The Persistence of Structural Inequality? A Network Analysis of International Trade, 1965-2000.*

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Abstract

This article reports results from a network analysis of international trade over the period 1965 to 2000. It addresses the impact of changes associated with globalization and the "new international division of labor" (NIDL) on structural inequality in the world economy. To assess this impact, I ask three specific questions. 1) Do patterns of international trade conform to a core / periphery structure through time? 2) Does the structure exhibit inequality with regard to industrial sophistication? 3) Have globalization and the NIDL encouraged upward mobility for historically poor countries, or have they reproduced a stable set of structural positions? The findings support the view that the NIDL and globalization have benefited a few exceptional countries while at the same time have reproduced structural inequality.

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Introduction

How is "globalization" changing the fate of developing countries in the world economy? There is considerable agreement that high levels of between nation inequality were caused by the spatial unevenness of the spread of capitalism that consolidated a global division of labor segmented into core and periphery between the mid 19th and 20th centuries (Firebaugh, 2000; Mittelman, 2000; Wallerstein, 1974). There is also broad agreement that the world economy experienced a "new international division of labor," (NIDL) which entails a shift in manufacturing from developed to developing countries and a concomitant increase in the volume of international trade beginning in the 1960's (Frobel, Heinrichs, and Kreye, 1980; Dicken, 2003). There is much less agreement on the prospects for poor countries that began to industrialize and open their economies to the world market. Some claim these global processes equalized the structure of the world economy. As Robert Wade (2004) paraphrases:

> the world economy is [now] an open system in the sense that country mobility up the income/wealth hierarchy is [no longer] constrained by the structure. The hierarchy is in the process of being flattened, the North-South, core-periphery, rich country-poor country divide is being eroded away as globalization proceeds (567).

Others contend instead that globalization reproduces old forms of structural inequality, along with producing new ones (Arrighi et al., 2003; Hirst and Thompson, 1996; Mittelman, 1996).

In many ways, current debates in sociology over "globalization" and trends in international inequality hinge on the interpretation of industrialization in historically poor countries. Those who suggest that poor countries are closing the gap between themselves and developed countries implicitly equate industry in advanced industrialized countries with industry that is developing in poorer countries. Thus, poor countries should have faster growth as they exploit the returns to closing the productivity gap between low and high capital / labor ratios (Barro and Sala-I-Martin, 1995). On the other hand, world-system and dependency theorists claim that technological and other historical forms of dependency delimit industry in developing countries to less sophisticated forms than those in core countries (Smith, 1997; Chase-Dunn, 1998). Macro level comparative studies tend to obfuscate the important distinction between levels of industrial sophistication when dealing with global change and economic development. For example, many scholars point to the meteoric growth of "manufacturing" in developing countries to suggest that historically poor countries can close the gap between themselves and the developed world:

> The conception of an interdependent, interacting, global manufacturing system cuts across the old view of a world consisting of…First and Third, haves and have-nots, rich and poor, industrialized and non-industrialized (Harris, 1986: 200).

Others point to increasing aggregate trade ties for historically poor countries to suggest that the world-economy is becoming less hierarchically organized (Kim and Shin, 2002). Among the problems with these measures of global shifts in manufacturing and international trade is that they equate everything from garments to semi-conductors. Such a level of aggregation runs the risk of misrepresenting the dynamics associated with globalization and the NIDL.

The central questions that emerge from these debates, then, concern the *qualitative* nature of industrialization occurring in historically poor countries, as well as the effect of increasing trade ties for developing countries. Is there a difference between the *type* of industry that dominates advanced industrial countries versus that in historically poor countries? Do expanding trade ties reflect a fundamental change in the underlying structure of the international division of labor? This article joins the debate on these global shifts by deriving competing empirical claims about the effects of globalization

on outcomes related to the structure of the world-economy and the performance of individual countries within that structure. I then adjudicate between these claims by employing a network analysis of international trade over five points in time between 1965 and 2000. Three main research questions guide this investigation. First, does the structure of international trade continually exhibit a hierarchical structure in which some countries occupy dominant positions and play dominant roles vis-à-vis others? Second, are dominant positions associated with higher levels of industrial sophistication than subordinate positions? Finally, do patterns of mobility suggest that historically underdeveloped countries have been able to improve their position in the world economy, or has the relative position of countries remained stable throughout these global shifts? I turn now to discussing the historical context of industrialization in the developing world, emphasizing the role that *levels of processing* play in creating and maintaining structural inequality.

