Roles and Positions in International Exchange

Chapter 6
6.1 Introduction

The previous chapters have been principally concerned with establishing the empirical validity of organizational positions in the context of inter-industry exchange within the United States. The wide range of organizational theories predicated on the existence of these industrial positions (Hannan and Freeman 1977; Burt 1981; DiMaggio and Powell 1983) produced an extensive stream of research on organizations that makes the question of identifying industrial positions particularly relevant. While the analyses in the prior chapter demonstrate how industrial positions play a significant role in shaping the economic behavior of firms, the organizational position construct can be used to analyze social contexts other than those that are based on industries.

States and nations have been theorized to play a role in shaping economic exchange that may be as if not more significant than that of industries. Over several decades, proponents of world system theory (Frank 1969; Wallerstein 1974; Snyder and Kick 1979; Nemeth and Smith 1985; Smith and White 1992) have made a set of arguments about the role of states in determining the pattern of economic exchange that are quite analogous to the arguments organizational scholars have made about the role of industries. These authors argue that the political and economic outcomes of individual nations and states are not only driven by their internal histories and attributes, but are also determined by their relationships to other nations and their position in the worldwide network of dependency relationships.

In this chapter I illustrate how the organizational position construct applies not only to the structural analysis of industries and industry groups, but to the structural analysis of international exchange as well. I review the body of quantitative empirical
research that has addressed this question in order to identify key issues in modeling the structure of international exchange, and then I use the stochastic complexity framework to analyze the structure of exchange over four distinct periods in time. I conclude by commenting on how this study speaks to the substantive understanding of the contemporary structure of exchange in the world system.

6.2 World System Locations as Organizational Positions

The fundamental correspondence between research in the world system framework and organizational positions research is that both seek to show how economic choices and opportunities for action are shaped by an actor’s location in a structure of relationships. Given this shared underlying principle, it is perhaps not surprising that empirical research on identifying the structure of international exchange faces the same set of issues as does research on identifying the structure of domestic exchange between firms in different industries. That said, an empirical approach to analyzing the structure of the world system can be developed by illustrating the ways in which the world system framework is consistent with the organizational position construct.

One of the questions at the center of world system research concerns explaining differential economic development between states. Systemic or relational accounts of economic development arose partially in response to explanations that attributed differences in development to the characteristics of states as individual actors. A study of social stratification and economic development by Hoselitz (1964) is characteristic of this latter approach. Hoselitz (1964: 237) sought to identify a social structural explanation for the differences between economically advanced and underdeveloped nations. In order to
do this, he attempts to identify a set of characteristics of these nations that distinguishes them with respect to these developmental differences. While Hoselitz does define social structure in a relational sense in terms of “characteristic, recurrent form[s] of interaction between two or more persons,” (1964: 238) in his analysis, social structure is taken as an individual characteristic of a state, rather than as a feature of the pattern of relationships between states. As such, he attributes differences in development to the different characteristics of social structure exhibited by individual states, conceptualized in terms of pattern variables (Parsons 1951). Specifically, he argues that developed nations express pattern variables of universalism, achievement orientation, and functional specificity, while underdeveloped nations express the opposite pattern variables of particularism, ascription, and functional diffuseness (Hoselitz 1964: 240-241). He goes on to argue that the features of social structure found in underdeveloped nations do not contribute to the ability of these states to act as functional contexts for the development of organized industrial economic activity.

While the characteristics of individual states may well be implicated in economic development processes, other scholars have argued that relational characteristics are equally if not more important. Frank (1969) responds to Hoselitz directly along these lines. Rather than attributing underdevelopment to the cultural characteristics of certain states, he argues that “contemporary underdevelopment is in large part the historical product of past and continuing economic and other relations between the satellite underdeveloped and the now developed metropolitan countries.” (Frank 1969: 4) This argument is based on a particular perspective about the structure of international political and economic relations, in which some areas of the world identified as satellite regions
are relationally dependent on other areas identified as metropoles. Frank argues that the economic development of these states is limited by the pattern of relational exchange with their respective economically dominant metropole (1969: 8). Galtung (1971) elaborates on this set of ideas by bringing a more abstract and systemic approach to the analysis of interstate dominance relationships. Like Frank, he identifies a bipartite role structure of international relations. While he does not use Frank’s language of satellites and metropoles, he identifies the types of nations involved in economic, political, and cultural exchange as a specific form of a dominance relationship directed at peripheral nations from central nations (Galtung 1971: 81). Wallerstein (1974) places these ideas into an even broader historical context by using a relational framework to explain the development of the modern world economy into a world system of exchange. In particular, Wallerstein (1974: 103-109) identifies a particular substantive role for semiperipheral actors that are neither a part of the core or the periphery.

Each of these studies contributes to the development of a relational perspective on the social structure of international development. Rather than simply identifying patterned regularities in the attributes of more and less developed states, these approaches identify the process by which the relations between these states are instrumental in shaping economic and political outcomes. The location of a given state in this world system, then, is based on the pattern of relationships that a state has with other states in the system. Locations in the world system are therefore comprised of states that are similar with respect to their pattern of relationships, rather than their similarity with respect to any particular set of individual attributes.
Given the role patterns of relationships play in defining locations in the world system locations, the claim that these locations constitute organizational positions hinges critically on the relationship between organizations as focal actors and locations in the world system as social contexts for economic action. The characterization of an industry or group of industries as an organizational position is perhaps less controversial given the wide range of empirical and theoretical research that reflects the possibility of this choice. Firms and organizations as economic actors, however, are frequently implicated in the definition of world system locations as well. Chase-Dunn (1989: 207-208), for example, concludes that regions rather than firms, states or cities constitute the basic unit of coreness or peripherality in the world system. In doing so, he identifies firms and organizations as key actors in the appropriation of profit within and across these units. He moreover defines world system locations in terms of kinds of production, particularly around the idea of capital intensity. Wallerstein (1974) defines world system locations in terms of the division of labor—another phenomenon strongly associated with firm-level decisions in the modern economy. While political and legal actors can inform decisions about production, capital intensity, and the division of labor, the typical actor engaged in making each of these decision is a firm or organizational actor. While locations in the world system clearly differ from industries and industry groups in significant ways, it is clear that they do serve as relevant contexts for the economic activities of firms, and as such, they constitute organizational positions.

Inasmuch as locations in the world system are characterized by relationally defined closeness and context boundaries, they face the same identifiability issues as other kinds of organizational positions. The question of how many locations exist in the

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world system is a question that has been raised by many proponents of the theoretical
perspective. As noted earlier, Frank (1969) and Galtung (1971) propose a dichotomous
system, while Wallerstein (1974) proposes a tripartite system and delineates a specific
role for the third semiperipheral location.

Large-scale quantitative empirical research on the structure of international
exchange is no less equivocal about this question than is the more in-depth but case
specific qualitative research of earlier researchers. Snyder and Kick (1979) perform a
blockmodel analysis of the pattern of international relations and use their results to
support the three-division system proposed by Wallerstein. Nemeth and Smith (1985:
538) perform a similar analysis, but argue that their analysis is more consistent with a
four-position model. In this model, the semiperiphery is divided into a strong
semiperiphery characterized by cohesive patterns of exchange and a weak semiperiphery
with relatively sparse within-position exchange. Smith and White (1992: 869-871)
present results that they argue are consistent with the traditional three-position model of
world exchange, but they agree with Nemeth and Smith that some of these positions may
be usefully decomposed. Specifically, they suggest (1992: 870) that both the
semiperiphery and the periphery might be decomposed into strong and weak sub-
positions. Kick and Davis (2001: 1568) also identify a five-position system, though they
distinguish their findings by claiming that the strong semiperiphery is more clearly
conceptualized as a semicore, and what Nemeth and Smith label as a weak semiperiphery
is more consistent with the traditional definition of the semiperiphery. They go further to
distinguish a capitalist semicore with ties to the central capitalist core from a socialist
semicore that has strong ties to formerly socialist satellite states.
Whether qualitative or quantitative, none of these empirical studies can conclusively identify the number of locations in the world system because the methods they apply to this task suffer from the same problems as earlier analyses of industry structure. Moreover, these studies cannot refute the argument that categorical distinctions between core and periphery are meaningful (Chase-Dunn 1989: 207). The stochastic structure framework outlined in Chapter 3 of this dissertation, along with the stochastic blockmodeling approach outlined in Chapter 2 can, however, be used to address this question. In order to do so, there are a number of issues that must be addressed about empirically assessing the structure of the world system.

6.3 Assessing the Structure of the World System

Every empirical assessment of the structure of the world system must make a set of decisions concerning issues fundamental to theorized mechanisms of the world system. The first of these issues concerns the logic by which the critical locations within the world system are defined. A second issue, which has only been indirectly addressed by existing research at best, concerns assessing changes in the structure of exchange over time. A final issue concerns identifying the kinds of relations between states that are deemed to be structurally important, and determining how best to empirically account for these relations. In this section I outline how prior empirical studies of the world system engage each of these issues.
6.3.1 Positions and Roles in the World System

A critical issue facing quantitative researchers investigating exchange in the world system concerns the process by which states are assigned to the same location in the world system. Quantitative studies of the structure of the world system are unequivocal in arguing that positions in the system should be populated by states that have similar patterns of dominance relationships to other states. However, while some researchers assess the spatial idea of closeness by measuring the structural equivalence of states (Snyder and Kick 1979; Nemeth and Smith 1985; Kick and Davis 2001), other researchers assess the closeness of states using a measure of regular equivalence (Smith and White 1992; Van Rossem 1996; Alderson and Beckfield 2004). Underlying the disagreement about the appropriate measure of closeness is a theoretical distinction between positions and roles. While there is a clear conceptual distinction between the positions that are defined by structural equivalence and the roles that are defined by regular equivalence, the substantive differences in structure identified by empirical methods that take these two approaches are less easy to identify. Moreover, these two equivalence measures differ significantly with respect to the extent to which they correspond to an explicit modeling approach, which has substantial consequences for empirically determining their relation to empirical phenomena.

