher. Due to the administrative restrictions of Section 306 of the amended Trade Law of 1974 the US is less willing to compromise. The US will lift its threat of sanction if and only if China makes significant concessions. If the US delegation is not satisfied with China's concessions and efforts, it will ultimately retaliate and impose sanctions against China. This scenario shows the seriousness of the dispute. The US delegation is well advised to value the actions of the Chinese at least as high as its own because unless the US is satisfied with China's concessions, a trade war could result.

Finally, the *fifth stage game* elaborates on the domestic support of the agreement in

the US and the chances for its successful implementation in China. The results of the computer simulation imply that the overall structure of the domestic dynamics in the US has not changed. Provided the industry is satisfied with China's progress the overall chances for yet another Special 301 investigation are low. If it is politically unfeasible to re-designate China as a priority foreign country the following picture emerges: Compared to the third stage game the level of domestic support for the agreement is lower. The industry's concerns and interests continue to influence the actions of the USTR, but the internal political constraints of the USTR are too strong such that it would re-designate China as a priority foreign country. If the industry expresses serious concerns about China's implementation efforts, the USTR will criticize China and try to push China to improved compliance. However, it will not launch a new Special 301 investigation. Given the nature of the industry, it continues to work for further improvements of the IPR regime in China. The simulation of the interactions in China generates the following results: While problems with China's IPR regime remain, it is fair to say that the IPR negotiations and agreements have improved the domestic situation in China. The domestic situation in China has changed insofar as the central government signals a greater commitment to implement the agreement. However, it still relies on the provinces. If the provincial governments lack the political and economic will to improve IPR protection and undertake appropriate actions, the accord cannot be implemented effectively. If on the other side the provincial governments show this willingness, the chances for success of the accord are good. If the central Chinese government is truly committed to implement the IPR accord, it is well advised to develop means to help accelerate the supporting institution building process. Passing appropriate legislation is a necessary step into the right direction. Formal institutions can help set up the framework for informal institutions to evolve. For example, stricter enforcement of IPR laws can cause the costs of IPR piracy to increase and make original and innovative activities more profitable. The central government has to convince the provinces of the advantages of improved IPR protection. The US, too, can help assist building informal and formal institutions by following policies that have positive impacts on this lengthy process.

Comparing the generated computer simulation results with the actual process and outcome of the negotiations we conclude that the sociocybernetic model seems to be a good approximation of reality. In addition to explaining real developments, the model outlines several other possible scenarios that could have happened along the way. An agreement was by far no foregone conclusion. For example, if the USTR had not valued China's input as much as its own actions, a trade war could have been the final outcome. Furthermore, if the IP industry had not unanimously advocated a tough stance against China this would have undermined the negotiation leverage of the US.

In addition to explaining and discussing actual developments and counterfactuals, the sociocybernetic model is also a valuable tool for a priori analyses of social interactions in foreign policy. For example, the negotiation parties could be stuck in a suboptimal situation where a trade war seems inevitable. Knowledge of the logic of social interactions as revealed by the sociocybernetic model may facilitate the resolution of this impasse and negotiators can take the necessary steps that lead to a mutual agreement. Simulating negotiations a priori can warn negotiators against undesired developments and outcomes. At the same time, negotiators may find it easier to control negotiation processes.

In summary, the developed discrete sociocybernetic model helps reveal the logic of the social interactions in the 1994-1996 US-Chinese negotiations on intellectual property rights. However, we have to understand that in order to use the model effectively we need to have good knowledge of the institutional context of the negotiations. The sociocybernetic model does not undermine the necessity of an accurate assessment of the other party. Indeed,

the more we know about the institutional context of the social interactions on the specific level, the easier it becomes to describe the behavior patterns correctly and select the right interactive weights. Hence, the combination of sociocybernetics and an institutional analysis proves to be a valuable tool for this case study.

#### 4. The Value of Sociocybernetics in Foreign Policy Analysis

It is difficult to describe social interaction patterns in foreign policy. They are not static but change over time adapting to the complex dynamic of international relations. The process and outcomes of foreign policy are a reflection of the dynamic nature, structure, patterns, and rules of these interactions. Today there is a variety of actors involved in foreign policy. Next to state-governments, firms, industries, pressure groups, and many others non-governmental polities play an increasing role in international relations. In addition, as domestic and international issues affect each other it becomes more difficult to draw a clear line between domestic and foreign policies. Analyzing the complex nature of social interactions advances the understanding of the dynamics of foreign policy. The dissertation contributes to this advancement.

The modern international world is characterized by complex interdependence. As the boundary between international and domestic policies becomes blurred, it is increasingly important to study domestic and international foreign policy issues simultaneously. Putnam's two-level games metaphor of the interconnectedness of domestic and international policies is one of the most popular analytical approaches. For good reasons. It goes beyond the artificial levels of analysis and comprises them in one analytical framework. Putnam emphasizes the interactive elements between diplomacy and domestic politics. Unfortunately, he does not elaborate on how they can be explained quantitatively. The advantages of a quantitative model are the general character and elegance of mathematics. However, we must not forget that quantitative models are only methodological simplifications. They approximate reality and necessarily remain incomplete. In order to quantify social interactions on and between the domestic and international levels of foreign policy we need to have a basic knowledge of the nature of the social interactions. This requires an institutional analysis of social interactions. The combination of an institutional analysis and a quantitative model can facilitate the analysis of complex and interdependent relationships in foreign policy.

Rational choice is the most widely used quantitative approach in applications of the two-level games metaphor. It convinces by its simplicity and elegance of conceptualizing complex constellations. Its primary goal is to identify optimal strategies to achieve well-defined goals. Unfortunately, rational choice does not offer many insights about the dynamics of social interactions in foreign policy. Sociocybernetics focuses on the analysis of social systems. It drops the assumption of rational and optimizing behavior. Instead, it describes general social interaction patterns and explains how they affect the process and outcomes of foreign policy. The quantitative description of social systems allows us to simulate social interactions in foreign policy with the help of a computer. Given an accurate game description it allows us to trace and predict the process and outcome of social interactions. This special feature makes sociocybernetics attractive to both the theoretical researcher and policy practitioner.

Section 3 demonstrates the practical use of sociocybernetics. It develops a discrete sociocybernetic model of the 1994-1996 US-Chinese negotiations on intellectual property rights (IPRs). The model is embedded in Putnam's two-level games framework. Since the IPR negotiations comprised a fairly long time, we divide them into five phases and analyze them separately. In order to minimize the complexity of the model we limit the analysis to two actors on the respective international and domestic levels. The US Trade Representative (USTR) and the intellectual property industry are the main actors in the US; in China the central and provincial governments play key roles. Furthermore, we include only a limited number of variables in the model. The selected variables and parameter are fairly general and

sufficiently describe the atmosphere of the social interaction dynamics. The simplest, non-trivial sociocybernetic setup does not undermine the explanatory value of the study. The sociocybernetic model proves to be a good approximation of reality. It accounts for systemic as well as subsystemic variables in one analytical framework. It thus provides a solid methodology for a balanced analysis of social interactions in foreign policy.

The developed sociocybernetic model expands Putnam's two-level games approach in at least two aspects. *First*, it provides a simple, quantitative methodology to analyze the social interactions on and between domestic and international levels of foreign policy. Sociocybernetics clarifies the importance of social interaction dynamics and helps explain how they affect the processes and outcomes in foreign policy. Putnam recognizes the significance of social interactions in foreign policy, but does not explain how we can model them quantitatively. Rational choice helps clarify constellations and relationships, but does not explain the dynamics of social interactions. Sociocybernetics fills this gap. *Second*, sociocybernetics adds a new meaning to Putnam's concept of a win set. A win set contains all those international agreements that can find the necessary domestic support. The shape and size of a win set are not constant. They change over time and negotiators can influence them only indirectly. The demonstrated sociocybernetic model teaches us that the social interaction dynamics causes the win set to change and quantifies this process. Furthermore, sociocybernetics can illustrate the effects of restructuring the composition of the determinants of a win set such as the influence of pressure groups or public opinion. While it is difficult to control one's win set, it is even harder to influence the size and shape of the win set of another country. The case study suggests that such efforts can be beneficial. If the US wants China to improve the effectiveness of its IPR regime it is well advised to help China develop necessary formal and informal institutions. The US has to follow policies that reverberate on the Chinese win set and influence the political and economic will in the central and provincial governments to enforce IPRs. This is no easy task especially because the US does not want China to perceive these policies as an undesired intervention into internal Chinese affairs.

Obvious caveats and points of criticism of the sociocybernetic model remain. The limitation to only a few variables poses unique challenges because we have to be very careful about choosing the right variables. This indicates the significance of an accurate game description. Therefore, applying sociocybernetics to the analysis of social interactions requires an institutional analysis of the actors and their interactions over time. Sociocybernetics can facilitate this institutional analysis insofar as it can generate hypotheses about the process and outcome of the interactions of the actors that can be tested empirically.

One of the strengths as well as weaknesses of the sociocybernetic model is its richness. The simplest, non-trivial sociocybernetic set-up of two interacting social system yield 16,777,216 possible interactive outcomes. Obviously, this is too high a number to analyze. Even if we limit the study to specific behavior patterns the number of outcomes can still be overwhelming. Two selection criteria help manage this complexity. *First*, thorough background knowledge of the social interaction dynamics helps eliminate implausible interaction patterns and outcomes and directs the analysis to focus on realistic patterns. Alternatively, we can select those behavior patterns that are most consistent with a given objective. This can but need not be rational and optimizing behavior.

The sociocybernetic model does not require the identification of an objective function. This could be viewed as another weakness of sociocybernetics. However, the description of the nature of interacting actors makes the explicit definition of an objective function obsolete. In the sociocybernetic model the actors do not choose their optimal strategies, but their moves are determined by their behavior patterns and social interaction dynamics. The leading question is which components produce what system. Sociocybernetics can assist

with the identification of constellations that lead to a desired outcome the quickest and outline the most promising strategies a priori as well as a posteriori. It reveals the logical consequence of interaction patterns. It thus becomes possible to choose an optimal strategy a posteriori.

Sociocybernetics is a dynamic analysis because it can trace changes of behavior through time. However, just like any other model sociocybernetics includes only a limited number of variables while treating others as constant. As time passes the constellation and structure of social systems change and require the adjustment of the sociocybernetic game descriptions. Therefore, it is essential to limit the period spanned by a sociocybernetic study. The division of the IPR negotiations into five distinct phases serves as an example.