Levels of Processing and Structural Inequality

The world-system and dependency perspectives suggest that the structure of the world economy creates international inequality. Generalizing from a long-term macro historical comparison, Wallerstein claims that dominant (core) countries rose to ascendancy as a direct result of their exploitation of non-western (peripheral) regions. Through colonization, core states enriched themselves and simultaneously retarded the growth of peripheral states by forcing them onto political and social paths that made technological advancement and competition with the core difficult, if not impossible (Wallerstein, 1974). More recent mechanisms of growth and stagnation have to do with the notion that the subsequent world-system is hierarchically organized into zones (core, semi-periphery and periphery) that perform different functions in the international division of labor.

The defining characteristic of world-system zones is the extent to which they are involved in core or periphery production processes. According to Chase-Dunn, "Core production is relatively capital intensive and employs skilled, high wage labor; peripheral production is labor intensive and employs cheap, often politically coerced labor" (Chase-Dunn: 1998, 77). Thus, core countries' production regimes are primarily capital intensive, while peripheral countries' regimes are primarily labor intensive or based on the export of raw materials. Conceptually, the core/periphery distinction is one of a continuum. Countries that have a relatively equal mix of core and peripheral production processes are labeled semi-peripheral and reside between core and periphery countries in the hierarchical structure. It is highly unlikely that countries with little to no advanced industry can move up into core production processes because they lack the necessary levels of capital, infrastructure, workforce skills and technical expertise to do so.

Prior to 1960, the international division of labor was relatively simple: core countries specialized in manufactured goods that were exported abroad, and peripheral countries specialized in raw materials and food stuffs for core markets (Dicken, 2003; Mittelman, 2000). Countries that specialized in manufacturing remained on the cutting edge of technological innovation and industrial capacity, which advantaged them in generating wealth through product innovation. Countries that specialized in raw material and agricultural extraction were disadvantaged in terms of their ability to generate wealth and develop modern industry, and were vulnerable to highly fluctuating prices for raw materials on the world market (Galtung, 1971). As Dicken (2003) states, this structural inequality manifests itself in the form of unequal terms of trade[1]:

> Over time, these inequalities tend to be reinforced through the operation of the cumulative processes of economic growth…the terms of trade for manufactured and primary products tend to diverge [and primary producers have] to export a larger quantity of goods in order to buy the same, or even a smaller, quantity of manufactured goods" (p572).

Thus, the picture that emerges prior to 1960 is one in which the international division of labor manifests structural inequality.

This international division of labor also had *political* consequences for individual nations. The periphery's export recipients are primarily located in the core. Consequently, peripheral countries remain highly sensitive to political and economic decisions of core countries and tend to maintain trade relations that favor them (Hirschman, [1945] 1980). The other side to this trade relationship is that peripheral countries are equally dependent on the core for imports that are necessary to reproduce their own economy:

> The rich country can with little effort supply a poor country with implements for agriculture or the chase which doubled the effectiveness of her labor, and which she could not make for herself; while the rich country could without great trouble make for herself most of the things which she purchased from the poor nation or at all events could get fairly good substitutes for them (Marshall, 1923 cited in Hirschman, 1980: 24).

Thus, core nations enjoy a structural advantage over peripheral nations by limiting their trading alternatives and maintaining trade relations that favor the core. Ultimately, peripheral states are unable to increase their standing *vis-à-vis* core states (Frank, 1969; Portes, 1976).

In sum, these perspectives suggest that the social organization of production, by structuring access to the material goods necessary for development, is "the major source of the inequality of this world" (Galtung, 1971: 89). Hirschman's theory of the relationship between *National Power and the Structure of Foreign Trade* ([1945] 1980) shows further that the reproduction of the core/periphery hierarchy occurs through structural inequality, which is the *interaction* of both "purely economic competitive advantage and political interference by states" (Chase-Dunn and Rubinson, 1979: 455). Ultimately, these operate through reciprocal causation as high levels of processing facilitate strong states, and strong states, in turn, facilitate higher levels of processing. Empirical research has found that both strong states (Evans, 1979) and high levels of processing (Stokes and Jaffee, 1982) are associated with economic growth.

The New International Division of Labor and Free Trade

Two interrelated processes occurred in the world economy to make this simple dichotomy between manufacturing and raw material/agricultural extraction no longer an adequate description of the international division of labor. The first of these began in the 1960's and 1970s. Due to increasing economic volatility, the world economy began to reorganize into a NIDL when industrialized countries began to relocate segments of their industrial sectors to developing countries (Frobel, Heinrichs, and Kreye, 1980). This global shift gave rise to claims that historically poor countries can close the developmental gap between themselves and the core. Though the above discussion of levels of processing and structural inequality juxtaposed manufacturing with raw materials to show that unequal levels of processing created inequality, "the general point here is the *gap*, which would also exist if one nation delivers semi-finished products and the other finished products" (Galtung, 1971: 88, emphasis added). In other words, potential qualitative distinctions between types of industrial processes that characterize national economies remain an important analytical component when assessing the developmental impact of globalization and the NIDL.