Substantive empirical studies that use blockmodel methods to identify social structure, whether in the context of world systems research or other domains overwhelmingly are based on the idea of structural equivalence (Lorrain and White 1971). As such, it is not surprising that the initial foray into using network analysis to assess the structure of the world system by Snyder and Kick (1979) applied this
methodological approach, or that subsequent research would continue in following this logic (Nemeth and Smith 1985; Kick and Davis 2001). Structural equivalence measures the extent to which two actors have similar ties to other actors. To the extent that states in the core all have, for instance, exploitative exchange relationships with states in the periphery, the logic of structural equivalence appears to be well suited to assessing the structure of the world system.

While the logic of structural equivalence is consistent with the proposed structural dynamics of the world system, both researchers interested in social network methodology (Borgatti and Everett 1992) as well as those substantively interested in international exchange (Smith and White 1992; Van Rossem 1996; Alderson and Beckfield 2004) note that the criterion of structural equivalence is stricter than the equivalence relation implied by the pattern of relationships posited by world system theory. These researchers argue that positions, defined in terms of structural equivalence, correspond to concrete locations in a given social structure. As such, positions are identified in terms of patterns of relationships to specific actors. Van Rossem (1996: 509) argues that dependency relationships in the world system should render the identity of particular actors as irrelevant—only the pattern of dependency should matter. As an example, he notes that it should not matter that Costa Rica is specifically dependent on the United States while Cuba is specifically dependent on the (former) Soviet Union. The logic of structural equivalence makes the identity of these actors relevant, as the pattern of relationships in this example would not cause Costa Rica and Cuba to be identified as structurally equivalent or located in the same position.
The actor-specificity issue can be addressed by replacing the structural equivalence criterion with the regular equivalence criterion (White and Reitz 1983). While structural equivalence requires two actors to have equivalent relations with all other actors in a social system to be located in the same position, in order for two actors to be located in the same role and be regularly equivalent, each of these actors need only have relations to other actors that are also regularly equivalent. In the context of the example from Van Rossem, in order for the United States to be structurally equivalent to the Soviet Union, both states must have ties to both Costa Rica and Cuba. Alternatively, a single relationship between the United States and Costa Rica, in combination with a single relation between the Soviet Union and Cuba is sufficient to establish the regular equivalence of the United States and the Soviet Union, given that Costa Rica and Cuba are also regularly equivalent. The substantive theory of the world system does not seem to suggest, for instance, that every state in the core must have exploitative relations with every state in the periphery, but rather that states in the core have exploitative relations with some states in the periphery. As such, the logic of regular equivalence seems to be more consistent with the posited mechanisms of the world system. Following this logic, a number of quantitative empirical studies of the structure of the world system use regular equivalence measures in place of structural equivalence measures (Smith and White 1992; Van Rossem 1996; Alderson and Beckfield 2004).

While the theoretical distinction between roles and positions is clear, as is the distinction between the associated measures of structural and regular equivalence, the logic of regular equivalence cannot be extended to a predictive model of social structure as straightforwardly as can the logic of structural equivalence. To the extent that the
logic of structural equivalence is based on the specific identity of actors, it can be easily extended to make specific predictions about the presence or absence of relations between specific states. In relaxing the demands of structural equivalence, regular equivalence moves the fundamental level of analysis from away from the dyad to the entire population of relations between two roles. The accuracy of a predictive model based on structural equivalence can be assessed by independently examining each dyad, while the assessment of accuracy for a regular equivalence-based predictive model is more complicated. For instance, the presence or absence of an export relationship from the United States to Costa Rica can be evaluated independently of the export relationship from the United States to Cuba in determining whether or not the United States and the Soviet Union are structurally equivalent. The logic of regular equivalence, however, does not correspond to a specific prediction about individual ties, but rather a general characterization of a set of ties between roles. As such, a claim about regular equivalence cannot be evaluated by assessing the independent presence or absence of ties between individual states. This leads to a fundamental difficulty in developing a predictive model of social structure based on the logic of regular equivalence.

Additionally, the empirical analysis of systems of relations with respect to structural and regular equivalence is complicated by the fact that, in practice, few pairs of states in a given system express perfect regular or structural equivalence. As such, studies of structure based on these concepts use approximations of equivalence to assess the assignment of states to locations. Studies that use the structural equivalence concept to assess the structure of international exchange (Snyder and Kick 1979; Nemeth and Smith 1985; Kick and Davis 2001) typically use the Convergence of Iterated Correlations...
(CONCOR) method (White, Boorman, and Breiger 1976) to assign states to positions. While the CONCOR method produces substantively convincing results in terms of assigning actors to positions in a manner consistent with the logic of structural equivalence, the analytic correspondence of the method to the measure is underspecified at best. Empirical investigations that use the regular equivalence concept to identify role locations in a social system (Smith and White 1992; Van Rossem 1996; Alderson and Beckfield 2004) have taken two different approaches to achieving this aim. One approach has been to use an approximation of regular equivalence (Faust 1988; Reitz and White 1989) to define the similarity of states in the network (Smith and White 1992; Alderson and Beckfield 2004). Other researchers (Van Rossem 1996) have used the idea that role equivalent actors should have the same involvement in triad networks (Burt 1990) to develop a measure of role similarity between states. In both cases, these measures are used with clustering algorithms (typically CONCOR) to identify the aggregation of states into roles. While both approximations of regular equivalence will correctly identify states that are *exactly* regularly equivalent, it is not clear how these various measures assign actors that are not perfectly equivalent to the same structural context.

Given the lack of clarity and theoretical precision around the measures of equivalence that are used to define these structural contexts, it is perhaps not surprising that empirical research based on these two approaches has not produced substantive results that are sharply distinguishable. Smith and While (1992: 872-874) provide a detailed analysis of how their partitioning of states into world system locations differs from that of Snyder and Kick (1979). While this may be due in part to underlying
differences in role-based and position-based measure, it could also well be due to the
different exchange relationships studied by Snyder and Kick, as well as the different way
economic exchanges between states are measured. A better way to assess the effect of
using a role-based equivalence measure would be to compare the results of Smith and
White to those of Nemeth and Smith (1985), who analyze a decidedly more similar set of
exchanges. Smith and White (1992: 874) do make this comparison, but instead of
highlighting the differences, they claim that the similarities between the results evidence
the “high reliability” of their method. A close review of the results of the two analyses
shows that there are very few significant differences between the assignments made by
these methods in these two studies. As such, these studies provide little empirical
evidence that could be used to establish the appropriateness of one conceptualization of
location over another.

The determination of the relative appropriateness of role-based and position-based
approaches is further complicated by the way these empirical studies use the results of
blockmodel analysis to draw substantive conclusions. Snyder and Kick (1979: 1114) use
blockmodel analysis to produce a partition of states into ten distinct positions, but
conclude that these ten positions are evidence of a three-position system. Nemeth and
Smith (1985: 533) similarly conclude that the eight positions identified by their
blockmodel analysis correspond to a four-position system, as Kick and Davis (2001:

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1 The most significant differences between these classifications appear in what Nemeth
and Smith identify as “Block H”—one of the blocks assigned to the weak semiperiphery.
The partition Smith and White produce assigns these states variously to different parts of
the semiperiphery and periphery. It is worth noting that Nemeth and Smith draw few
substantive conclusions about Block H that distinguish its role in the world system
significantly from other blocks assigned to the semiperiphery or periphery in their
analysis.
1566) conclude that the eleven positions identified by their blockmodel analysis reflect a five-position system. None of these analyses present an empirical justification for collapsing these detailed structures into the simpler structures that are more consistent with their proposed substantive theory. Though none of these researchers offer this argument, the conceptual distinction between roles and positions raises the possibility that each of these analyses identified a set of positions that were possibly instantiations of a smaller set of roles that were consistent with the theory proposed in each case.

At an abstract theoretical level, the distinction between roles and positions is clear and appears to have meaningful substantive consequences for the empirical identification of the structure of the world system. The implementation of these ideas into quantitative research, however, does not shed any particular light on which of these approaches is empirically most consistent with the theory. Given the lack of conclusive empirical evidence to support either a role-based or a position-based approach to assessing the structure of the world system, the analyses presented in this chapter will be based on both approaches. The stochastic complexity approach is particularly well suited to comparing the performance of fundamentally different types of structural models, and as such should be able to assess the extent to which the exchange behavior of states corresponds to each of these perspectives.

### 6.3.2 Modeling the World System Over Time

Another important issue in empirical and theoretical analyses of the world system theory concerns the development of the pattern of relationships between states over time. The issue of how temporality relates to the structure of the world system is most often
approached indirectly by research that seeks to explain the dynamics of world system structure, or the mobility of actors across the positions of the world system. While many empirical studies raise theoretical questions and draw substantive conclusions about mobility or the dynamic nature of structure, the methods applied in these studies are inherently cross-sectional. The inability of these methods to directly compare structures over time or the position of states within these structures over time raises potentially serious questions about the substantive conclusions they are alleged to support.