Another weak point of sociocybernetics is that while the time variable is included in the model, we cannot tell how long exactly it may take to move from one interactive constellation to the next. Obviously, this is less a problem in ex post than in present studies and predictions of social interaction dynamics. Varying the sociocybernetic game description by replacing, dropping, or adding variables and parameters may provide insights about a situation in question, but does not overcome this flaw. Consequently, we have to be cautious when assessing the relative length from an initial situation to a final outcome. However, this should not lead to question the overall value of sociocybernetics in foreign policy analysis. Rational choice confronts the same problem as do many other approaches. Indeed, no matter what model we adopt, it will always be incomplete. "The question is not whether the formal system mirrors the real system, but whether the formal system ... provides us with information about the structure of real systems" (Hamman, 1996, 10).<sup>102</sup>

Sociocybernetics offers a simple, quantitative, computer based approach of modeling social interactions in foreign policy. The case study demonstrates that even the simplest, non-trivial sociocybernetic set-up generates a huge number of hypotheses about the logic of social interactions in foreign policy. Simulating social interactions with the help of a computer makes sociocybernetics attractive to theorists and practitioners of foreign policy. It can be applied to both historical analyses as well as present studies and future predictions of social interactions in foreign policy. Sociocybernetics does not contradict but complements many other approaches of foreign policy. It can confirm, correct, and advance our understanding of social interactions in foreign policy. Therefore, sociocybernetics is of an exceptionally high value to foreign policy analysis.

<sup>102</sup> This is the content of Gödel's Incompleteness Theorem (1931).

## 5. Appendix

### 1 Tables of Simulation Results

*System Simulation* This column contains all situations that lead to the various terminal cycle arrays (*TCA<sub>i</sub>*) in the next column. If a situation leads directly to the terminal cycle this is illustrated by a semi-colon. If it first leads to another situation that is not a final outcome, this is denoted by a dash. For example, situation 8 in the first row leads directly to the terminal cycle 8, whereas situation 2 in colony B first goes into situation 8 and then becomes situation 0.

<i>i</i>	Index for the colonies A through I.
<i>j</i>	Index for the number of clusters.
<i>Colony<sub>i</sub></i>	This column lists the respective colony <i>i</i> .
<i>Cluster</i>	This column lists the number of clusters.
<i>Nodes</i>	This column contains information about the number of nodes in each cluster.
<i>CNV</i>	Cumulative node value; sum of binary 1's from each initial condition through each terminal cycle.
<i>WNN</i>	Weighted number of nodes; total number of nodes on the path from each initial condition to the terminal cycle.
<i>CTI<sub>ij</sub></i>	Cluster trade index, $\frac{250 * CNV_{ij}}{WNN_{ij}} = CTI_{ij}$
<i>TCl<sub>ij</sub></i>	Cluster terminal cycle trade index, 250 * number of binary one's in the terminal outcome (resulting situation in the connection matrix)
<i>CNV'<sub>i</sub></i>	Cumulative node value of colony <i>i</i> , $\sum_j CNV_{ij} = CNV'_i$
<i>WNN'<sub>i</sub></i>	Weighted number of nodes of colony <i>i</i> , $\sum_j WNN_{ij} = WNN'_i$
<i>STI<sub>i</sub></i>	System trade index of colony <i>i</i> , $\frac{250 * CNV'_i}{WNN'_i} = STI_i$
<i>TCl<sub>i</sub></i>	Terminal cycle trade index of colony <i>i</i> , $\frac{\sum_{ij} TCl_{ij}}{j} = TCl_i$

*STI* Combined system trade index of the whole stage game,

$$\frac{250 * \sum_i C N V'_i}{\sum_i W N N'_i} = S T I$$

*TCI* Combined terminal cycle trade index of the whole stage game,

$$\frac{250 * \sum_i C N V'_i}{\sum_i W N N'_i} = T C I$$

The “1” and “2” in the upper right hand corner of each table denotes the simulation series.  
**Simulation Series ONE**

**Table 1-I-US(a) = Table 8 of Section 3.5.1, page 86**

**Simulation Results of Stage Game I-US**

System Simulation	Cluster Analysis			
	TCA <sub>i</sub>	Colony <sub>i</sub>	Cluster	Nodes
8;	0	A	1	2
9;	1		2	2
2;	10		3	2
3;	11		4	2
4; 6; 12;	14		5	4
5; 7;13	15		6	4
2-8; 10-8;	0	B	1	4
3-9; 11-9;	1		2	4
4; 6; 12;	14		3	4
5;7;13;	15		4	4
8;	0	C	1	2
9;	1		2	2
2;	10		3	2
3;	11		4	2
4;	12		5	2
5;	13		6	2
6;	14		7	2
7;	15		8	2

System Simulation	Cluster Analysis			
	TCA <sub>i</sub>	Colony <sub>i</sub>	Cluster	Nodes
8;	0	D	1	2
9;	1		2	2
2;	10		3	2
3;	11		4	2
4-6; 12-6;	14		5	4
5-7; 13-7;	15		6	4
2-8; 10-8;	0	E	1	4
3-9; 11-9;	1		2	4
4-6; 12-6;	14		3	4
5-7; 13-7;	15		4	4
8;	0	F	1	2
9;	1		2	2
12;	4		3	2
13;	5		4	2
2;	10		5	2
3;	11		6	2
6;	14		7	2
7;	15		8	2
8;	0	G	1	2
9;	1		2	2
10;	2		3	2
11;	3		4	2
4; 6; 12;	14		5	4
5; 7; 13	15		6	4
2; 8; 10;	0	H	1	4
3; 9; 11;	1		2	4
4; 6; 12;	14		3	4
5;7;13;	15		4	4
8;	0	I	1	2
9;	1		2	2
10;	2		3	2
11;	3		4	2
4;	12		5	2
5;	13		6	2
6;	14		7	2
7;	15		8	2

2 Terminal Cycle Tables

These tables outline all final outcomes. The first column lists the initial situations of the connection matrix. The following columns contain the terminal cycle arrays the various situations lead to. If a situation leads to a specific outcome in all sixteen simulations, the final outcome is listed in the column *TC* (terminal cycle). The column *TCSum* summarizes the frequency of the terminal cycle arrays. Finally, the column *One's* tells us the total number of binary 1's in the terminal cycle arrays. The "1" or "2" in the upper right hand corner of each table denotes the simulation series.

Simulation Series ONE

The first terminal cycle table is equivalent to table 10 of Section 3.5.1, page 89.

Terminal Cycle Table														1	
Stage Game I-US															
	A	B	C	D	E	F	G	H	I	TC		TCSum		One's	
0	0	0	0	0	0	0	0	0	0	0	0	16x0	0	0	
1	1	1	1	1	1	1	1	1	1	1	1	16x1	1	16	
2	10	0	10	10	0	10	2	0	2	2	2	9x10;4x0;3x2	2	21	
3	11	1	11	11	1	11	3	1	3	3	3	9x11;4x1;3x3	3	37	
4	14	14	12	14	14	4	14	14	12	4	4	12x14;3x12;1x4	4	43	
5	15	15	13	15	15	5	15	15	13	5	5	12x15;3x13;1x5	5	59	
6	14	14	14	14	14	14	14	14	14	6	14	16x14	6	48	
7	15	15	15	15	15	15	15	15	15	7	15	16x15	7	64	
8	0	0	0	0	0	0	0	0	0	8	0	16x0	8	0	
9	1	1	1	1	1	1	1	1	1	9	1	16x1	9	16	
10	10	0	10	10	0	10	2	0	2	10	10	9x10;4x0;3x2	10	21	
11	11	1	11	11	1	11	3	1	3	11	11	9x11;4x1;3x3	11	37	
12	14	14	12	14	14	4	14	14	12	12	12	12x14;3x12;1x4	12	43	
13	15	15	13	15	15	5	15	15	13	13	13	12x15;3x13;1x5	13	59	
14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48	
15	15	15	15	15	15	15	15	15	15	15	15	16x15	15	64	

Terminal Cycle Table														1	
Stage Game I-China															
	A	B	C	D	E	F	G	H	I	TC		TCSum		One's	
0	0	0	0	0	0	0	0	0	0	0	0	16x0	0	0	
1	11	9	11	11	9	11	3	1	3	1	1	9x11;3x9;3x3;1x1	1	40	
2	0	0	0	0	0	0	0	0	0	2	0	16x0	2	0	
3	11	9	11	11	9	11	3	1	3	3	3	9x11;3x9;3x3;1x1	3	40	
4	14	14	12	14	14	4	14	14	12	4	4	9x14;3x12;3x6;1x4	4	40	
5	15	15	15	15	15	15	15	15	15	5	15	16x15	5	64	
6	14	14	12	14	14	4	14	14	12	6	6	9x14;3x12;3x6;1x4	6	40	
7	15	15	15	15	15	15	15	15	15	7	15	16x15	7	64	
8	0	0	0	0	0	0	0	0	0	8	0	16x0	8	0	
9	11	9	11	11	9	11	3	1	3	9	9	9x11;3x9;3x3;1x1	9	40	
10	0	0	0	0	0	0	0	0	0	10	0	16x0	10	0	
11	11	9	11	11	9	11	3	1	3	11	11	9x11;3x9;3x3;1x1	11	40	
12	14	14	12	14	14	4	14	14	12	12	12	9x14;3x12;3x6;1x4	12	40	
13	15	15	15	15	15	15	15	15	15	13	15	16x15	13	64	
14	14	14	12	14	14	4	14	14	12	14	14	9x14;3x12;3x6;1x4	14	40	
15	15	15	15	15	15	15	15	15	15	15	15	16x15	15	64	

Terminal Cycle Table														1	
Stage Game II															
	A	B	C	D	E	F	G	H	I	TC		TCSum		One's	
0	10	10	10	10	10	10	6	4	6	0	0	12x10;3x6;1x4	0	31	
1	10	10	10	10	10	10	6	5	6	1	1	12x10;3x6;1x5	1	32	
2	10	10	10	10	10	10	6	4	6	2	2	12x10;3x6;1x4	2	31	
3	10	10	10	10	10	10	6	4	6	3	3	12x10;3x6;1x4	3	31	
4	10	10	10	10	10	10	6	4	6	4	4	12x10;3x6;1x4	4	31	
5	10	10	10	10	10	10	6	5	6	5	5	12x10;3x6;1x5	5	32	
6	10	10	10	10	10	10	6	4	6	6	6	12x10;3x6;1x4	6	31	
7	10	10	10	10	10	10	6	4	6	7	7	12x10;3x6;1x4	7	31	
8	10	10	10	10	10	10	10	10	10	8	10	16x10	8	32	
9	10	10	10	10	10	10	10	10	10	9	10	16x10	9	32	
10	10	10	10	10	10	10	10	10	10	10	10	16x10	10	32	
11	10	10	10	10	10	10	10	10	10	11	10	16x10	11	32	
12	10	10	10	10	10	10	10	10	10	12	10	16x10	12	32	
13	10	10	10	10	10	10	10	10	10	13	10	16x10	13	32	
14	10	10	10	10	10	10	10	10	10	14	10	16x10	14	32	
15	10	10	10	10	10	10	10	10	10	15	10	16x10	15	32	