The second of these processes is more recent and has to do with expanding neo-liberal trade policy that began in the 1980s. The multilateral trade agreements that further institutionalized the General Agreement on Tariffs and Trade (GATT) into the World Trade Organization[2] (WTO) sparked debate among economists and scholars of international relations. Institutionalizing free trade agreements could have multiplied the benefits of the NIDL by lowering the costs associated with international exchange and encouraging further industrialization in the periphery. Furthermore, trade liberalization could encourage countries to invest in products for which they have a comparative advantage (Krueger, 1997). As Kim and Shin (2002) summarize, "according to neoclassical economic theory, [increased] trade would largely

eliminate the handicaps of countries with limited natural resources or those in lower developmental stages. It is through trade that developmental opportunities would be more widely distributed across the world" (449). On the other hand, the world-system/dependency perspective of free trade claims that lowering restrictions on exports and imports tends to favor firms and national economies that already dominate. As Frank argues, "free trade, like free enterprise, is protective monopoly under another name" (Frank, 1969: 54).

Network Analysis and International Trade

The preceding theoretical perspectives suggest several empirical implications for structures of international trade, the location of individual countries within that structure, as well as a country's level of industrial sophistication. First, the diversity of a country's production regime should increase monotonically with the overall level of processing at which they are capable of producing. Second, a country's position in structures of international trade is therefore highly correlated with its level of processing: high variation in the types of commodities a country produces means greater access to markets and trading partners. It follows that structures of international trade are hierarchically organized based on the marked contrast between the *roles* that core and peripheral countries play *vis-à-vis* each other. The role of core countries involves providing capital-intensive goods and technological ingenuities required by all regions of the world economy. Furthermore, core countries have the largest markets in the world. Thus, core countries will tend to export and import large volumes of commodities to and from *many* countries located throughout the entire world economy. The role of non-core countries involves specializing in exports of raw materials and, increasingly, intermediate processed goods to higher zones in the hierarchy. Consequently, these countries will tend to have fewer trading partners, most of which are located at higher zones in the hierarchy (Galtung, 1971).

These ideas - that the world economy is hierarchically organized and countries play distinct roles in the world economy - make network analysis uniquely suited to the study of international trade because of its ability to detect *social structure* by analyzing the *patterns of relations* between actors.[3] Since the late seventies, we have learned much from the study of international trade using network analysis. Many studies confirmed the world-system hypothesis that the world economy is composed of distinct positions: core, periphery and semi-periphery (Blanton, 1999; Kick and Davis, 2001; Nemeth and Smith, 1985; Schott, 1986; Smith and White, 1992; Snyder and Kick, 1979; Su and Clawson, 1994; Van Rossem, 1996). Furthermore, several studies found that zones lower than the core have slower economic growth (Kick and Davis, 2001; Kick et. al., 2000; Nemeth and Smith, 1985; Snyder and Kick, 1979).

In addition to showing that the world-economy is hierarchically organized and lower zones tend to grow more slowly than the core, another line of research demonstrated the notion that zones of the world economy display differential levels of processing in terms of the products they produce and export (Nemeth and Smith, 1985; Smith and White, 1992). Smith and White's (1992) study illustrated an unequal division of labor from 1965 to 1980. According to Smith and White (1992), high processed goods flowed from core to non-core countries in ratios ranging from 3/1 to 13/1, and commodities of low processing levels flowed in the opposite direction, from "peripheral and other lower bocks toward consumption in the core" (882). Recent network analyses claim to find evidence that the world economy is becoming more structurally equal (Kim and Shin, 2002). However, their findings are hard to interpret because of their operationalization of *structure* and neglect of *levels of processing*.

Kim and Shin (2002) conduct a longitudinal network analysis of globalization and suggest that the network is becoming more equal. This claim is based on two related empirical observations. First, they observe an increase of trade ties by middle range countries to suggest that "at the core of [globalization] has been the *development* of countries in the middle strata (emphasis added)" (Kim and Shin, 2002: 445). Second, they observe that "…over time the network looks less like a star configuration with one dominant node… , the relative dominance of a single central country has decreased, and the world trade structure has been decentralized since 1959" (Kim and Shin, 2002: 456). However, these empirical observations are difficult to interpret for two reasons. First, they make no attempt to assess the alleged benefit of the expanded ties they observe by looking at the type of commodities that make up the

increased interaction, or correlating these expanded ties with development indicators like change in GDP per capita. Second, they do not delineate subgroups in their data. Rather, they measure network centralization from the perspective of one individual actor. Therefore, their finding that the network is less centered around one dominant node fails to adequately assess whether or not the network conforms to a core/periphery hierarchy, and may simply reflect greater density.[4] Ultimately, when they purport to assess the explanatory value of world-system/dependency literature *vis-à-vis* classical and neo-classical economics, they fail to adequately operationalize these theoretical perspectives. This article resolves these problems of interpretation by assessing the extent to which the structure conforms to a core / periphery hierarchy, establishing whether or not structural positions remain unequal in terms of levels of processing, and measuring the temporal mobility of individual countries within the structure.