Issues of time, historical development, structural change, and the mobility of states between positions are pervasive within research on the world system. For example, Wallerstein (1974: 10) seeks to explain the emergence of the world system over four major epochs, the first of which dates as far back as 1450 and the last of which encompasses the present time. In doing so, he seeks to document not only the development of the core, periphery and semiperiphery out of earlier structures of the world economy, but also the persistence of these structural locations over time. Contemporary research on the modern epoch of the world system is equally likely to focus on issues of temporal change. Smith and White (1992) seek to explain the dynamics of the pattern of exchange between states by analyzing this structure at three distinct points in time from 1965-1980. By taking this analytic approach, Smith and White are able to assess the mobility of states across positions in the world system.

Positional accounts of the system of world exchange are based on the premise that locations in the structure of exchange should not only exist at a particular point in time, but should also retain their structural coherence over time with some degree of stability. Moreover, structural accounts imply that the characteristics and even the existence of
these positions are independent of the particular states that occupy the position at any
given point in time. Wallerstein, for instance, argues that the position of the
semiperiphery is a necessary structural element of the world economy (1974: 349). Yet,
in explaining the development and persistence of the semiperiphery in 16th century
Europe (1974:103-109), he describes how some areas moved in and out of this status.
While the semiperiphery may be structurally necessary for the world system to function
properly, mobility of geographic areas in and out of the semiperiphery demonstrates that
the semiperiphery need not be populated by the same set of state actors from year to year.
Moreover, while Wallerstein argues that a populated semiperiphery is necessary for the
modern world system to function correctly, the mobility that he observes is certainly
consistent with the empirical possibility that at a given point in time, the semiperiphery
might exist or may have existed as an unpopulated position, even to the extent that this
would undermine the proper functioning of the system as a whole.

Disagreements about the number of positions in the world system can also be
located in the analysis of how temporal issues affect the dynamics of the structure of
worldwide exchange. To be sure, discrepancies between conclusions about the number
of positions can be attributed to the characteristics or specificities of the methodologies
employed by each of these researchers. Galtung’s (1971) abstract characterization of the
distinctions between central and peripheral states might be given over in favor to
Wallerstein’s (1974) tripartite division into core, periphery and semiperiphery on the
basis of the detailed and comprehensive historical analysis Wallerstein employed in
drawing his conclusion. In turn, conclusions about a three-position system based on
Snyder and Kick’s (1979) early blockmodel analysis might be called into question
because of the more refined quantitative analysis of Nemeth and Smith (1985) or Smith and White (1992).

While the methodological refinements applied to each of these successive research designs certainly raise important questions about the relationship between claims about the number of positions in the world system and the means used to support these claims, the fact that these analyses generally cover different periods of time is equally if not more important. It is entirely possible that the number and typology of positions that characterize the pattern of dominance and exchange in the 16th century described by Wallerstein (1974) is in fact quite different than the number and typology of positions that best characterizes international exchange in 1980. Wallerstein explains the structural necessity of the semiperiphery in the 16th century by noting the increased prevalence of sharecropping as a form of labor in these areas intermediate to the coerced mining and agricultural labor of the periphery and the market-oriented labor processes of the core (1974: 101). It is thus possible that the emergence of an area in which sharecropping could persist as the dominant form of labor represented the population of a previously empty semiperipheral region. Similarly, Smith and White note that a “distinct ‘Fourth World’ group of very poor African countries emerg[es] in 1980” (1992: 870) which could well correspond to the possibility that this represented the creation of a new position within the structure of the world system, or the population of a position which was empty prior to that date. The identification of a separate capitalist and socialist semicore by Kick and Davis (2001) speaks rather directly to the possibility that specific historical occurrences (in this case, the colonial activities of both capitalist and socialist states
during the Cold War) can be implicated in the production of positions in the world system of exchange.

Each of these studies engages the possibility that either the set of positions that comprise a world system of exchange may change over time, or the possibility that certain positions in the world system may be unoccupied at particular periods in history. While these possibilities are not theoretically or substantially excluded from any of these analyses, the methods these analyses use to identify positions are incompatible with this possibility. The incompatibility of existing quantitative studies with assessing change in positional structures over time is rooted in the fact that the methods used to perform these analyses are inherently cross-sectional. In each of these studies, similarities in patterns of exchange are compared between nations and states at a fixed period in time, but no comparisons are made between the patterns of exchange of states at different points in time.

Both positional and role analyses of the relational structure of world exchange can be adapted to account for changes in structure across time. Positional analyses of exchange (Snyder and Kick 1979, Kick and Davis 2001) most frequently employ a structural equivalence measure to assess the similarity of exchange patterns between two states. For a two states $i$ and $j$ at time $t$, the structural equivalence $d_{ijt}$ of exchange can be computed as

$$d_{ijt} = \sqrt{\sum_r \sum_k (x_{rit} - x_{jkt})^2 + (x_{rit} - x_{rjt})^2}$$ (6.1)
where $x_{rijt}$ corresponds to the level of exchange from an state $i$ to a state $j$ for a relation $r$ at time $t$. This expression can be straightforwardly extended to determine the structural equivalence $d_{iju}$ between an state $i$ at time $t$ and a state $j$ at time $u$ as

$$d_{iju} = \sqrt{\sum_r \sum_k (x_{rkit} - x_{rjtu})^2 + (x_{rkit} - x_{rjtu})^2}.$$ (6.2)

In other words, this expression matches the pattern of ties of an actor at one time with the pattern of ties of another actor at a different time. If, for instance, the United States only has ties with Canada and the United Kingdom in 1965 and France only has ties with Canada and the United Kingdom in 1975, then this expression will evaluate the United States in 1965 as structurally equivalent to France in 1975.

The fundamental difference between these two approaches is that Equation 6.1 can only be used to compare the structural equivalence of two actors in a given time period, while Equation 6.2 can be used to compare actors across time periods. As such, Equation 6.2 can be used to build models of structure that can be applied across all time periods, while Equation 6.1 requires that a separate model be built for each time period. Accordingly, models based on Equation 6.2 can be less complex than models based on Equation 6.1, because they only require one set of inter-positional parameters, rather than a set of inter-positional parameters for each time period. This formulation also allows mobility to be more explicitly assessed, as it allows the pattern of relationships of a given state to be directly compared across time. In order for this expression to be meaningful, there must be a correspondence between the indices of states across periods. That being
the case, the formulation is robust to entries and exits of states at various points in time across an analysis\(^2\).

Role analyses of exchange (Smith and White 1992, Van Rossem 1996, Alderson and Beckfield 2004) can be adapted to compare states across time even more straightforwardly. The extent to which one actor is regularly equivalent to another is independent of the identity of the actors to which both are related, and only a function of the pattern of relationships itself. As such, the regular equivalence of actors that share no exchange partners can be determined, even to the extent that actors are in completely unconnected components of a network. Following this logic, the regular equivalence of states across time can be determined simply by combining the networks prior to conducting the regular equivalence analysis.

### 6.3.3 Interstate Relations in the World System

A third critical issue in quantitative empirical studies of the world system concerns the determination of the universe of relationships between states that are deemed to be important in assessing the structure of international exchange and dominance. Some researchers (Snyder and Kick 1979; Van Rossem 1996; Kick and

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\(^2\) It is worth noting that the ability to determine the position of emerging states has presented a problem in prior research. Alderson and Beckfield (2004: 826), for instance, attempt to use the positional classification of Snyder and Kick (1979) in their study. However, since the time of Snyder and Kick’s study, new states emerged, and a number of states including the former Soviet Union decomposed into smaller states. Alderson and Beckfield (2004: fn. 17) assign states that used to be parts of larger states the position of their predecessor. Though this is a reasonable approximation, it is not at all self-evident that all parts of a former state would have the same positional status as their predecessor. States that did not appear in Snyder and Kick’s analysis are assigned a position “on the basis of the structure of foreign trade”. While this process is not explicated, at a high level it is similar to the approach proposed here.
Davis 2001) base their analyses on a wide range of ties between states including economic flows but including non-economic exchange as well, while other researchers (Delacroix 1977; Nemeth and Smith 1985; Smith and White 1992; Sacks, Ventresca, and Uzzi 2001; Kim and Shin 2002) limit their analyses to economic exchange. Those analyses that focus on economic exchange are further differentiated with respect to how the exchange of different kinds commodities is treated. These distinctions and their consequences for identifying organizational positions in the world system are discussed below.

Early research in the world system framework is characterized by a theoretical and substantive focus on dominance relationships between states and parts of the world (Frank 1969; Galtung 1971). While this body of research consistently reflected an interest in the economic dominance of some states by others, and the economic consequences of this dominance, economic relations figured as one of many interstate relations identified as important in this process. Galtung (1971: 87) is explicit in identifying how political, military, communication and knowledge institutions among others are implicated in the dominance processes of imperialism in international relations. Frank is even more specific in hypothesizing that “satellites experience their greatest economic development and especially their most classically industrial development when their ties to their metropolis are weakest” (1969: 9). In illustrating this hypothesis, he notes that industrial development was most pronounced in the satellite nations of Argentina, Brazil, Mexico, and Chile during the first and second World Wars. It is worth noting that these periods would correspond exactly to the time when core states would be least able to use military relations to enforce exploitative economic organizations with
these peripheral nations. Following this set of concerns about both economic and extra-economic relations, Snyder and Kick (1979: 1105) examine four specific types of relationships: trade flows, military interventions, diplomatic exchanges, and conjoint treaty memberships. Subsequent studies follow the logic outlined by Snyder and Kick and assess roles in the world system by analyzing relations based on imports, exports, trade in major conventional weapons systems, troop presence, and the presence of diplomatic relations (Van Rossem 1996: 511). In a more recent study, Kick and Davis (2001: 1565) expand their prior research by examining relationships based on trade flows, bilateral economic aid and assistance treaties, bilateral communication and transportation treaties, bilateral sociocultural treaties, bilateral administrative and diplomatic treaties, political conflicts, armament transfers, and military conflicts. Kick and Davis argue that this broad consideration of relational modes is not overly exhaustive, but rather that each of these relationships is implicated in the shaping of economic exchange, and moreover that these relationships are integrally related with one another.