Terminal Cycle Table														1	
Stage Game III-US															
	A	B	C	D	E	F	G	H	I	TC		TCSum		One's	
0	1	1	1	1	1	1	1	1	1	0	1	16x1	0	16	

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16x1	1	16
2	10	1	10	10	1	10	2	1	2	2		2		2	9x10;4x1;3x2	2	25
3	10	1	10	10	1	10	2	1	2	3		3		3	9x10;4x1;3x2	3	25
4	14	14	13	14	14	5	14	14	13	4		4		4	12x14;3x13;1x5	4	47
5	14	14	13	14	14	5	14	14	13	5		5		5	12x14;3x13;1x5	5	47
6	14	14	14	14	14	14	14	14	14	6	14	6		6	16x14	6	48
7	14	14	14	14	14	14	14	14	14	7	14	7		7	16x14	7	48
8	1	1	1	1	1	1	1	1	1	8	1	8		8	16x1	8	16
9	1	1	1	1	1	1	1	1	1	9	1	9		9	16x1	9	16
10	10	1	10	10	1	10	2	1	2	10		10		10	9x10;4x1;3x2	10	25
11	10	1	10	10	1	10	2	1	2	11		11		11	9x10;4x1;3x2	11	25
12	14	14	13	14	14	5	14	14	13	12		12		12	12x14;3x13;1x5	12	47
13	14	14	13	14	14	5	14	14	13	13		13		13	12x14;3x13;1x5	13	47
14	14	14	14	14	14	14	14	14	14	14	14	14		14	16x14	14	48
15	14	14	14	14	14	14	14	14	14	15	14	15		15	16x14	15	48

Terminal Cycle Table																	1
Stage Game III-China																	
	A	B	C	D	E	F	G	H	I		TC		TCSum		One's		
0	0	0	0	0	0	0	0	0	0	0	0	0		16x0	0	0	
1	10	0	10	10	0	10	2	0	2	1		1		9x10;4x0;3x2	1	21	
2	10	0	10	10	0	10	2	0	2	2		2		9x10;4x0;3x2	2	21	
3	10	0	10	10	0	10	2	0	2	3		3		9x10;4x0;3x2	3	21	
4	14	14	12	14	14	4	14	14	12	4		4		12x14;3x12;1x4	4	43	
5	14	14	14	14	14	14	14	14	14	5	14	5		16x14	5	48	
6	14	14	14	14	14	14	14	14	14	6	14	6		16x14	6	48	
7	14	14	14	14	14	14	14	14	14	7	14	7		16x14	7	48	
8	0	0	0	0	0	0	0	0	0	8	0	8		16x0	8	0	
9	10	0	10	10	0	10	2	0	2	9		9		9x10;4x0;3x2	9	21	
10	10	0	10	10	0	10	2	0	2	10		10		9x10;4x0;3x2	10	21	
11	10	0	10	10	0	10	2	0	2	11		11		9x10;4x0;3x2	11	21	
12	14	14	12	14	14	4	14	14	12	12		12		12x14;3x12;1x4	12	43	
13	14	14	14	14	14	14	14	14	14	13	14	13		16x14	13	48	
14	14	14	14	14	14	14	14	14	14	14	14	14		16x14	14	48	
15	14	14	14	14	14	14	14	14	14	15	14	15		16x14	15	48	

Terminal Cycle Table																	1
Stage Game IV																	
	A	B	C	D	E	F	G	H	I		TC		TCSum		One's		
0	10	10	10	10	10	10	2	0	2	0		0		12x10;3x2;1x0	0	27	
1	1	1	1	1	1	1	1	1	1	1	1	1		16x1	1	16	
2	10	10	10	10	10	10	2	0	2	2		2		12x10;3x2;1x0	2	27	
3	10	10	10	10	10	10	2	0	2	3		3		12x10;3x2;1x0	3	27	
4	10	10	10	10	10	10	6	4	6	4		4		12x10;3x6;1x4	4	31	
5	5	5	5	5	5	5	5	5	5	5	5	5		16x5	5	32	
6	10	10	10	10	10	10	6	4	6	6		6		12x10;3x6;1x4	6	31	
7	10	10	10	10	10	10	6	4	6	7		7		12x10;3x6;1x4	7	31	
8	10	10	10	10	10	10	10	10	10	8	10	8		16x10	8	32	
9	10	10	9	10	1	10	10	10	9	9		9		12x10;3x9;1x1	9	31	
10	10	10	10	10	10	10	10	10	10	10	10	10		16x10	10	32	
11	10	10	10	10	10	10	10	10	10	11	10	11		16x10	11	32	
12	10	10	10	10	10	10	10	10	10	12	10	12		16x10	12	32	
13	10	10	9	10	1	10	10	10	9	13		13		12x10;3x9;1x1	13	31	
14	10	10	10	10	10	10	10	10	10	14	10	14		16x10	14	32	
15	10	10	10	10	10	10	10	10	10	15	10	15		16x10	15	32	

Terminal Cycle Table																	1
Stage Game V-US*																	
	A	B	C	D	E	F	G	H	I		TC		TCSum		One's		
0	10	8	10	10	8	10	2	0	2	0		0		9x10;3x8;3x2;1x0	0	24	
1	10	8	10	10	8	10	2	0	2	1		1		9x10;3x8;3x2;1x0	1	24	
2	10	8	10	10	8	10	2	0	2	2		2		9x10;3x8;3x2;1x0	2	24	
3	10	8	10	10	8	10	2	0	2	3		3		9x10;3x8;3x2;1x0	3	24	
4	14	14	14	14	14	14	14	14	14	4	14	4		16x14	4	48	
5	14	14	14	14	14	14	14	14	14	5	14	5		16x14	5	48	
6	14	14	14	14	14	14	14	14	14	6	14	6		16x14	6	48	
7	14	14	14	14	14	14	14	14	14	7	14	7		16x14	7	48	
8	10	8	10	10	8	10	2	0	2	8		8		9x10;3x8;3x2;1x0	8	24	
9	10	8	10	10	8	10	2	0	2	9		9		9x10;3x8;3x2;1x0	9	24	
10	10	8	10	10	8	10	2	0	2	10		10		9x10;3x8;3x2;1x0	10	24	
11	10	8	10	10	8	10	2	0	2	11		11		9x10;3x8;3x2;1x0	11	24	
12	14	14	14	14	14	14	14	14	14	12	14	12		16x14	12	48	
13	14	14	14	14	14	14	14	14	14	13	14	13		16x14	13	48	
14	14	14	14	14	14	14	14	14	14	14	14	14		16x14	14	48	
15	14	14	14	14	14	14	14	14	14	15	14	15		16x14	15	48	

Terminal Cycle Table																	1
Stage Game V-China																	
	A	B	C	D	E	F	G	H	I		TC		TCSum		One's		
0	1	1	1	1	1	1	1	1	1	1	1	1		16x1	0	16	
1	1	1	1	1	1	1	1	1	1	1	1	1		16x1	1	16	

2	10	1	10	10	1	10	2	1	2	2		2	9x10;4x1;3x2	2	25
3	10	1	10	10	1	10	2	1	2	3		3	9x10;4x1;3x2	3	25
4	14	14	13	14	14	5	14	14	13	4		4	12x14;3x13;1x5	4	47
5	14	14	13	14	14	5	14	14	13	5		5	12x14;3x13;1x5	5	47
6	14	14	14	14	14	14	14	14	14	6	14	6	16x14	6	48
7	14	14	14	14	14	14	14	14	14	7	14	7	16x14	7	48
8	1	1	1	1	1	1	1	1	1	8	1	8	16x1	8	16
9	1	1	1	1	1	1	1	1	1	9	1	9	16x1	9	16
10	10	1	10	10	1	10	2	1	2	10		10	9x10;4x1;3x2	10	25
11	10	1	10	10	1	10	2	1	2	11		11	9x10;4x1;3x2	11	25
12	14	14	13	14	14	5	14	14	13	12		12	12x14;3x13;1x5	12	47
13	14	14	13	14	14	5	14	14	13	13		13	12x14;3x13;1x5	13	47
14	14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48
15	14	14	14	14	14	14	14	14	14	15	14	15	16x14	15	48

**Simulation Series TWO**

Terminal Cycle Table														2	
Stage Game I-US															
	A	B	C	D	E	F	G	H	I		TC		TCSum		One's
0	0	0	0	0	0	0	0	0	0	0	0	0	16x0	0	0
1	0	0	0	0	0	0	0	0	0	1	0	1	16x0	1	0
2	10	0	10	10	0	10	2	0	2	2		2	9x10;4x0;3x2	2	21
3	11	0	11	11	0	11	3	0	3	3		3	9x11;4x0;3x3	3	33
4	0	0	0	0	0	0	0	0	0	4	0	4	16x0	4	0
5	0	0	0	0	0	0	0	0	0	5	0	5	16x0	5	0
6	10	0	10	10	0	10	2	0	2	6		6	9x10;4x0;3x2	6	21
7	11	0	11	11	0	11	3	0	3	7		7	9x11;4x0;3x3	7	33
8	0	0	0	0	0	0	0	0	0	8	0	8	16x0	8	0
9	0	0	0	0	0	0	0	0	0	9	0	9	16x0	9	0
10	10	0	10	10	0	10	2	0	2	10		10	9x10;4x0;3x2	10	21
11	11	0	11	11	0	11	3	0	3	11		11	9x11;4x0;3x3	11	33
12	14	14	12	10	0	0	14	14	12	12		12	9x14;3x12;2x10;2x0	12	37
13	14	14	12	10	0	0	14	14	12	13		13	9x14;3x12;2x10;2x0	13	37
14	14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48
15	15	15	15	15	15	15	15	15	15	15	15	15	16x15	15	64

Terminal Cycle Table														2	
Stage Game I-China															
	A	B	C	D	E	F	G	H	I		TC		TCSum		One's
0	0	0	0	0	0	0	0	0	0	0	0	0	16x0	0	0
1	0	0	0	0	0	0	0	0	0	1	0	1	16x0	1	0
2	0	0	0	0	0	0	0	0	0	2	0	2	16x0	2	0
3	11	0	11	11	0	11	3	0	3	3		3	9x11;4x0;3x3	3	33
4	4	4	4	4	4	4	4	4	4	4	4	4	16x4	4	16
5	4	4	4	4	4	4	4	4	4	5	4	5	16x4	5	16
6	4	4	4	4	4	4	4	4	4	6	4	6	16x4	6	16
7	15	14	15	15	4	15	7	4	7	7		7	9x15;2x14;2x4;3x7	7	53

8	0	0	0	0	0	0	0	0	0	0	8	0	8	16x0	8	0
9	0	0	0	0	0	0	0	0	0	9	0	9	16x0	9	0	
10	0	0	0	0	0	0	0	0	0	10	0	10	16x0	10	0	
11	11	0	11	11	0	11	3	0	3	11		11	9x11;4x0;3x3	11	33	
12	14	14	12	4	4	4	14	14	12	12		12	9x14;3x12;4x4	12	37	
13	14	14	12	4	4	4	14	14	12	13		13	9x14;3x12;4x4	13	37	
14	14	14	12	4	4	4	14	14	12	14		14	9x14;3x12;4x4	14	37	
15	15	15	15	15	15	15	15	15	15	15	15	15	16x15	15	64	

**Intuition behind the entries of terminal cycle tables 2-II and 2-IV**

The table of the simulation results reveal that there are several two-, three-, and even four-step terminal cycles in the second stage game. This means that those systems do not yield stable outcomes. However, considering that the two parties did sign an agreement we select the most realistic outcome of those initial situations that lead to two-, three-, or four-step cycles. The selected outcomes are connoted by an asterik \*.