The all-encompassing empirical approach taken by researchers who consider a wide range of relationships in assessing the world system highlights the potential importance of extra-economic relations in shaping economic exchange. The task of identifying organizational positions as the context of economic activity, however, clearly has economic exchange as its principal object of concern. Even to the extent that political and cultural relations of dominance appeared in the analysis, early investigations of the world system (Wallerstein 1974) were principally concerned with identifying the world system as one in a historical sequence of world economies. Viewed in this light,
the overwhelming focus of most empirical investigations of the world system on economic exchange and trade flows (Delacroix 1977; Nemeth and Smith 1985; Smith and White 1992; Sacks, Ventresca, and Uzzi 2001; Kim and Shin 2002) seems well founded. Emphasizing the importance of economic exchange and the flow of goods between states may be particularly worthwhile because it allows a researcher to examine the nature of economic exchange in a way that more fully captures the logic of economic dependency than would be possible in a study that examined a broader range of non-economic relationships. Studies that model multiple types of economic and non-economic relationships often assess the flow of goods between states in very broad terms. Snyder and Kick (1979) and Kick and Davis (2001) model economic exchange using a dichotomous measure that reflects whether or not the total flow of goods between two states surpasses a particular threshold. Van Rossem (1996) distinguishes between exports and imports, but still measures these exchanges across all types of goods exchanged. Economic dependence and dominance should be related to the total exchange of commodities between states at some level, but substantive theories of the world system (Wallerstein 1974) relate positions in the world system to the division of labor, which in turn is theorized to relate to the different types of goods states in different positions should exchange. Frank (1969: 149-161) details the exploitative nature of foreign aid in the case of Brazil and the United States, and argues that not only does this arrangement force Brazil to export raw materials and import American goods, but that it does this to the economic disadvantage of Brazil due to their satellite status relative to the United States. These arguments suggest that empirical studies of economic exchange should pay
particular attention not only to the total level of exchange between states, but also the composition of the goods that make up that exchange.

The principal relationship between the division of labor across states and the composition of exports that a given state exports concerns the kind of labor involved in producing different kinds of export goods. Galtung (1971: 102) codifies this concept by devising a *trade composition index* that relates the import and export of raw materials to the import and export of processed goods. The trade composition index is a one-dimensional measure that corresponds closely to the center-periphery world structure that Galtung seeks to explain. Galtung’s distinction between raw materials and processed goods raises the question of how exactly how this distinction should be made empirically, and more broadly speaking, what types of goods should be empirically and theoretically distinguished in research along these lines. In his empirical investigation of the world system, Steiber (1979: 26) identifies four classes of commodities—crude materials, mineral fuels and related materials, chemicals, and machinery and transport equipment—that disaggregate the dichotomous classification proposed by Galtung. Delacroix (1977: 159) also argues that goods should not be simply dichotomized into raw materials and processed goods, but rather should be considered at a much more fine-grained level. He proposes a method for evaluating the degree of processing involved in producing exports for each of the two-digit divisions in the Standard International Trade Classification (SITC). Stokes and Jaffee (1982: 404-405) go even further in investigating detailed product classifications by forgoing the aggregation of products into two-digit SITC
classifications and examining the five leading individual products exported by a given state

The difference in approaches taken by Galtung (1971), Delacroix (1977), Steiber (1979) and Stokes and Jaffee (1982) to analyzing product categories can essentially be reduced to a determination of the level of product aggregation that corresponds most closely to exchange behavior involving these products. The stochastic structural approach outlined in Chapters 2 and 3 of this dissertation arguably represents a principled way to answer this question, but such an analysis is outside the scope of the question of interest in this chapter. Other researchers have taken approaches similar to the stochastic structure approach to answer this question. Nemeth and Smith (1985: 528-529) attempt to resolve this question by factor analyzing the patterns of trade across the 53 commodity categories represented by two-digit SIC codes. This analyses resulted in five groups—heavy and high technology manufactures, intermediate manufactures, raw materials, light manufactures, and food products and by-products—that are at the very least compatible with the level-of-processing schemas theorized in earlier research. Smith and Nemeth (1988) propose an alternative but related approach to identifying relevant product categories by performing a similar factor analysis of product exchange over three separate time periods. Smith and White (1992) draw upon these results in their analysis of the structure of international exchange, and rather than using trade levels across all commodities, they restrict their attention to only products that have a stable presence in a commodity group across all three time periods.

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3 While Stokes and Jaffee do consider each individual product classification, they assign each product a value on a scale from 1 to 6 that corresponds to their assessment of its degree of processing. This degree of processing measure is what they actually use in their empirical analysis.
The empirical analyses presented in this chapter follow the mainstream of quantitative research on the structure of the world system and focus on economic exchange to the exclusion of other non-economic relations. While this may limit the conclusions that can be drawn about the total breadth of structural processes in the world system of international relations, it does create an opportunity to pursue an in-depth analysis of the economic exchanges central to these relationships. The analyses in this chapter are based on the five-category schema of economic exchange used by Smith and White (1992), and is specifically based on the commodities that have a stable presence within each of these categories. While a complete stochastic analysis of the structure of these exchanges would reveal the partition of commodities into groups that best corresponds to exchange behavior, identifying the commodities that have a stable group membership is a reasonable approximation of this process.

6.4 A Stochastic Structural Analysis of Exchange in the World System

6.4.1 Data and Methods

*International Trade Data*

Data on international exchange flows were gathered from the United Nations’ *Commodity Trade Statistics* (Comtrade) database (United Nations Statistical Division 2003). The Comtrade database reports import and export levels for thousands of detailed product classifications between over 130 countries. These data are compiled annually and reflect changes in the composition of nations over time (e.g. the reunification of Germany and the breakup of the former Soviet Union). Exchange levels are reported by

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value in U.S. dollars for each year. While the database reports exchange levels for every year from 1962 until 1999, this study only analyzes exchanges in the years 1965, 1975, 1985, and 1995.

Table 6.1 – Major Types of Global Commodity Exchange

High Technology Heavy Manufacture
- Machinery – non-electrical
- Artificial resins, plastics, cellulose esters and ethers
- Manufactures of metal, not elsewhere specified

Sophisticated Extractive
- Paper, paperboard, and articles of paper pulp
- Pulp and waste paper
- Gas, natural and manufactured

Simple Extractive
- Oil seeds and oleaginous fruit
- Animal oils and fats
- Cereals and cereal preparations

Low Wage/Light Manufacture
- Articles of apparel and clothing accessories
- Footwear
- Travel goods, handbags, and similar containers

Food Products and By-Products
- Meat and meat preparations
- Dairy products and bird’s eggs
- Crude animal and vegetable material, not elsewhere specified

4 In order to control for unusual variations in commodity exchange levels in a given year, data were also analyzed averaged across a three-year span (e.g. 1964-1966 for the 1965 data set). The results of these analyses did not differ substantively from the results presented here. Averaging trade flows across multiple years, however, introduces an analytic problem due to the fact that states enter and exit the sample every year. As such, states can appear in averaged analyses for a given year that did not exist in the year sampled (e.g. West Germany, East Germany and a unified Germany all appearing in the same year). In order to avoid this analytic difficulty, the results in this chapter are based on un-averaged commodity flows for single years.
Following Smith and White (1992: 866) I selected 15 detailed two-digit commodity flows, and aggregate these commodities into five product categories reflecting the major types of global exchange. These commodities and the product types they correspond to are detailed in Table 6.1. For each year, I determined the total amount of exchange for each product type. An export relationship for a given product type is coded as 1 if the dollar value of exports for that product exceed 0.1% of the total product type flow for that year. States that do not participate in any exchange that exceeds this threshold for any product type are eliminated from the network for that year for the final analysis\(^5\). This process yields 76 states in 1965, 89 states in 1975, 64 states in 1985, and 67 states in 1995.

**Cluster Analyses**

I analyzed the entire set of four networks using both time-based structural equivalence and time-based regular equivalence. Time-based structural equivalence was determined following Equation 6.2. Regular equivalence was determined following Faust (1988). Faust presents an iterative procedure for determining the degree of regular equivalence $M_{ij}$ between two actors $i$ and $j$ originally developed by White and Reitz (1985). Given an initial set of values $M_{ij}^0$, successive iterations of $M_{ij}^t$ can be computed as:

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\(^5\) In order to compute time-based structural equivalence, all states must be left in the analysis for each year analyzed. After structural similarities are computed, states with no exchange over the threshold level are eliminated, before states are clustered into positions.
where

\(N\) corresponds to the number of actors,
\(Q\) corresponds to the number of relations,
\(\max\) means to choose the \(m\) chosen to maximize the denominator for a given \(k\),
\(ijq\) Match\(_{km}\) = \(\min(x_{ikq}, x_{jmq}) + \min(x_{kiq}, x_{mjq})\),
\(ijq\) Match\(_{km}\) = \(\max(x_{ikq}, x_{jmq}) + \max(x_{kiq}, x_{mjq})\), and
\(x_{ijq}\) is the value of the tie from \(i\) to \(j\) on relation \(q\).