Terminal Cycle Table														2
Stage Game II														
	A	B	C	D	E	F	G	H	I	TC		TCSum	One's	
0	10	10	10*	10*	10*	14*	0*	4*	0*	0	0	11x10;3x0;1x4;1x14	0	26
1	10	10	10*	10*	10*	14*	4*	4*	4*	1	1	11x10;4x4;1x14	1	29
2	10	10	10*	10*	10*	14*	4*	4*	4*	2	2	11x10;4x4;1x14	2	29
3	10	10	10*	10*	10*	14*	0*	4*	0*	3	3	11x10;3x0;1x4;1x14	3	26
4	10	10	10*	10*	10*	14*	4*	4*	4*	4	4	11x10;4x4;1x14	4	29
5	10	10	10*	10*	10*	14*	0*	4*	0*	5	5	11x10;3x0;1x4;1x14	5	26
6	10	10	10*	10*	10*	14*	0*	4*	0*	6	6	11x10;3x0;1x4;1x14	6	26
7	10	10	10*	10*	10*	14*	4*	4*	4*	7	7	11x10;4x4;1x14	7	29
8	10	10	10*	10*	10*	14*	10	10	10*	8	8	15x10;1x14	8	33
9	10	10	10*	10*	10*	14*	10	10	10*	9	9	15x10;1x14	9	33
10	10	10	10*	10*	10*	14*	10	10	10*	10	10	15x10;1x14	10	33
11	10	10	10*	10*	10*	14*	10	10	10*	11	11	15x10;1x14	11	33
12	10	10	10*	10*	10*	14*	10	10	10*	12	12	15x10;1x14	12	33
13	10	10	10*	10*	10*	14*	10	10	10*	13	13	15x10;1x14	13	33
14	10	10	10*	10*	10*	14*	10	10	10*	14	14	15x10;1x14	14	33
15	10	10	10*	10*	10*	14*	10	10	10*	15	15	15x10;1x14	15	33

Terminal Cycle Table														2	
Stage Game III-US															
	A	B	C	D	E	F	G	H	I	TC		TCSum	One's		
0	1	1	1	1	1	1	1	1	1	0	1	0	16x1	0	16
1	1	1	1	1	1	1	1	1	1	1	1	1	16x1	1	16
2	10	1	10	10	1	10	2	1	2	2	2	9x10;4x1;3x2	2	25	
3	10	1	10	10	1	10	2	1	2	3	3	9x10;4x1;3x2	3	25	
4	1	1	1	1	1	1	1	1	1	4	1	4	16x1	4	16
5	1	1	1	1	1	1	1	1	1	5	1	5	16x1	5	16
6	10	1	10	10	1	10	2	1	2	6	6	9x10;4x1;3x2	6	25	
7	10	1	10	10	1	10	2	1	2	7	7	9x10;4x1;3x2	7	25	
8	1	1	1	1	1	1	1	1	1	8	1	8	16x1	8	16
9	1	1	1	1	1	1	1	1	1	9	1	9	16x1	9	16
10	10	1	10	10	1	10	2	1	2	10	10	9x10;4x1;3x2	10	25	
11	10	1	10	10	1	10	2	1	2	11	11	9x10;4x1;3x2	11	25	
12	14	14	13	10	1	1	14	14	13	12	12	9x14;3x13;2x10;2x1	12	42	
13	14	14	13	10	1	1	14	14	13	13	13	9x14;3x13;2x10;2x1	13	42	
14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48	
15	14	14	14	14	14	14	14	14	14	15	14	15	16x14	15	48

Terminal Cycle Table														2	
Stage Game III-China															
	A	B	C	D	E	F	G	H	I	TC		TCSum	One's		
0	10	8	10	10	8	10	2	0	2	0	0	9x10;3x8;3x2;1x0	0	24	
1	10	8	10	10	8	10	2	0	2	1	1	9x10;3x8;3x2;1x0	1	24	
2	10	8	10	10	8	10	2	0	2	2	2	9x10;3x8;3x2;1x0	2	24	
3	10	8	10	10	8	10	2	0	2	3	3	9x10;3x8;3x2;1x0	3	24	
4	14	14	14	14	14	14	6	4	6	4	4	12x14;3x6;1x4	4	43	
5	14	14	14	14	14	14	6	4	6	5	5	12x14;3x6;1x4	5	43	
6	14	14	14	14	14	14	6	4	6	6	6	12x14;3x6;1x4	6	43	
7	14	14	14	14	14	14	6	4	6	7	7	12x14;3x6;1x4	7	43	
8	10	8	10	10	8	10	2	0	2	8	8	9x10;3x8;3x2;1x0	8	24	
9	10	8	10	10	8	10	2	0	2	9	9	9x10;3x8;3x2;1x0	9	24	
10	10	8	10	10	8	10	2	0	2	10	10	9x10;3x8;3x2;1x0	10	24	
11	10	8	10	10	8	10	2	0	2	11	11	9x10;3x8;3x2;1x0	11	24	
12	14	14	14	14	14	14	14	14	14	12	14	12	16x14	12	48
13	14	14	14	14	14	14	14	14	14	13	14	13	16x14	13	48
14	14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48
15	14	14	14	14	14	14	14	14	14	15	14	15	16x14	15	48

Terminal Cycle Table														2	
Stage Game IV															
	A	B	C	D	E	F	G	H	I	TC		TCSum	One's		
0	14	14	14	14	14	14	6*	4*	6*	0	0	12x14;3x6;1x4	0	43	
1	5*	5*	5*	5*	5*	5*	5*	5*	5*	1	5*	1	16x5*	1	32
2	14	14	14	14	14	14	6*	4*	6*	2	2	12x14;3x6;1x4	2	43	
3	15	15	15	15	9*	15	7*	5	7*	3	3	11x15;1x9;3x7;1x5	3	57	
4	10	10	10	10	10	10	6*	4*	6*	4	4	12x10;3x6;1x4	4	31	
5	5*	5*	5*	5*	5*	5*	5*	5*	5*	5	5*	5	16x5*	5	32
6	10	10	10	10	10	10	6*	4*	6*	6	6	12x10;3x6;1x4	6	31	
7	11	11	11	11	9*	11	7*	5	7*	7	7	11x11;1x9;3x7;1x5	7	46	
8	10	10	10	10	10	10	10	10	10	8	10	8	16x10	8	32
9	10	11	9	15	9*	5*	11	11	9	9	9	4x10;5x11;4x9;2x15;1x5	9	41	
10	10	10	10	10	10	10	10	10	10	10	10	16x10	10	32	
11	11	11	11	11	11	11	11	11	11	11	11	16x11	11	32	
12	14	14	14	14	14	14	14	14	14	12	14	12	16x14	12	48
13	15	15	13	11	9*	5*	15	15	13	13	13	9x15;3x13;2x11;1x9;1x5	13	55	
14	14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48
15	15	15	15	15	15	15	15	15	15	15	15	15	16x15	15	64

Terminal Cycle Table														2	
Stage Game V-US															
	A	B	C	D	E	F	G	H	I	TC		TCSum	One's		
0	10	8	10	10	8	10	2	0	2	0	0	9x10;3x8;3x2;1x0	0	24	
1	10	8	10	10	8	10	2	0	2	1	1	9x10;3x8;3x2;1x0	1	24	
2	10	8	10	10	8	10	2	0	2	2	2	9x10;3x8;3x2;1x0	2	24	
3	10	8	10	10	8	10	2	0	2	3	3	9x10;3x8;3x2;1x0	3	24	
4	10	8	10	10	8	10	2	0	2	4	4	9x10;3x8;3x2;1x0	4	24	
5	10	8	10	10	8	10	2	0	2	5	5	9x10;3x8;3x2;1x0	5	24	
6	10	8	10	10	8	10	2	0	2	6	6	9x10;3x8;3x2;1x0	6	24	
7	10	8	10	10	8	10	2	0	2	7	7	9x10;3x8;3x2;1x0	7	24	
8	10	8	10	10	8	10	2	0	2	8	8	9x10;3x8;3x2;1x0	8	24	
9	10	8	10	10	8	10	2	0	2	9	9	9x10;3x8;3x2;1x0	9	24	
10	10	8	10	10	8	10	2	0	2	10	10	9x10;3x8;3x2;1x0	10	24	
11	10	8	10	10	8	10	2	0	2	11	11	9x10;3x8;3x2;1x0	11	24	
12	14	14	14	14	14	14	14	14	14	12	14	12	16x14	12	48
13	14	14	14	14	14	14	14	14	14	13	14	13	16x14	13	48
14	14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48
15	14	14	14	14	14	14	14	14	14	15	14	15	16x14	15	48