This measure of regular equivalence determines the degree to which, for actors \(i\) and \(j\), a pair of actors \(k\) and \(m\) can be selected such that there is a tie \(x_{ikq}\) that can be matched to a tie \(x_{jmq}\), a tie \(x_{kiq}\) that can be matched to a tie \(x_{mjq}\), a tie \(x_{jkq}\) that can be matched to a tie \(x_{imq}\), and a tie \(x_{kjq}\) that can be matched to a tie \(x_{miq}\). Determining the degree to which actors \(i\) and \(j\) are equivalent involves the comparison of four separate pairs of ties associated with these four dyads, for each of the \(Q\) relations. The inner term of the numerator can therefore take on a value from 0 to \(4Q\) based on the extent to which these dyads match, weighted by the current estimate of the extent to which the actors \(k\) and \(m\) are regularly equivalent. Accordingly, the value of the numerator is equal to the weighted sum of the number of ties that can be matched for each actor \(k\) to which actors \(i\) and \(j\) are connected. The denominator of Equation 6.3 is equal to the total number of ties to actors \(k\) that are connected to actors \(i\) and \(j\), or the total indegree and outdegree of actors \(i\) and \(j\), which is the maximum value that the numerator could take if the actors \(i\) and \(j\) were perfectly regularly equivalent. Thus, Equation 6.3 takes on a value of 1 if the actors \(i\) and \(j\) are perfectly regularly equivalent, and will take on smaller non-negative values.
values to the extent that these actors are not equivalent. Reitz and White (1989: 451) argue that this sequence of iteration converges, which empirically bears out to be true. While it has been argued that this sequence will substantively converge in three iterations (Faust 1988: 328; Reitz and White 1989: 451), due to the large number of actors and relations in this investigation, the sequence was determined to have converged either when no estimate of $M'_{ij}$ changed by more than 0.01 between iterations, or after a total of ten iterations.

These time-based structural equivalence and regular equivalence algorithms allow a distance to be determined for each pair of states for every year\(^6\). These distances can then be subjected to a clustering algorithm to determine a potential set of boundaries of locations in the world system. While the overwhelming majority of prior studies have used the CONCOR algorithm or a variant thereof to produce clusters (Snyder and Kick 1979: 1109; Nemeth and Smith 1985: 532; Van Rossem 1996: 511), the analytic properties of CONCOR and the partitions that it produces are less than transparent. I therefore used the $k$-medians clustering algorithm to produce a set of candidate partitions across all states and years. The $k$-medians algorithm iteratively identifies a set of $k$ objects (state-year combinations, in this case) that are the medians of their respective clusters. In each iteration, a set of clusters are produced by assigning each object is assigned to the median that it is closest to, and then a new set of medians are determined from this set of clusters. The iteration continues until the assignment to clusters does not change. The algorithm attempts to produce a set of clusters that minimize the distance

\(^6\) The regular equivalence approximations $M_{ij}$ are take on a value of 1.0 for perfect equivalence and 0.0 for a complete lack of equivalence. Accordingly, the values ($1.0-M_{ij}$) were used as inputs to the clustering algorithm.
total distance of each object from its cluster median\(^7\). In the context of this analysis, this means that states are assigned to clusters on the basis of their degree of equivalence to the “representative” median state in that cluster. The state-by-year partitions were then decomposed to produce a set of partitions for states for each of the four years analyzed.

In addition to the time-based structural and regular equivalence analyses, I also performed a set of structural and regular equivalence analyses on each of the four individual year exchange networks. I determined the structural equivalence for two states in an individual year exchange network using Equation 6.1. I determined the degree of regular equivalence between two states using Equation 6.3 on a single year exchange network. The results of these equivalence analyses can be used along with the stochastic structure analytic approach to determine the extent to which the structure of exchange across these networks is unique across time periods.

**Stochastic Structure Analyses**

In order to assess the degree to which the partitions produced by the equivalence relations correspond to the actual exchange behavior of states, networks for each year were subjected to a stochastic blockmodel analysis, and the results of these analyses were assessed using the stochastic complexity framework. As explained in Chapter 2, a fully specified \(p_1\) stochastic blockmodel models the individual productivity and attractiveness of each actor in a network. Preliminary analyses of the international exchange network

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\(^7\) The \(k\)-medians algorithm uses a random initial assignment of objects to clusters. To obtain a degree of consistency to the results, I ran the algorithm 1,000 times for each \(k\). The best partition of the 1,000 produced was defined as the partition that produced the shortest description length based on the stochastic blockmodel proposed later in this chapter.
suggested that the fully specified $p_1$ stochastic blockmodel that is most consistent with
the realized pattern of exchange is a model that assigns every state to its own position.
This result suggests that a less complex set of models may be more appropriate for
assessing international patterns of exchange. Accordingly, the model tested here is a
simpler model of exchange that assesses the likelihood of a tie from $i$ to $j$ as a function of
the density of all ties sent from position $\phi(i)$ to $\phi(j)$. The probability of observing a
particular pattern of ties $x$ according to this model is

$$p(x \mid \theta) = \prod_{q, i \neq j} x_{ijq} \Delta_{\phi(i)\phi(j)} + (1 - x_{ijq})(1 - \Delta_{\phi(i)\phi(j)}) \cdot q,$$  \hspace{1cm} (6.4)

where $\Delta_{rs}$ is the block density defined by Equation 2.2. The description length for this
stochastic blockmodel is a function of the number of block densities. Each block density
is determined from $g_{rs}$ tie observations, so following Equation 3.7, the description length
of a model $L(\theta)$ is

$$L(\theta) = Q \sum_{r,s} d(g_{rs}),$$  \hspace{1cm} (6.5)

where $Q$ is the number of relations, $d(\cdot)$ is the optimal precision function described in
Equation 3.6, and $g_{rs}$ is total number of possible ties from actors in position $B_r$ to actors in
position $B_s$ defined by Equation 2.1.

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8 For this to be formally true, the description length of the one-position fully specified $p_1$
stochastic blockmodel must be greater than the minimum description length of the
models compared here. Preliminary results suggested that this is in fact the case.

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6.4.2 Results

The principal objective of the analyses presented in this chapter is to determine what the structure of exchange relationships is between nations, and to assess the extent to which this structure changes over time. These objectives can be addressed, in part, by identifying the number of roles or positions that are implied by the observed pattern of exchange between states. Additionally, these analyses seek to shed some light on how the constructs of positions and roles are implicated in the stability or lack thereof of this structure. In order to address these objectives, I will first discuss the results of the analyses based on the assumption that there may be a relationship between structures over time. I will then discuss analyses where this assumption is relaxed and exchange networks for each year are treated independently.

Temporal Stability Analyses

The overwhelming majority of empirical studies of the world system make the implicit if not explicit assumption that the structure of exchange in the world system is relatively stable over time, even if there is mobility of states between locations within a given structure. Following this logic, this first set of analyses applies the time-based structural and regular equivalence approaches outlined in this chapter to the analysis of international exchange from 1965 to 1995. The objective of each of these analyses is to determine the number of positions in a time-based structure that most closely corresponds to the observed pattern of exchange behavior over the four time periods analyzed. Prior studies of the structure of the world system (Kick and Davis 2001) have used blockmodel
For a comprehensive substantive analysis of each of these 16 partitions and the pattern of relationships they imply is well beyond the scope of this chapter. However, the stochastic structure approach provides explicit guidance as to which partitions correspond
most closely to the observed pattern of exchange. Table 6.2 presents description length estimates for stochastic blockmodels based each of the 16 identified partition sets. This analysis provides evidence that supports the possibility that there may be from three to six structurally equivalent positions in the world system of exchange over the time period analyzed. In particular, it suggests that the five-position structure identified corresponds particularly well to the observed pattern of exchange. As such, the substantive conclusions presented here are based on this partition.

Table 6.3 – Representative States in Five-Position Structure

<table>
<thead>
<tr>
<th>Position</th>
<th>States</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Old Core (1965-1975)</strong></td>
<td>United Kingdom (1965), United States (1965-1975)</td>
</tr>
<tr>
<td><strong>Emergent Core (1965-1995)</strong></td>
<td>Hong Kong (1965), Australia, South Korea (1975), United States (1985-1995)</td>
</tr>
<tr>
<td><strong>Hong Kong Core (1975-1995)</strong></td>
<td>Hong Kong (1975-1995)</td>
</tr>
<tr>
<td><strong>Semiperiphery (1965)</strong></td>
<td>Barbados, Belgium, Luxembourg, Bulgaria, Iceland, Ireland, Netherlands, Norway, South Africa, Spain, Trinidad and Tobago (1965)</td>
</tr>
</tbody>
</table>

Table 6.3 presents a representative sample of the states associated with each of the five positions identified, and the years that each state or set of states is an incumbent of

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each position. Figure 6.1 presents images of the pattern of relationships between these five positions. The five positions identified broadly correspond to the typologies proposed in previous research, with a number of notable exceptions. There are three positions that clearly correspond to a manufacturing core, a set of positions that consistently are occupied by the United States and Hong Kong over the time period analyzed. The analysis also identifies a position that seems most consistent with the semiperiphery identified in earlier research. Finally, the analysis identifies a position occupied by the remainder of states active in the exchange network, which appears to be most consistent with the peripheral position articulated by other world system theorists. While these three positions are broadly consistent with prior empirical research on the world system, there are significant differences between the implications of this analysis and prior research concerning the stability of these positions.

The three core positions identified exhibit a general pattern of exchange that is broadly consistent with the tripartite system articulated by world system theorists. Across types of commodities, there is a high incidence of exchange relationships between these positions, and each of these positions maintains a smaller degree of exchange with the periphery. There is also a consistent pattern of asymmetric export activity from these core positions to the semiperiphery across types of commodities. While these positions are similar in this general sense, the stochastic structure analysis suggests that they are structurally distinct in that they correspond to different locations in the relational structure of exchange over time. One important driver of this change is the apparent decrease in the structural significance of the semiperiphery over time. This analysis suggests that the semiperipheral position identified ceases to be structurally significant
after 1965\(^9\). The old core position is defined in part by a significant set of exchange relationships with the semiperiphery, and the structural significance of the old core position depends in part on the significance of the semiperiphery. By 1985, Hong Kong occupies a distinct core position that is similarly structurally dependent on the absence of the semiperiphery.

The “emergent core” position identified in this analysis plays a particularly important role in shaping the dynamic structure of exchange over this period. This position is initially occupied by Hong Kong in 1965, by Australia and South Korea in 1975, and by the United States from 1985 until 1995. Like the old core, the emergent core unilaterally exports commodities to the periphery and the semiperiphery, and it has strong bilateral exchange with the Hong Kong core. Interestingly, the emerging core tends to unilaterally export high technology products to the old core, while importing simple extractive commodities—a pattern of exchange typically associated with the core-periphery relationship. While it is difficult to draw causal conclusions about changes in the structure of international exchange, the correspondence of this exchange pattern and the exit of the United Kingdom from the manufacturing core at the very least suggest that this may be a characteristic change process.

A structural equivalence based assessment of the structure of international exchange corresponds closely to the approach taken by many earlier empirical studies, and the logic of structural equivalence is moreover tightly coupled with the stochastic blockmodel used to assess observed patterns of exchange. While these are both valid

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\(^9\) While the three-, four-, and six- position structures identified correspond to a different set of substantive conclusions, all three of these other structures are consistent with the claim that a clear semiperiphery does not appear to be structurally significant by 1985.
High Technology/Heavy Manufacture

Sophisticated Extractive

Simple Extractive

Light Manufacture/Low Wage

Food Products and By-Products

Figure 6.1 – Positional Images of Interstate Exchange
reasons to use structural equivalence to assess the structure of international exchange and
changes therein, the idea of role equivalence does appear to correspond more closely to
the logic of exchange in the world system. The second set of results presented here
corresponds to an assessment of structure based on this logic. Table 6.5 reports
description length estimates for time-based regular equivalence blockmodels of
exchange.

<table>
<thead>
<tr>
<th>Roles</th>
<th>( \lg(p(Ties)) )</th>
<th>( \lg(p(Model)) )</th>
<th>Description Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-6,992.54</td>
<td>-36.06</td>
<td>7,028.60</td>
</tr>
<tr>
<td>2</td>
<td>-5,220.55</td>
<td>-117.75</td>
<td>5,338.30</td>
</tr>
<tr>
<td>3</td>
<td>-4,795.69</td>
<td>-223.81</td>
<td>5,019.50</td>
</tr>
<tr>
<td>4</td>
<td>-4,619.63</td>
<td>-389.40</td>
<td>5,009.03</td>
</tr>
<tr>
<td>5</td>
<td>-4,559.56</td>
<td>-488.31</td>
<td>5,047.87</td>
</tr>
<tr>
<td>6</td>
<td>-4,338.49</td>
<td>-734.66</td>
<td>5,073.14</td>
</tr>
<tr>
<td>7</td>
<td>-4,167.45</td>
<td>-871.18</td>
<td>5,038.63</td>
</tr>
<tr>
<td>8</td>
<td>-4,152.99</td>
<td>-1,065.66</td>
<td>5,218.65</td>
</tr>
<tr>
<td>9</td>
<td>-3,992.42</td>
<td>-1,336.13</td>
<td>5,328.55</td>
</tr>
<tr>
<td>10</td>
<td>-3,940.49</td>
<td>-1,601.52</td>
<td>5,542.01</td>
</tr>
<tr>
<td>11</td>
<td>-3,696.79</td>
<td>-1,888.71</td>
<td>5,585.50</td>
</tr>
<tr>
<td>12</td>
<td>-3,658.99</td>
<td>-2,258.35</td>
<td>5,917.34</td>
</tr>
<tr>
<td>13</td>
<td>-3,778.48</td>
<td>-2,237.37</td>
<td>6,015.86</td>
</tr>
<tr>
<td>14</td>
<td>-3,468.94</td>
<td>-2,801.00</td>
<td>6,269.95</td>
</tr>
<tr>
<td>15</td>
<td>-3,701.14</td>
<td>-2,639.27</td>
<td>6,340.41</td>
</tr>
<tr>
<td>16</td>
<td>-3,659.33</td>
<td>-2,861.47</td>
<td>6,520.80</td>
</tr>
</tbody>
</table>

Like the other stochastic structure analyses presented here, this analysis
demonstrates how the additional description length required to capture the complexity of
more fine-grained models balances the accuracy gained through modeling these
exchanges using more positions. These results are broadly similar to the structural
equivalence results presented in Table 6.2, but it is noteworthy that, for a given number
of structural locations, the regular equivalence model selected is generally more accurate
and more complex. As noted earlier, regular equivalence is a less strict criterion than is structural equivalence, and as such, partitions produced using structural equivalence are more likely to identify positions occupied by one or some small number of actors. In accordance with Equation 6.5, the complexity of these models is driven by the precision of the block parameters. The precision of parameters, in turn, is driven by the logarithm of the number of observations on which each parameter value is based. Given this logarithmic dependence, the incremental penalty for a particular parameter falls off with more observations, which means that partitions in which actors are evenly distributed will be penalized more heavily than partitions in which some partitions only contain a small number of actors. In other words, information about the first 10 states assigned to a world system position indicates a lot more about the parameter values for that position than does information about an additional 10 states.

Following this logic, analyses of stochastic blockmodels based on the less stringent criteria of regular equivalence lead to the conclusion that the pattern of observed exchange is most consistent with a four-role structure. Table 6.6 presents a representative sample of the states assigned to each of these roles. Figure 6.2 depicts the characteristic role relationships between states in each of these roles. In general terms, this analysis identifies a manufacturing core and a periphery, and it identifies semiperipheral locations characterized by attributes somewhere between those of the core and periphery. There are, however, significant differences between the locations

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10 The thickness of a line in the role image diagrams corresponds to the observed likelihood that a state in a given role has one or more exchange relationships directed at states in the targeted role. Thus, these images do not reflect the density of ties between positions, but rather the extent to which states in a given location exhibit a given form of role-relational behavior.
Table 6.6 – Representative States in Four-Role Structure

Core
Hong Kong, United States (1965-1995), United Kingdom (1965), Australia (1975-1995), Kenya (1975), Belize (1985)

Regional Producers

Exclusive Consumers

Periphery

identified by this analysis and those identified by the positional structural equivalence analysis.

One of the major differences between the role analysis of exchange and the positional analysis of exchange is that the role analysis appears to identify a single core role that captures the distinct core positions identified using structural equivalence. The core role is occupied by the United States and Hong Kong over the entire period analyzed, and the United Kingdom occupies this role in 1965 just as it occupies the old core position in the positional analysis. States in the core position generally have exports across all types of commodities to some state in each of the other three positions, and
Figure 6.2 – Role Images of Interstate Exchange
they are particularly likely to have an asymmetric exporting relationship across all commodity types with some state in the periphery. While the logic of structural equivalence requires a state to have similar relations to all states in a different position, the logic of role equivalence only requires a state to have some relations to states in these locations. Australia is a significant producer that fulfills the core role by exporting goods to a wide range of states, though not to the broad extent demonstrated by the United States or Hong Kong. The role equivalence analysis therefore assigns Australia to the core, while the structural equivalence analysis does not.

The role analysis identifies two positions that could be seen as consistent with the semicore and semiperiphery identified by earlier analyses. States that occupy the “regional producer” role generally are asymmetric exporters to some state or set of states in the periphery, particularly for high technology goods and extractive (both simple and sophisticated) goods. Thailand, for example, exports high technology products to Singapore and Hong Kong, sophisticated extractive products to Singapore, and simple extractive products to Malaysia in 1975. In general, states in this position have a limited number of typically regionally proximate states that they export to across a limited set of commodities. States in this role are further characterized by some degree of bilateral exchange with the core, and in particular by their notable lack of exchange with states in the “exclusive consumer” role. The exclusive consumer role seems to fall somewhere between the semiperiphery and periphery identified in earlier research. States that occupy this role generally are unlikely to have significant exports to states in any of the other three positions. While these states generally only act as consumers in international
exchange, they show a strong pattern of only consuming products produced in the manufacturing core.