Terminal Cycle Table														2	
Stage Game V-China															
	A	B	C	D	E	F	G	H	I	TC		TCSum	One's		
0	10	8	10	10	8	10	2	0	2	0	0	9x10;3x8;3x2;1x0	0	24	
1	10	9	10	10	9	10	2	1	2	1	1	9x10;3x9;3x2;1x1	1	28	
2	10	8	10	10	8	10	2	0	2	2	2	9x10;3x8;3x2;1x0	2	24	
3	10	8	10	10	8	10	2	0	2	3	3	9x10;3x8;3x2;1x0	3	24	
4	14	14	14	14	14	14	6	4	6	4	4	12x14;3x6;1x4	4	43	
5	14	14	14	14	14	14	6	5	6	5	5	12x14;3x6;1x5	5	44	
6	14	14	14	14	14	14	6	4	6	6	6	12x14;3x6;1x4	6	43	
7	14	14	14	14	14	14	6	4	6	7	7	12x14;3x6;1x4	7	43	
8	10	8	10	10	8	10	2	0	2	8	8	9x10;3x8;3x2;1x0	8	24	
9	10	9	10	10	9	10	2	1	2	9	9	9x10;3x9;3x2;1x1	9	28	
10	10	8	10	10	8	10	2	0	2	10	10	9x10;3x8;3x2;1x0	10	24	
11	10	8	10	10	8	10	2	0	2	11	11	9x10;3x8;3x2;1x0	11	24	
12	14	14	14	14	14	14	14	14	14	12	14	12	16x14	12	48
13	14	14	14	14	14	14	14	14	14	13	14	13	16x14	13	48
14	14	14	14	14	14	14	14	14	14	14	14	14	16x14	14	48
15	14	14	14	14	14	14	14	14	14	15	14	15	16x14	15	48

**3 Glossary and Abbreviations**

CNV	Cumulative node value
Colony	Partition of set of all possible outcomes
Clusters	Disjoint subsets of digraphs
Connection Matrix	Combination of the transition tables of two or more interacting FSA
Cybernetics	Theory of communication and control of the animal and machine
Digraphs	Directed graphs
Equivalence Class	Group of interactive weights combinations that yield the same colony
FSA	Finite State Automata
IIPA	International Intellectual Property Association; Washington, DC
Interactive Weight	Parameter value an actor attributes to the external input and its own actions
Internal State	Incorporates the constraints as well as the mood and attitude of an actor or FSA
IP	Intellectual property
IPR	Intellectual property rights
MOFERT	Ministry of Foreign Economic Relations and Trade (China)
MOU	Memorandum of Understanding on Intellectual Property Rights 1992 between the US and China
PRC	People's Republic of China
Social system	Any bounded set of interrelated, social elements
SPA	Software Publishers Association; Washington, DC
STI	System trade index
System	Any bounded set of interrelated elements
TC	Terminal cycle
TCA	Terminal cycle array or final outcome

TCI	Terminal cycle index
TCSum	Summary of the frequency of terminal cycle array
Transient Path	Sequence of constellations from an initial situation to the final outcome
Transition Table	Summary of principal behavior or interaction patterns of an actor described by an FSA
TRIP	Trade related intellectual property rights
USTR	United States Trade Representative

#### 4 Sample Run of Computer Program

The 3.5" disc at the end of this thesis contains a read-me file and an executable version of the used sociocybernetic program. The following is a sample run of the used computer simulation program:

## 6. Bibliography

- (1984, July). Computer Maps Human Behavior. Science Digest, 92, 19.
- (1985). Using a Computer to Predict Behavior. Success!, 32, 17.
- (various). Inside U.S. Trade.
- Abreu, D., & Rubinstein, A. (1988). The Structure of Nash Equilibria in Repeated Games with Finite Automata. Econometrica, 56(6), 1259-1281.
- Allison, G. (1969). Conceptual Models and the Cuban Missile Crisis. American Political Science Review, 63(3), 689-718.
- Allison, G. (1971). Essence of Decision: Explaining the Cuban Missile Crisis. Boston: Little, Brown.
- Altar, M. (1986). The Romanian School of Economic Cybernetics. Economic Computation and Economic Cybernetics Studies and Research, 21(3), 79-82.
- Arbib, M., Kfoury, A. J., & Moll, R. N. (1981). A Basis for Theoretical Computer Science. New York, Heidelberg, Berlin: Springer-Verlag.
- Arbib, M. A. (1987). Brains, Machines, and Mathematics. (2 ed.). New York, Heidelberg, Berlin: Springer-Verlag.
- Arthur, W. B. (1991). On Designing Economic Agents That Act Like Human Agents: A Behavioral Approach to Bounded Rationality. American Economic Review, 81(2), 353-359.
- Arthur, W. B. (1993). On Designing Economic Agents That Behave Like Human Agents. Journal of Evolutionary Economics, 3(1), 1-22.
- Ashby, W. R. (1952). Design for a Brain. New York: John Wiley and Sons.
- Bacharach, S. B., & Lawler, E. J. (1981). Bargaining, Power, Tactics, and Outcomes. San Francisco: Jossey-Bass.
- Banks, J. S., & Sundaram, R. K. (1990). Repeated Games, Finite Automata, and Complexity. Games and Economic Behavior, 2(2), 97-117.
- Bartos, O. J. (1976). How Predictable are Negotiations. In W. I. Zartman (Ed.), The 50% Solution: How to Bargain Successfully with Hijackers, Strikers, Bosses, Oil Magnates, Arabs, Russians, and Other Worthy Opponents (pp. 485-509). Garden City: Anchor/Doubleday.
- Baumgartner, T. (1986). Actors, Models and Limits to Societal Self-Steering. In R. F. Geyer & J. v. d. Zouwen (Eds.), Sociocybernetics: Observation, Control and Evolution (pp.

- 9-25). Beverly Hills, CA: Sage.
- Bayard, T. O., & Elliott, K. A. (1994). Reciprocity and Retaliation in U.S. Trade Policy. Washington, DC: Institute for International Economics.
- Bazerman, M. H. (1983). Negotiator Judgment: A Critical Look at the Rationality Assumption. American Behavioral Scientist, 27, 618-634.
- Bazerman, M. H., & Sondak, H. (1988). Judgmental Limitations in Diplomatic Negotiations. Negotiation Journal, 4(3), 303-317.
- Beer, S. (1959). Cybernetics and Management. New York: Wiley.
- Bendor, J., & Hammond, T. H. (1992). Rethinking Allison's Models. American Political Science Review, 86(2), 301-322.
- Benewick, R., & Wingrove, P. (Eds.). (1995). China in the 1990s. Vancouver: UBC Press.
- Bercovitch, J. (1984). Problems and Approaches in the Study of Bargaining and Negotiation. Political Science, 36(2), 125-144.
- Berman, M. R., & Zartman, W. I. (1982). The Practical Negotiator. New Haven, London: Yale University Press.
- Bhagwati, J., & Patrick, H. T. (Eds.). (1990). Aggressive Unilateralism: America's 301 Trade Policy and the World Trading System. Ann Arbor: University of Michigan Press.
- Bilcin, C. (1979). Preoccupations and Results in the Field of Economic Cybernetics. Economic Computation and Economic Cybernetics Studies and Research, 13(3), 79-81.
- Binmore, K. G., & Samuelson, L. (1992). Evolutionary Stability in Repeated Games Played by Finite Automata. Journal of Economic Theory, 57(2), 278-305.
- Birden, P. B. J. (1996). Trademark Protection in China: Trends and Directions. Loyola of Los Angeles International and Comparative Law Journal, 18(3), 431-495.
- Boldur, G. (1975). The Integration of System Analysis into Economic Cybernetics. Economic Computation and Economic Cybernetics Studies and Research, 9(1), 39-48.
- Bonham, G. M. (1971). Simulating International Disarmament Negotiations. Journal of Conflict Resolution, 15, 299-315.
- Bracken, P. (1984). Deterrence, Gaming, and Game Theory. ORBIS, 27(4), 790-802.
- Brahm, L., & Daoran, L. (1996). The Business Guide to China. Singapore: Butterworth-Heinemann Asia.
- Brams, S. J. (1985). Superpower Games: Applying Game Theory to Superpower Conflict.

- New Haven: Yale University Press.
- Brubaker, R. (1984). The Limits of Rationality: An Essay on the Social and Moral Thought of Max Weber. London, Boston, Sydney: George Allen and Unwin.
- Bryen, S. D. (1971). The Application of Cybernetic Analysis to the Study of International Politics. The Hague, Netherlands: Martinus Nijhoff.
- Burton, J. W. (1968). Systems, States, Diplomacy and Rules. New York: Cambridge University Press.
- Busch, J. A., & Busch, G. M. (1992). Sociocybernetics: A Perspective For Living in Complexity. Jeffersonville, IN: Social Systems Press.
- Business Software Alliance. (1997). Homepage of the Business Software Alliance: <http://www.bsa.org/>.
- Butterton, G. R. (1996). Pirates, Dragons and U.S. Intellectual Property Rights in China: Problems and Prospects of Chinese Enforcement. Arizona Law Review, 38(4), 1081-1123.
- Callières, F. d. (1663 (1716)). On the Manner of Negotiating With Princes, on the Use of Diplomacy; the Choice of Ministers and Envoys; and the Personal Qualities Necessary for Success in Missions Abroad. Notre Dame: University of Notre Dame Press.
- Chatterjee, K. (1982). Incentive Compatibility in Bargaining Under Uncertainty. Quarterly Journal of Economics, 82, 717-726.
- Chen, A. H.-Y. (1992). An Introduction to the Legal System of the People's Republic of China. Singapore: Butterworth Asia.
- Chinese Embassy in Washington DC. (1997). Homepage of the Chinese Embassy in Washington DC: <http://www.china-embassy.org/>.
- Cohen, S. D. (1994). The Making of United States International Economic Policy: Principles, Problems, and Proposals for Reform. (4 ed.). New York: Praeger.
- Cohen, S. D., Paul, J. R., & Blecker, R. A. (1996). Fundamentals of U.S. Foreign Trade Policy: Economics, Politics, Laws, and Issues. Boulder: Westview Press.
- Coplin, W. D. (1966). Inter-Nation Simulation and Contemporary Theories of International Relations. American Political Science Review, 60(3), 562-578.
- Cramton, P. C. (1984). Bargaining with Incomplete Information: A Two-Period Model with Continuous Uncertainty. Review of Economic Studies, 51, 579-593.
- Cramton, P. C. (1985). Sequential Bargaining Mechanisms. In A. Roth (Ed.), Game Theoretic Models of Bargaining (pp. 149-179). Cambridge: Cambridge University Press.