A strict application of the theory underlying the stochastic complexity modeling approach would lead to the conclusion that the four-position structure identified (description length 4,799.29) is a significantly better representation of the pattern of exchange than is the three-role structure (description length 5,009.03). One explanation for this outcome could be that a positional explanation of international exchange is more descriptive than a role-based explanation. Individual characteristics of states could clearly be important in determining the structure of exchange, such that, for example, idiosyncratic distinctions between the United States and Hong Kong as manufacturing contexts would be critical in determining the structure of exchange with these core states. While this may well be the case, another explanation for this difference is that the stochastic model of exchange analyzed here is essentially one based on the logic of structural rather than regular equivalence. It is impossible to quantify the extent to which the description length of the regular equivalence-based model would be reduced without proposing a different stochastic blockmodel based on regular equivalence. Nevertheless, a model proposed that is logically consistent with regular equivalence would necessarily produce shorter minimum description lengths for the evaluation of these partitions. As such, it is at least possible that a model could be proposed that might demonstrate that the logic of roles might be more consistent with the observed pattern of exchange. The fact that the description length for the three-role model is fairly close to that of the identified four-position model is certainly suggestive of this possibility.
Time Independent Analyses

The previous analyses are all based on the assumption, implicit in much world systems research, that the fundamental structure of world exchange is characterized by some significant degree of temporal stability. While the idea that states have mobility between locations over time has been clearly articulated (Wallerstein 1974; Chirot 1977; Smith and White 1992), studies of the modern world system are implicitly based on the assumption that the locations themselves and the structural relations between them do not change. For example, the core is assumed to have exploitative relations with the periphery at all points in time, independent of whether a particular set of states occupy the core or the periphery. While this position may be dictated by theory, the assumptions underlying it can be empirically investigated. These assumptions can be tested for both models based on structural and regular equivalence.

In order to assess the structure of international exchange in a time independent way, exchange networks for each year were independently subjected to a stochastic structure analysis. In these analyses, a separate set of inter-positional tie likelihood parameters were estimated for each network for each year, rather than estimating a set of inter-positional tie likelihoods for the entire set of four networks. Consequently, the description length for a given network for a given number of positions incorporates a model likelihood/length based on an independent set of parameters. Table 6.7 presents estimates of the minimum description length for each of the four years based on partitions of between one and sixteen positions.

These results provide evidence that there may in fact have been significant changes in the structure of international exchange between 1965 and 1995. In order for
these results to provide strong evidence that the structure of international exchange was
stable over this period, not only would each stochastic analysis have to identify the same
number of positions as optimal, but the estimates of inter-positional tie density would
have to have been equivalent as well. Were this the case, the total description length
across the four networks would sum to more than the description length for the four
networks analyzed together as they were in the previous section. The total description
length of the optimal partitions identified by this analysis is 4,597.94 – less

Table 6.7 – Description Length Estimates for Time-Independent Structural
Equivalence Blockmodels of Interstate Exchange

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,012.39</td>
<td>2,304.13</td>
<td>1,397.12</td>
<td>1,364.96</td>
</tr>
<tr>
<td>2</td>
<td>1,564.93</td>
<td>1,746.68</td>
<td>1,168.77</td>
<td>999.13</td>
</tr>
<tr>
<td>3</td>
<td>1,262.00</td>
<td>1,723.73</td>
<td>909.95</td>
<td>926.91</td>
</tr>
<tr>
<td>4</td>
<td><strong>1,239.05</strong></td>
<td>1,676.43</td>
<td>893.50</td>
<td><strong>838.90</strong></td>
</tr>
<tr>
<td>5</td>
<td>1,265.24</td>
<td>1,639.14</td>
<td>888.41</td>
<td>868.79</td>
</tr>
<tr>
<td>6</td>
<td>1,293.32</td>
<td>1,657.82</td>
<td><strong>882.25</strong></td>
<td>855.64</td>
</tr>
<tr>
<td>7</td>
<td>1,356.81</td>
<td><strong>1,637.74</strong></td>
<td>895.33</td>
<td>989.49</td>
</tr>
<tr>
<td>8</td>
<td>1,399.19</td>
<td>1,712.56</td>
<td>949.03</td>
<td>1,010.54</td>
</tr>
<tr>
<td>9</td>
<td>1,466.16</td>
<td>1,683.44</td>
<td>1,047.34</td>
<td>1,104.12</td>
</tr>
<tr>
<td>10</td>
<td>1,393.62</td>
<td>1,814.77</td>
<td>1,017.18</td>
<td>1,167.73</td>
</tr>
<tr>
<td>11</td>
<td>1,528.82</td>
<td>1,803.04</td>
<td>1,088.52</td>
<td>1,181.83</td>
</tr>
<tr>
<td>12</td>
<td>1,712.53</td>
<td>1,929.67</td>
<td>1,190.64</td>
<td>1,267.04</td>
</tr>
<tr>
<td>13</td>
<td>1,742.70</td>
<td>1,853.87</td>
<td>1,217.39</td>
<td>1,379.04</td>
</tr>
<tr>
<td>14</td>
<td>1,675.02</td>
<td>2,083.03</td>
<td>1,210.13</td>
<td>1,338.24</td>
</tr>
<tr>
<td>15</td>
<td>1,879.98</td>
<td>1,970.06</td>
<td>1,264.61</td>
<td>1,527.99</td>
</tr>
<tr>
<td>16</td>
<td>1,879.26</td>
<td>2,125.94</td>
<td>1,344.59</td>
<td>1,485.25</td>
</tr>
</tbody>
</table>

than the total description length for all four networks analyzed together, indicating that
the structure may not be stable at all. This analysis identifies four positions in 1965,
seven in 1975, six and 1985 and four positions in 1995, consistent with a story of some
significant degree of structural change.

The dynamics of change suggested by this structural analysis are revealed to a
certain extent by examining the substantive content of these positions over time. Table
6.8 presents the assignment of states to structurally equivalent world-system positions following the results of the analysis. There are similarities between these results and those produced by the time-based structural equivalence analysis, as well as some significant differences. The most significant apparent similarity between these analyses is the identification of the unique core position of the United States and Hong Kong, and the United Kingdom and Australia to a lesser extent. These states occupy a central core position in each of the years analyzed, and engage in a significant degree of exchange with a wide range of states across positions and years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Anglo Core</th>
<th>HK Core</th>
<th>HK Periphery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>United Kingdom, United States</td>
<td>Hong Kong</td>
<td>Cambodia, China, East Timor, Indonesia, Japan, Malaysia, North Vietnam, Philippines, Singapore, South Korea, Sri Lanka, Thailand</td>
</tr>
<tr>
<td>1975</td>
<td>United States</td>
<td>New Zealand</td>
<td>Australia</td>
</tr>
<tr>
<td></td>
<td>Hong Kong</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canada, Japan, United Kingdom</td>
<td>Semiperiphery 1</td>
<td>Semiperiphery 2</td>
</tr>
<tr>
<td></td>
<td>Belgium, Luxembourg, France, Indonesia, Italy, Mexico, Netherlands, South Korea, Venezuela, West Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>United States</td>
<td>Australia</td>
<td>Hong Kong</td>
</tr>
<tr>
<td></td>
<td>China, Indonesia, Japan, Macau, Philippines, Singapore, South Korea, Thailand</td>
<td>Spec. Consumer</td>
<td>Iraq</td>
</tr>
<tr>
<td>1995</td>
<td>United States</td>
<td>Hong Kong</td>
<td>Australia, Canada, China, France, Germany, Japan, Netherlands, Singapore, United Kingdom</td>
</tr>
</tbody>
</table>
The most significant difference between these results and the results of the time-based structural equivalence analysis is the identification of what appear to be semiperipheral positions for three of the four years analyzed. In 1965 there appears to be a set of states that broadly serve as an (not entirely exclusive) export market for Hong Kong. States like Canada, France, Japan, Singapore and the United Kingdom are identified as economically active members of various semiperipheral positions from 1975 until 1995. The relatively consistent presence of these states in these positions might be suggestive of a consistent and stable semiperipheral location in the world system over this time period. However, these analyses identify structurally distinct semiperipheral positions, indicating that this is unlikely to be the case. Moreover, a temporally stable semiperiphery should have been identified by the time-based structural equivalence analysis – the inability of that analysis to identify such a structural position provides additional evidence against this claim. While these findings do not disprove the presence of a semiperiphery, they do suggest that there may be a number of distinct semiperipheral positions that figure into the structure of the world system.

Time-independent analyses can also be performed on models of the structure of the world system based on the logic of regular rather than structural equivalence, in order to examine whether or not the role structure of exchange is stable over time. Exchange networks for each year were independently analyzed using the stochastic complexity approach across a set of partitions generated using regular equivalence distances. Table 6.9 presents minimum description length estimates for each exchange network partitioned into one to sixteen roles.
Table 6.9 – Description Length Estimates for Time-Independent Regular Equivalence Blockmodels of Interstate Exchange

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,012.39</td>
<td>2,304.13</td>
<td>1,397.12</td>
<td>1,364.96</td>
</tr>
<tr>
<td>2</td>
<td>1,482.14</td>
<td>2,005.59</td>
<td><strong>1,130.39</strong></td>
<td>1,214.55</td>
</tr>
<tr>
<td>3</td>
<td>1,460.25</td>
<td><strong>1,861.60</strong></td>
<td>1,132.39</td>
<td>1,177.02</td>
</tr>
<tr>
<td>4</td>
<td>1,402.78</td>
<td>1,902.06</td>
<td>1,151.91</td>
<td><strong>887.18</strong></td>
</tr>
<tr>
<td>5</td>
<td><strong>1,386.80</strong></td>
<td>1,964.37</td>
<td>1,185.75</td>
<td>948.97</td>
</tr>
<tr>
<td>6</td>
<td>1,484.78</td>
<td>2,059.05</td>
<td>1,280.98</td>
<td>1,045.85</td>
</tr>
<tr>
<td>7</td>
<td>1,598.74</td>
<td>2,102.71</td>
<td>1,294.30</td>
<td>1,128.47</td>
</tr>
<tr>
<td>8</td>
<td>1,692.13</td>
<td>2,297.31</td>
<td>1,364.95</td>
<td>1,251.70</td>
</tr>
<tr>
<td>9</td>
<td>1,811.28</td>
<td>2,390.48</td>
<td>1,497.22</td>
<td>1,369.01</td>
</tr>
<tr>
<td>10</td>
<td>1,839.35</td>
<td>2,578.33</td>
<td>1,604.54</td>
<td>1,449.55</td>
</tr>
<tr>
<td>11</td>
<td>2,010.03</td>
<td>2,646.82</td>
<td>1,605.16</td>
<td>1,548.16</td>
</tr>
<tr>
<td>12</td>
<td>2,199.15</td>
<td>2,796.30</td>
<td>1,788.45</td>
<td>1,667.34</td>
</tr>
<tr>
<td>13</td>
<td>2,169.16</td>
<td>2,901.13</td>
<td>1,903.20</td>
<td>1,717.78</td>
</tr>
<tr>
<td>14</td>
<td>2,398.39</td>
<td>3,083.24</td>
<td>2,003.81</td>
<td>1,895.46</td>
</tr>
<tr>
<td>15</td>
<td>2,590.21</td>
<td>3,297.36</td>
<td>2,125.34</td>
<td>1,802.99</td>
</tr>
<tr>
<td>16</td>
<td>2,676.99</td>
<td>3,203.37</td>
<td>2,187.95</td>
<td>2,113.90</td>
</tr>
</tbody>
</table>

These results may at first appear to suggest that the role structure of international exchange is similarly unstable between 1965 and 1995. The time-independent stochastic structural analyses indicate that a structure composed of five roles is most consistent with the observed pattern of exchanges in 1965, three roles in 1975, two roles in 1985, and four roles in 1995. Table 6.10 presents the states that take on each of these roles for each of these four years. There are some fundamental similarities between this set of identified roles and the four roles identified in the earlier analysis. The major core and peripheral roles are identified in all of these analyses, with the United States and Hong Kong as principal occupants of this role, as well as the United Kingdom 1965 and Australia from 1975 through 1995. Roles that appear to be consistent with the regional producer and exclusive consumer roles identified earlier also appear in this time-independent analysis. The most significant differences appear in the 1975 and 1985,
Table 6.10 – States in Time-Independent Role Structure (Periphery Excluded)

<table>
<thead>
<tr>
<th>Year</th>
<th>Core</th>
<th>Regional Producers</th>
<th>Regional Consumers</th>
<th>Food Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>Brunei Darussalam, Hong Kong, United Kingdom, United States</td>
<td>Congo Dem. Republic, El Salvador, Ghana, India, Jordan, Libya, Myanmar, Sudan, Thailand</td>
<td>Egypt, Honduras, Iraq, Laos, Lebanon, Nicaragua, Saudi Arabia, Tunisia, Turkey</td>
<td>Somoa</td>
</tr>
<tr>
<td>1975</td>
<td>Australia, Ethiopia, Hong Kong, Jordan, Mauritis, New Zealand, United States, Zambia</td>
<td>Afghanistan, Antigua and Barbuda, Bahamas, Belize, Brunei Darussalam, Bunkers, Denmark, Guyana, Honduras, India, Jamaica, Kuwait, Lebanon, Malta, Myanmar, Pakistan, Sierra Leone, South Africa, South Korea, Thailand, Vietnam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>Australia, Bahamas, Bahrain, Belize, Brunei Darussalam, Fiji, Hong Kong, Jamaica, Jordan, Kenya, Malta, Pakistan, United States, Zimbabwe</td>
<td>Barbados, Benin, Cote d'Ivoire, Cyprus, Guinea Bissau, Jamaica, Jordan, Malta, Niger, Saudi Arabia, Togo</td>
<td>Brazil, Burkina Faso, Canada, China, Croatia, Ecuador, France, Germany, Indonesia, Ireland, Italy, Japan, Macau, Malaysia, Mexico, Netherlands, New Zealand, Panama, Papua New Guinea, Philippines, Russian Federation, Singapore, South Africa, South Korea, Spain, Switzerland, Thailand, Zimbabwe</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Australia, Hong Kong, United States</td>
<td>Barbados, Benin, Cote d'Ivoire, Cyprus, Guinea Bissau, Jamaica, Jordan, Malta, Niger, Saudi Arabia, Togo</td>
<td>Brazil, Burkina Faso, Canada, China, Croatia, Ecuador, France, Germany, Indonesia, Ireland, Italy, Japan, Macau, Malaysia, Mexico, Netherlands, New Zealand, Panama, Papua New Guinea, Philippines, Russian Federation, Singapore, South Africa, South Korea, Spain, Switzerland, Thailand, Zimbabwe</td>
<td></td>
</tr>
</tbody>
</table>

where many of these semiperipheral roles do not appear to play a clear role in international exchange.

While these results might appear to provide evidence that the role structure of exchange is as temporally unstable as the positional structure of exchange, the total description length for the time-independent role structure model (5,265.97) is greater than that for the temporally stable four-role structure model (5,009.03). This suggests that the independent stochastic structure analyses of exchange patterns for each year are less consistent with the observed pattern of exchange than is an analysis that assumes that
the structure is stable over time. The additional complexity introduced by analyzing each of the four years separately, in this case, is not made up for by a gain in the accuracy with which the observed pattern of exchanges can be predicted. As such, these results provide strong evidence for the claim that the role structure of exchange is stable over time, which is consistent with the substantive results of the temporally stable role analysis presented here.

6.5 Discussion and Conclusions

The analyses presented in this chapter show how the idea of stochastic complexity can be used to address issues that are central to world system theory research. The network analytic methods applied in prior research on the world system toward the objective of identifying the structure of international exchange have been at best equivocal in answering two specific questions. The first question concerns the number of locations in the world system, and the substantive character of these locations and the relations between them. The second question concerns the temporal dynamics of the structure of international exchange. The empirical results presented here in addressing these questions raise a set of interesting substantive questions about locations in the world system, which I address here as well.

The identification of the number of locations in the world system, the substantive characteristics of these locations, and the character of the relations between these locations is a core question in world systems research. A related question that closely follows one of the fundamental questions around the organizational position construct concerns the logic by which states are assigned to a location in the world system – the
theoretically consistent logic of closeness that underlies the constitution of an organizational position in this context. The analyses presented in this chapter demonstrate how the answers to these two questions are fundamentally interdependent. The claim that, for instance, Hong Kong and the United States occupy two different positions in the structure of international exchange is logically and empirically consistent with the claim that they play the same role. Thus, the number of positions in the world system need not be the same as the number of roles that comprise it. To the extent that the stochastic blockmodel used in this chapter is equally suited to the analysis of role structures as it is to positional structures, the results presented here suggest that a positional account of structure may be a better representation of the observed pattern of interstate exchange. That said, the substantive analysis of these results suggests that a role structure may in fact be a good representation, and one that is more consistent with the proposed theoretical mechanisms of the world system.

A second interdependent question addressed by the empirical results presented in this chapter concerns how the structure of international exchange changes over time. The fundamental issue underlying this question is whether positions persist over time, or the extent to which the set of positional contexts that characterize a set of organizational activity at one point in time are related to the set of positional contexts at a different time. Whether the world system is defined in terms of positions or roles, the identification of the number of positions in the structure at a given time is critically dependent on which assumptions are made about the persistence of these positions over time. The claim that a system is defined in terms of a core, a semiperiphery and a periphery implicitly entails the assumption that these three positions persist over time, as does the structure of the
relations between them. The analyses presented in this chapter suggest that this may not in fact be the case. While the core, regional producer, exclusive consumer and peripheral roles identified appear to demonstrate temporal stability, the evidence presented in this chapter strongly suggest positions associated with these roles may have changed dramatically, even over the short thirty year period investigated. The Anglo (United States and United Kingdom) core identified in 1965 does not appear to have the same structure of relations as either the United States core or the Hong Kong core that emerge by 1995. Accordingly, it may be less helpful to ask how many positions comprise the world system than it may be to ask how many positions comprise the world system at any given moment.

The substantive content of the positions and roles identified in this chapter speaks to a set of possible changes in the world system that have largely been unaddressed by empirical network analyses of the structure of international exchange. The core role and core positions identified in these analyses suggest that the core may be substantially more exclusive than previous analyses claim. Smith and White (1992: 872), for instance, identify a core in 1965 that includes the United States and the United Kingdom but include Canada and West Germany as well. By 1980, this core has expanded substantially to include eleven states\(^\text{11}\). While there are methodological differences between the approach taken by Smith and White and the approach taken here, the emergence of an economically dominant context occupied by the United States, Hong Kong, and perhaps Australia by 1995 certainly suggests that the core may be smaller at

\(^{11}\) Hong Kong, however, is not included as a part of the core in their analysis for 1965, 1970 or 1980. It is worth noting that Hong Kong is very near the boundary that Smith and White draw between the core and the semiperiphery (1992: 871).
that point than it was at the end of the colonial period. The substantive character of the semiperiphery is also called into question by the analyses presented in this chapter. Theoretical accounts of the semiperiphery are not particularly precise when defining its boundaries. Chase-Dunn, for example, argues that there are two analytic kinds of semiperipheries (1989: 212): one in which states display a balanced mix of core and peripheral activities, and another in which states express activities that are intermediate between core and peripheral activities. To the extent that the analyses presented here are interpreted as consistent with the core-periphery-semiperiphery tripartite scheme, they at best suggest that there are multiple kinds of semiperipheries. An alternative interpretation of the results presented in this chapter is that the semiperiphery is not an important feature of the contemporary postcolonial world economy, and that a new set of roles and position best characterize the contexts of economic activity outside the core and the periphery.