- Cross, J. G. (1991). Economic Perspective. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues (pp. 164-179). San Francisco: Jossey-Bass.
- Cunningham, J. B. (1984). Assumptions Underlying the Use of Different Types of Simulations. Simulation and Games, 15(2), 213-234.
- Deardorff, A. V. (1992). Welfare Effects of Global Patent Protection. Economica, 59(233), 35-51.
- Deardorff, A. V., & Stern, R. M. (Eds.). (1994). Analytical and Negotiating Issues in the Global Trading System. Ann Arbor: University of Michigan Press.
- Denzau, A. T., & North, D. C. (1994). Shared Mental Models: Ideologies and Institutions. Kyklos, 47(1), 3-31.
- Destler, I. M. (1992). American Trade Politics. (2 ed.). Washington, DC: Institute for International Economics.
- Deutsch, K. W. (1966). The Nerves of Government: Models of Political Communication and Control. (2 ed.). New York: Free Press.
- Druckman, D. (1971). Understanding the Operation of Complex Social Systems: Some Uses of Simulation Design. Simulation and Games, 2(2), 173-195.
- Druckman, D. (1991). Turning Points in the INF Negotiations. Negotiation Journal, 7(1), 55-68.
- Dupont, C., & Fauré, G.-O. (1991). The Negotiation Process. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues (pp. 40-57). San Francisco: Jossey-Bass.
- Duvanel, F. Y. (1996). The Evolution and Enforcement of Computer Software Copyright in the People's Republic of China. New York Law School Journal of International and Comparative Law, 16(3), 337-403.
- Easton, D. (1965). A Framework for Political Analysis. Englewood Cliffs, NJ: Prentice-Hall.
- Eckes, A. E. J. (1995). Opening America's Market: U.S. Foreign Trade Policy Since 1776. Chapel Hill, London: University of North Carolina Press.
- Eckstein, H. (1975). Case Study and Theory in Political Science. In F. I. Greenstein & N. W. Polsby (Eds.), Strategies of Inquiry: Handbook of Political Science (Vol. 7, pp. 113-123). Reading, MA: Addison-Wesley.
- Evans, P. B., Jacobson, H. K., & Putnam, R. D. (Eds.). (1993). Double-Edged Diplomacy: International Bargaining and Domestic Politics. Berkeley and Los Angeles, CA: University of California Press.

- Fauré, G. O., & Sjøstedt, G. (1993). Culture and Negotiation: An Introduction. In G. O. Fauré & G. Sjøstedt (Eds.), Culture and Negotiation: The Resolution of Water Disputes (pp. 1-13). Newbury Park, London, New Delhi: Sage.
- Feinberg, R. M., & Rousslang, D. J. (1990). The Economic Effects of Intellectual Property Right Infringements. Journal of Business, 63(1 Part 1), 79-90.
- Ferrantino, M. J. (1993). The Effect of Intellectual Property Rights on International Trade and Investment. Weltwirtschaftliches Archiv, 129(2), 300-331.
- Fisher, R., & Ury, W. (1981). Getting to Yes: Negotiating Agreement Without Giving In. Boston: Houghton Mifflin.
- Florescu, M. (1984). Present Trends of Industrial Cybernetics. Economic Computation and Economic Cybernetics Studies and Research, 19(1), 12-23.
- Flueckiger, G. E. (1979). A Finite Automaton Model of Behavior and Learning. Economic Inquiry(October), 508-530.
- Forrester, J. W. (1968). Principles of Systems: Text and Workbook. Cambridge, MA: Wright-Allen Press.
- Forrester, J. W. (1971). World Dynamics. Cambridge, MA: Wright-Allen Press.
- Fudenberg, D., & Tirole, J. (1983). Sequential Bargaining with Incomplete Information. Review of Economic Studies, 50, 221-247.
- Fung, J. C. (1996). Can Mickey Mouse Prevail in the Court of the Monkey King? Enforcing Foreign Intellectual Property Rights in the People's Republic of China. Loyola of Los Angeles International and Comparative Law Journal, 18(3), 613-639.
- George, A. L. (1993). Bridging the Gap: Theory and Practice in Foreign Policy. Washington, DC: United States Institute of Peace Press.
- George, A. L. (1994). The Cuban Missile Crisis: Peaceful Resolution Through Coercive Diplomacy. In A. L. George & W. E. Simons (Eds.), The Limits of Coercive Diplomacy (pp. 111-132). Boulder, San Francisco, Oxford: Westview.
- Geyer, R. F., & Zouwen, J. v. d. (Eds.). (1986). Sociocybernetics: Observation, Control and Evolution. Beverly Hills, CA: Sage.
- Gilboa, I. (1988). The Complexity of Computing Best-Response Automata in Repeated Games. Journal of Economic Theory, 45(2), 342-352.
- Graham, H. J. (1996). Foreign Investment Laws of China and the United States: A Comprehensive Study. Journal of Transnational Law and Policy, 5(2), 253-278.
- Grey, R. d. C. (1990). Concepts of Trade Diplomacy and Trade in Services. London:

- Harvester Wheatsheaf, for the Trade Policy Research Centre.
- Guetzkow, H. (1963). A Use of Simulation in the Study of Inter-Nation Relations. In H. Guetzkow, C. F. Alger, R. A. Brody, R. C. Noel, & R. C. Snyder (Eds.), Simulation in International Relations: Developments for Research and Training (pp. 24-42). Englewood Cliffs, NJ: Prentice-Hall.
- Guetzkow, H., Alger, C. F., Brody, R. A., Noel, R. C., & Snyder, R. C. (1963). Simulation in International Relations: Development for Research and Teaching. Englewood Cliffs, NJ: Prentice-Hall.
- Gulliver, P. H. (1979). Disputes and Negotiations: A Cross-Cultural Perspective. New York: Academic.
- Habeeb, W. M. (1988). Power and Tactics in International Negotiation: How Weak Nations Bargain With Strong Nations. Baltimore, London: The Johns Hopkins University Press.
- Hamman, H. (1996). Après Waltz: Scientific Theory and IR (unpublished manuscript).
- Hamman, H. L. (1993). The Emergent Scientific Epistemology and International Relations. Unpublished Ph.D., University of Miami, Coral Gables, Florida.
- Hart, M. (1987). The Mercantilist's Lament: National Treatment and Modern Trade Negotiations. Journal of World Trade, 21(6), 37-61.
- Hermann, C. F., & Hermann, M. G. (1967). An Attempt to Simulate the Outbreak of World War I. American Political Science Review, 61(2), 400-416.
- Hermann, M. G. (1980). Explaining Foreign Policy Behavior Using the Personal Characteristics of Political Leaders. International Studies Quarterly, 24(1), 7-46.
- Hiebsch, H. (Ed.). (1982). Social Psychology. New York: North Holland Publishing Company.
- Hofstede, G. H. (1991). Cultures and Organizations: Software of the Mind. London, New York: McGraw-Hill.
- Hogarth, R. M., & Reder, M. W. (Eds.). (1987). Rational Choice: The Contrast Between Economics and Psychology. Chicago: University of Chicago Press.
- Holland, J. H. (1992). Complex Adaptive Systems. Daedalus, 121(1), 17-30.
- Holland, J. H., & Miller, J. H. (1991). Artificial Adaptive Agents in Economic Theory. American Economic Review, 81(2), 365-370.
- Hopcroft, J. E., & Ullman, J. D. (1979). Introduction to Automata Theory, Languages, and Computation. Reading, MA: Addison-Wesley.

- Hopmann, P. T., & with the collaboration of Daniel Druckman. (1991). Arms Control and Arms Reduction: View I. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues (pp. 269-288). San Francisco: Jossey-Bass.
- Howard, B. E. (1995). Sociocybernetics: Commentary to Relevant Excerpts from "CYBERNETICS" by N. Wiener, MIT Press 1948, 9th Printing 1951.
- Hybel, A. R. (1993). Power over Rationality: The Bush Administration and the Gulf Crisis. Albany: State University of New York Press.
- Iida, K. (1993). When and How Do Domestic Constraints Matter? Two-Level Games With Uncertainty. Journal of Conflict Resolution, 37(3), 403-426.
- Iklé, F. C. (1964). How Nations Negotiate. New York: Harper and Row.
- Information Office State Council of the People's Republic of China. (1994). Intellectual Property Protection in China (<http://www.chinanews.org/WhitePapers/IntellectualPropertyProtectionE.html>). Beijing: Information Office State Council of the People's Republic of China.
- International Intellectual Property Alliance. (1997). Homepage of the International Intellectual Property Alliance. Washington, DC: <http://www.iipa.com>.
- Johnson, M. R. (1995). Ideal Structures of Path Independent Choice Functions. Journal of Economic Theory, 65(2), 468-505.
- Kahn, R. L. (1989). Nations as Organizations: Organizational Theory and International Relations. Journal of Social Issues, 45(2), 181-194.
- Kahn, R. L. (1991). Organizational Theory. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues. San Francisco, Oxford: Jossey-Bass.
- Kalai, E., & Stanford, W. (1988). Finite Rationality and Interpersonal Complexity in Repeated Games. Econometrica, 56(2), 397-410.
- Kaplan, C. A., & Simon, H. A. (1989). Foundations of Cognitive Science. In M. I. Posner (Ed.), Foundations of Cognitive Science. Cambridge, MA: MIT Press.
- Katz, D., & Kahn, R. L. (1978). The Social Psychology of Organizations. (2 ed.). New York: John Wiley and Sons.
- Katzenstein, P. (1975). International Interdependence: Some Long-Term Trends and Recent Changes. International Organization, 29(4 (Autumn)), 1021-1034.
- Katzenstein, P. J. (Ed.). (1978). Between Power and Plenty: Foreign Economic Policies of Advanced Industrial States. Madison: University of Wisconsin Press.
- Kelman, H. C. (1965a). Conclusion: Social-Psychological Approaches and the Study of International Relations: The Question of Relevance. In H. C. Kelman (Ed.),

- International Behavior: A Social-Psychological Analysis (pp. 565-607). New York: Rinehart and Winston.
- Kelman, H. C. (Ed.). (1965b). International Behavior: A Social-Psychological Analysis. New York: Rinehart and Winston.
- Kelman, H. C. (1965c). Social-Psychological Approaches to the Study of International Relations: Definition of Scope. In H. C. Kelman (Ed.), International Behavior: A Social-Psychological Analysis (pp. 3-39). New York: Rinehart and Winston.
- Keohane, R. O., & Nye, J. S., Jr. (1977). Power and Interdependence: World Politics in Transition. Boston: Little, Brown.
- Kim, W., & Bueno de Mesquita, B. (1995). How Perceptions Influence the Risk of War. International Studies Quarterly, 39(1), 51-65.
- Kolton, G. S. (1996). Copyright Law and the People's Courts in the People's Republic of China: A Review and Critique of China's Intellectual Property Courts. University of Pennsylvania Journal of International Economic Law, 17(1), 415-460.
- Kotabe, M. (1992). The Impact of Foreign Patents on National Economy: A Case of the United States, Japan, Germany and Britain. Applied Economics, 24(12), 1335-1343.
- Krasner, S. (1972). Are Bureaucracies Important? (Or Allison's Wonderland). Foreign Policy, 7(Summer), 159-179.
- Kremenyuk, V. A. (Ed.). (1991). International Negotiation: Analysis, Approaches, Issues. San Francisco: Jossey-Bass.
- Krugman, P. (1997). What Should Trade Negotiators Negotiate About? Journal of Economic Literature, 35(March), 113-120.
- Kunce, H. W., & Kunce, J. T. (1977). An Empirical Test of the Sociocybernetic Model. Journal of Clinical Psychology, 33(3), 760-765.
- Kunce, J. T., Kunce, H. W., Moore, E. J., & Lavin, T. (1981). Interactional Personality, Mathematical Simulation, and Prediction of Interpersonal Compatibility. Journal of Clinical Psychology, 37(4), 749-754.
- Kunce, J. T., Moore, E. J., & Kunce, H. W. (1984). A Systems Approach to Investigating Interpersonal Strife. Journal of Clinical Psychology, 40(3), 713-716.
- Lardy, N. R. (1994). China in the World Economy. Washington: Institute for International Economics.
- Laufer, D. (1989). Mediation, Conciliation and Arbitration in China. Loyola of Los Angeles International and Comparative Law Journal, 12(1), 91-92.
- Lax, D. A., & Sebenius, J. K. (1986). The Manager as Negotiator: Bargaining for

- Cooperation and Competitive Gain. New York: Free Press.
- Lebow, R. N. (1981). Between Peace and War: The Nature of International Crises. Baltimore: Johns Hopkins University Press.
- LEXIS/NEXUS. (1997). IPR AGREEMENT! AND CHINA. Library: World; File: ALLNWS.
- Linster, B. G. (1992). Evolutionary Stability in the Infinitely Repeated Prisoner's Dilemma Played by Two-State Moore Machines. Southern Economic Journal, 58(4), 880-903.
- Mahoney, R., & Druckman, D. (1975). Simulation, Experimentation, and Context: Dimensions of Design and Inference. Simulation and Games, 6(3), 235-270.
- Mailath, G. J. (1992). Introduction: Symposium on Evolutionary Game Theory. Journal of Economic Theory, 57(2), 259-77.
- Manescu, M. (1975). Economic Cybernetics. Economic Computation and Economic Cybernetics Studies and Research, 9(4), 7-19.
- March, J. G. (1978). Bounded Rationality, Ambiguity, and the Engineering of Choice. Bell Journal of Economics, 9(2), 587-608.
- Maron, M. E. (1965). On Cybernetics, Information Processing and Thinking. In N. Wiener & J. P. Schade (Eds.), Cybernetics of the Nervous System (Vol. 17, pp. 118-138). New York: Elsevier Publishing Company.
- Martin, G. R. (1988). The 'Practical' and the 'Theoretical' Split in Modern Negotiation Literature. Negotiation Journal, 4(1), 45-54.
- Masani, P. (Ed.). (1985). Cybernetics, Science, and Society, and Literary Criticism: Book Reviews and Obituaries. (Vol. 4). Cambridge, MA: MIT Press.
- Mastel, G. (1996). American Trade Laws After the Uruguay Round. Armonk, NY: M.E.Sharpe.
- Mastenbrock, W. (1989). Negotiate. New York: Basil Blackwell.
- Mastenbrock, W. F. G. (1987). Conflict Management and Organization Development. Chichester, NY: Wiley.
- Mautner-Markhof, F. (Ed.). (1989). Processes of International Negotiation. Boulder, CO: Westview.
- McClintock, J. (1984, June 13). Can Human Behavior Be Predicted, Controlled? Tribune.
- McGee, V. (1991). We Turing Machines Aren't Expected-Utility Maximizers (Even Ideally). Philosophical Studies, 64, 115-123.

- McGinnis, M. D., & Williams, J. T. (1993). Policy Uncertainty in Two-Level Games: Examples of Correlated Equilibria. International Studies Quarterly, 37, 29-54.
- McKeown, T. J. (1993). Introduction. In D. Caldwell & T. J. McKeown (Eds.), Diplomacy, Force, and Leadership: Essays in Honor of Alexander L. George (pp. 1-6). Boulder, San Francisco, Oxford: Westview Press.
- Mingst, K. A. (1995). Uncovering the Missing Links: Linkage Actors and Their Strategies in Foreign Policy Analysis. In L. Neack, J. A. K. Hey, & P. J. Haney (Eds.), Foreign Policy Analysis. Continuity and Change in its Second Generation (pp. 229-242). Englewood Cliffs, NJ: Prentice Hall.
- Mitrany, D. (1966). A Working Peace System. Chicago: Quadrangle Books.
- Mo, J. (1994). The Logic of Two-Level Games With Endogenous Domestic Coalitions. Journal of Conflict Resolution, 38(3), 402-422.
- Moravcsik, A. (1993). Integrating International and Domestic Theories of International Bargaining. In P. B. Evans, H. K. Jacobson, & R. D. Putnam (Eds.), Double-Edged Diplomacy. International Bargaining and Domestic Politics (pp. 3-42). Berkeley and Los Angeles, CA: University of California Press.
- Morgenthau, H. J. (1985). The Future of Diplomacy. In R. J. Art & R. Jervis (Eds.), International Politics: Anarchy, Force, Political Economy, and Decision-Making (pp. 101-111). Boston, Toronto: Little, Brown and Company.
- Morosani, R. (1985). Sociocybernetics. Omni, 7(5).
- Morrison, W. F., & Calero, H. H. (1994). The Human Side of Negotiations. Malabar, FL: Krieger.
- Murphy, C., & Tooze, R. (Eds.). (1991). The New Political Economy. Boulder: Lynne Rienner Publishers.
- Murray, J. S. (1986). Understanding Competing Theories of Negotiation. Negotiation Journal, 2(2), 179-186.
- Myerson, R. (1985). Analysis of Two Bargaining Problems with Incomplete Information. In A. Roth (Ed.), Game Theoretic Models of Bargaining (pp. 125-147). Cambridge: Cambridge University Press.
- Neale, M. A., & Bazerman, M. B. (1985). Perspectives for Understanding Negotiation. Journal of Conflict Resolution, 29(1), 33-55.
- Neale, M. A., & Bazerman, M. H. (1991). Cognition and Rationality in Negotiation. New York: Maxwell MacMillan International.
- Neale, M. A., & Bazerman, M. H. (1992). Negotiating Rationally. New York: Maxwell MacMillan International.

- Negoita, C. V. (1981). Human Systems Cybernetics. Economic Computation and Economic Cybernetics Studies and Research, 15(2), 57-63.
- Newsom, D. D. (1995/96). Foreign Policy and Academia. Foreign Policy, 101(Winter), 52-67.
- Nicholson, M. (1989). Formal Theories in International Relations. Cambridge, New York: Cambridge University Press.
- Nicholson, M. (1992). Rationality and the Analysis of International Conflict. Cambridge, New York: Cambridge University Press.
- Nierenberg, G. I. (1968). The Art of Negotiating: Psychological Strategies For Gaining Advantageous Bargains. New York: Cornerstone Library.
- North, D. C. (1990). Institutions, Institutional Change and Economic Performance. New York: Cambridge University Press.
- Ohmae, K. (1995a). The End of the Nation State: The Rise of Regional Economies. New York: Free Press.
- Ohmae, K. (Ed.). (1995b). The Evolving Global Economy: Making Sense of the New World Order. Boston, MA: Harvard Business School.
- Ohmae, K. (1995c). Managing in a Borderless World. In K. Ohmae (Ed.), The Evolving Global Economy: Making sense of the New World Order (pp. 269-284). Boston, MA: Harvard Business School.
- Ohmae, K. (1995d). Putting Global Logic First. In K. Ohmae (Ed.), The Evolving Global Economy: Making Sense of the New World Order (pp. 129-140). Boston, MA: Harvard Business School.
- Pask, G. (1961). An Approach to Cybernetics. New York: Harper and Brothers.
- Piccione, M. (1992). Finite Automata Equilibria With Discounting. Journal of Economic Theory, 56(1), 180-194.
- Piccione, M., & Rubinstein, A. R. (1993). Finite Automata Play a Repeated Extensive Game. Journal of Economic Theory, 61(1), 160-169.
- Potter, P. B. (1995). Foreign Business Law in China: Past Progress and Future Challenges. South San Francisco: The 1990 Institute.
- Pruitt, D. G. (1981). Negotiation Behavior. New York: Academic.
- Putnam, R. D. (1988). Diplomacy and Domestic Politics: The Logic of Two-Level Games. International Organization, 42(3), 427-460.

- Raiffa, H. (1982). The Art and Science of Negotiation. Cambridge: Harvard University Press.
- Raimondi, D. (1984, November 23). Computer Counseling May Reduce Marital Stress. ComputerWorld.
- Ramjerdi, H., & D'Amato, A. (1995). The Intellectual Property Rights Laws of the People's Republic of China. The North Carolina Journal of International Law and Commercial Regulation, 21(1), 169-185.
- Rapoport, A. (1959). Mathematics and Cybernetics. In S. Arieti (Ed.), American Handbook of Psychiatry (pp. 1743-1759). New York: Basic Books.
- Rasmusen, E. (1989). Games and Information: An Introduction to Game Theory. Cambridge, MA: Basil Blackwell.
- Reich, R. B. (1992). The Work of Nations: Preparing Ourselves for 21st-Century Capitalism. New York: Vintage Books.
- Ripley, B. (1995). Cognition, Culture, and Bureaucratic Politics. In L. Neack, J. A. K. Hey, & P. J. Haney (Eds.), Foreign Policy Analysis. Continuity and Change in its Second Generation (pp. 85-98). Englewood Cliffs, NJ: Prentice Hall.
- Risse-Kappen, T. (1995a). Bringing Transnational Relations Back In: Introduction. In T. Risse-Kappen (Ed.), Bringing Transnational Relations Back In: Non-state Actors, Domestic Structures and International Institutions (pp. 3-33). Cambridge: Cambridge University Press.
- Risse-Kappen, T. (1995b). Structures of Governance and Transnational Relations: What Have We Learned? In T. Risse-Kappen (Ed.), Bringing Transnational Relations Back In: Non-state Actors, Domestic Structures and International Institutions (pp. 280-313). Cambridge: Cambridge University Press.
- Rosati, J. A. (1981). Developing a Systematic Decision-Making Framework: Bureaucratic Politics in Perspective. World Politics, 33(2), 234-252.
- Rosati, J. A. (1995). A Cognitive Approach to the Study of Foreign Policy. In L. Neack, J. A. K. Hey, & P. J. Haney (Eds.), Foreign Policy Analysis. Continuity and Change in its Second Generation (pp. 49-70). Englewood Cliffs, NJ: Prentice Hall.
- Rubin, J., & Brown, B. (1975). The Social Psychology of Bargaining and Negotiation. New York: Academic.
- Rubin, J. Z. (1991). The Actors in Negotiations. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues (pp. 90-99). San Francisco, Oxford.
- Rubinstein, A. (1986). Finite Automata Play the Repeated Prisoner's Dilemma. Journal of Economic Literature, 39, 83-96.
- Sadowsky, V. N. (1991). Philosophical and Methodological Foundations of Systems Theory.

- In S. Umpleby & V. N. Sadowsky (Eds.), A Science of Goal Formulation: American and Soviet Discussions of Cybernetics and Systems Theory (pp. 9-17). New York, Washington, Philadelphia, London: Hemisphere Publishing Corporation.
- Schelling, T. (1960). The Strategy of Conflict. Cambridge: Harvard University Press.
- Schneider, G., & Weitsman, P. A. (1996). The Punishment Trap. Integration Referendums as Popularity Contests. Comparative Political Studies, 28(4), 582-607.
- Schoemaker, P. J. H. (1982). The Expected Utility Model: Its Variants, Purposes, Evidence and Limitations. Journal of Economic Literature, 20(2), 529-563.
- Sebenius, J. K. (1981). The Computer as Mediator: Law of the Sea and Beyond. Journal of Policy Analysis and Management, 1(1), 77-95.
- Sebenius, J. K. (1992a). Challenging Conventional Explanations of International Cooperation: Negotiation Analysis and the Case of Epistemic Communities. International Organization, 46(1), 323-365.
- Sebenius, J. K. (1992b). Negotiation Analysis: A Characterization and Review. Management Science, 38, 18-38.
- Siebe, W. (1991). Game Theory. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues (pp. 180-202). San Francisco: Jossey-Bass.
- Singh, D. (1996). The Heterarchical Society: Explaining and Understanding Post Cold War International Relations. Unpublished Ph.D., University of Miami, Coral Gables, Florida.
- Snyder, G. H., & Diesing, P. (1977). Conflict Among Nations: Bargaining, Decision Making, and System Structure in International Crises. Princeton: Princeton University Press.
- Sociocybernetics Inc. (1995). A Primer of Sociocybernetics. Miami, FL.
- Software Publishers Association. (1997). Homepage of the Software Publishers Association: <http://www.spa.org/>.
- Spero, J. E., & Hart, J. A. (1997). The Politics of International Economic Relations. (5 ed.). New York: St. Martin's Press.
- Stalson, H. (1987). Intellectual Property Rights and U.S. Competitiveness in Trade. (Vol. 18). Washington, DC: National Planning Association.
- Stein, J. G. (1988). International Negotiation: A Multidisciplinary Perspective. Negotiation Journal, 4(3), 227.
- Steinbruner, J. D. (1974). The Cybernetic Theory of Decision: New Dimensions of Political Analysis. Princeton, NJ: Princeton University Press.

- Steiner, M. (1983). The Search For Order in a Disorderly World: Worldview and Prescriptive Decision Paradigms. International Organization, 37(3), 373-413.
- Stopford, J. M., & Strange, S. (1991). Rival States, Rival Firms. Cambridge, New York: Cambridge University Press.
- Strange, S. (1989). Toward a Theory of Transnational Empire. In E.-O. Czempiel & J. N. Rosenau (Eds.), Global Changes and Theoretical Challenges. Approaches to World Politics for the 1990s (pp. 161-76). Lexington, MA: Lexington Books.
- Strange, S. (1991). An Eclectic Approach. In C. Murphy & R. Tooz (Eds.), The New International Political Economy (pp. 33-49). Boulder: Lynne Rienner Publishers.
- Strange, S. (1992). States, Firms and Diplomacy. International Affairs, 68(1), 1-15.
- Strange, S. (1995). Political Economy and International Relations. In K. Booth & S. Smith (Eds.), International Relations Theory Today (pp. 154-174). University Park, PA: Pennsylvania State University Press.
- Stremlau, J. (1995/96). Clinton's Dollar Diplomacy. Foreign Policy, 97(Winter), 18-35.
- Thomson, J. E. (1995). State Sovereignty in International Relations: Bridging the Gap between Theory and Empirical Research. International Studies Quarterly, 39(2), 213-33.
- Turnbull, S. J. (1994). Organizations as Teams of Automata. Games and Economic Behavior, 7(1), 116-138.
- Tversky, A., & Kahneman, D. (1987). Rational Choice and the Framing of Decisions. In R. M. Hogarth & M. W. Reder (Eds.), Rational Choice: The Contrast Between Economics and Psychology (pp. 67-94). Chicago: University of Chicago Press.
- United States General Accounting Office. (1995). U.S.-China Trade: Implementation of Agreements on Market Access and Intellectual Property. Washington, DC: US General Accounting Office.
- United States House of Representatives. (1995). The U.S.-China Intellectual Property Rights Agreement and Accession to the World Trade Organization: Hearing Before the Subcommittee on Trade of the Committee on Ways and Means. (hearing Serial 104-3). Washington, DC: 104th Congress.
- United States Information Agency. (1996). Protecting U.S. Intellectual Property Rights in China. Washington, DC: <http://usiahq.usis.usemb.se/regional/prcipr/prcipr.htm>.
- United States International Trade Commission. (1992-1996). The Year in Trade: Operation of the Trade Agreements Program. Washington, DC: US International Trade Commission.

- United States Trade Representative. (1997). Homepage of the United States Trade Representative: <http://www.ustr.gov/>.
- United States. Bureau of National Affairs. (various). International Trade Reporter.
- United States. Office of the U.S. Trade Representative. (1995). 1995 Trade Policy Agenda and 1994 Annual Report of the President of the Trade Agreements Program. Washington, DC: <http://www.ustr.gov/reports/tpa/1995/contents.html>.
- United States. Office of the U.S. Trade Representative. (1997a). Congressional Testimony by USTR Officials. Washington, DC: <http://www.ustr.gov/testimony/index.html>.
- United States. Office of the U.S. Trade Representative. (1997b). National Trade Estimates Report on Foreign Trade Barriers. Washington, DC: Office of the U.S. Trade Representative.
- Verba, S. (1961). Assumptions of Rationality and Non-Rationality in Models of the International System. In K. Knorr & S. Verba (Eds.), The International System. Princeton: Princeton University Press.
- Viotti, P. R., & Kauppi, M. V. (1993). International Relations Theory: Realism, Pluralism, Globalism. New York: MacMillan.
- Wagner, R. H. (1988). Economic Interdependence, Bargaining Power, and Political Influence. International Organization, 42(3), 461-483.
- Walker, C. E., & Bloomfield, M. A. (Eds.). (1988). Intellectual Property Rights and Capital Formation in the Next Decade. Lanham, MD: University Press of America.
- Ward, M. D. (Ed.). (1985). Theories, Models, and Simulations in International Relations. Boulder, CO: Westview Press.
- Watson, A. (1982). Diplomacy - The Dialogue Between States. New York: Eyri Methuen.
- Wheeler, M. (1995). Computer and Negotiation: Backing Into the Future. Negotiation Journal, 11(2), 169-176.
- Wiener, N. (1957). Cybernetics. The Universal Standard Encyclopedia (Abridgment of The New Funk and Wagnall's Encyclopedia) (pp. 180). New York: Standard Reference Works Publishing.
- Wiener, N. (1965). Cybernetics or Control and Communication in the Animal and the Machine. (2 ed.). Cambridge, MA: MIT Press.
- Wiener, N. (1967). The Human Use of Human Beings: Cybernetics and Society. New York: Avon Books.
- Wilkins, M. (1992). The Neglected Intangible Asset: The Influence of the Trade Mark on the Rise of the Modern Corporation. Business History, 34(1), 66-95.

- Winham, G. R. (1977). Complexity in International Negotiation. In D. Druckman (Ed.), Negotiations: Social-Psychological Perspectives (pp. 348-). Beverly Hills, CA: Sage.
- Winham, G. R. (1987). Multilateral Economic Negotiation. Negotiation Journal, 3(2), 175.
- Winham, G. R. (1991). Simulation for Teaching and Analysis. In V. A. Kremenyuk (Ed.), International Negotiation: Analysis, Approaches, Issues (pp. 409-424). San Francisco: Jossey-Bass.
- Winham, G. R., & Bovis, H. E. (1978). Agreement and Breakdown in Negotiation: Report on a State Department Training Simulation. Journal of Peace Research, 15(4), 285-303.
- Witzell, O. W., & Smith, J. K. L. (1989). Closing the Gap: Computer Development in the People's Republic of China. Boulder: Westview Press.
- Wu, T. W. (1989). Political Aspects of Technological Transfer in China. Loyola of Los Angeles International and Comparative Law Journal, 12(1), 86-90.
- Yabuki, S. (1995). China's New Political Economy: The Giant Awakes (Stephen H. Harner, Trans.). Boulder: Westview Press.
- Young, H. P. (Ed.). (1990). Negotiation Analysis. Ann Arbor: University of Michigan Press.
- Young, O. R. (Ed.). (1975). Bargaining: Formal Theories of Negotiation. Urbana: University of Illinois Press.
- Zagare, F. C. (1990). Rationality and Deterrence. World Politics, 42(2), 238-260.
- Zalewski, M., & Enloe, C. (1995). Questions about Identity in International Relations. In K. Booth & S. Smith (Eds.), International Relations Theory Today (pp. 279-305). University Park, PA: Pennsylvania State University Press.
- Zangl, B. (1994). Politik auf zwei Ebenen. Hypothesen zur Bildung internationaler Regime. Zeitschrift für Internationale Beziehungen, 1(2), 279-312.
- Zartman, I. W. (1974). The Political Analysis of Negotiation: How Who Gets What and When. World Politics, 26(3), 385-399.
- Zartman, I. W. (1976). The Analysis of Negotiation. In W. I. Zartman (Ed.), The 50% Solution: How to Bargain Successfully with Hijackers, Strikers, Bosses, Oil Magnates, Arabs, Russians, and Other Worthy Opponents (pp. 1-42). Garden City: Anchor/Doubleday.
- Zartman, I. W. (1988). Common Elements in the Analysis of the Negotiation Process. Negotiation Journal, 4(1), 31-43.
- Zeleny, M. (1991). Spontaneous Social Orders. In S. Umpleby & V. N. Sadovsky (Eds.), A

Science of Goal Formulation: American and Soviet Discussions of Cybernetics and Systems Theory (pp. 133-150). New York, Washington, Philadelphia, London: Hemisphere Publishing Corporation.

Zhang, J. X., & Wang, Y. (1995). The Emerging Market of China's Computer Industry. Westport, CT: Quorum Books.

Zhou, X.-L. (1992). U.S.-China Trade Dispute and China's Intellectual Property Rights Protection. New York University Journal of International Law and Politics, 24(3), 1115-1129.

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- Mark Traphagen, Software Publishers Association
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