Data

The data for this study come from the Commodity Trade Statistics compiled annually by the UN (United Nations, 1986). The data are classified according to the *Standard International Trade Classification* system (SITC Rev.1). SITC classifies commodities on a continuum from one digit (very general) to five digits (very specific).[5] Since this study is designed to follow Smith and White (1992) in drawing distinctions between levels of processing, I use the two-digit level. The two-digit level is superior to other levels of generality for a number of reasons. (1) One digit categories are too aggregated to draw appropriate distinctions.[6] (2) Using the two digit codes over less general categories limits the range of possible commodity matrices from thousands to fifty-five. (3) Measurement error and misclassification become increasingly problematic as researchers move to the more specific SITC categories (Durand, 1953). However, it is difficult to assign a level of processing to even the two-digit level commodity categories because they, too, are quite heterogeneous. This problem is addressed often in the literature (Smith and Nemeth, 1988; Firebaugh and Bullock, 1986; Nemeth and Smith, 1985; Stokes and Jaffee, 1982; Steiber, 1979; Delacroix, 1977).

The most systematic and replicable way to resolve this problem was carried out by Nemeth and Smith (1985; 1988), who found five significant factors of commodities in a continuous space between extraction based/labor intensive to production based/capital intensive. The commodities I use here match Smith and White's (1992), and represent the levels of processing developed by Smith and Nemeth (1988): [7]

High Technology/Heavy Manufacture

71 Power-generating machinery and equipment
58 Artificial resins, plastics, cellulose esters and ethers
69 Manufactures of metal, not elsewhere specified

Extractive

64 Paper, paperboard, and articles of paper pulp
25 Pulp and waster paper
34 Gas, natural and manufactured

Low Wage/Light Manufacture

84 Articles of apparel and clothing accessories
85 Footwear
83 Travel goods, handbags, and similar containers

Food Products and By-Products

01 Meat and meat preparations
02 Dairy products and bird's eggs
29 Crude animal and vegetable material, not elsewhere specified

Finally, it is important that this study be restricted to countries that appear in every year for the fact that any change in position or flow intensity would be impossible to interpret if each time slice had a different set of actors. Smith and White had 63 countries at each time point between 1965 and 1980. Since 1980, however, new countries have emerged while others fail to report their data after 1980. Therefore, new data has emerged since Smith and White (1992), while information on some countries in later years is missing. Thus, in order to maintain a network with the same countries at each time point, this project analyzes matrices of order 53.[8] To conclude, the data are pair-wise trade flows between 53 countries measured in current US dollars in 1965, 1970, 1980, 1990 and 2000.

Methods: Comparative Network Analysis.

Network methodology is well suited to the study of international trade because it focuses on *relationships* among social entities and the implications of these relationships (Wasserman and Faust, 1999). As I describe above, world-system theory explains national development by highlighting the relations between nation states and the corresponding roles these relations facilitate in the world economy. The method I use involves the network concept of regular equivalence. Regular equivalence locates actors who relate to the other actors in a network in the same way. Specifically, "the notion of regular equivalence formalizes the observation that actors who occupy the same social position relate in the same ways with other actors who are themselves in the same positions" (Wasserman and Faust: 1999: 473). More formally, "two points in a network are regularly equivalent if and only if for each tie one has with another point, the self-equivalent point has an identical tie with an other-equivalent point" (White and Reitz: 1985). This is an important distinction. For point A and B to be regularly equivalent, they must have the same ties to *equally equivalent* others.

The first step in this analysis calculates the degree of regular equivalence for each pair of countries with the following algorithm. The regular equivalence (M_{ij}^{t+1}) between countries *i* and *j* at iteration t+1 is:

$$M_{ij}^{t+1} = \frac{\sum_{k=1}^{g} \max_{m=1}^{g} \sum_{r=1}^{R} M_{km}^{t} \left({}_{ijr}M_{kmr}^{t} + {}_{jir}M_{kmr}^{t} \right)}{\sum_{k=1}^{g} \max_{m}^{*} \sum_{r=1}^{R} \left({}_{ijr}Max_{kmr} + {}_{jir}Max_{kmr} \right)}$$

where the denominator is the maximum possible value of the matches between the profiles of *ik* and *jm* that would occur if all of the ties between *i* and its alters (*k*) were perfectly matched to the ties between *j* and its alters (*m*), and all of *k* and *m* were regularly equivalent. The numerator determines the *best matching* of the ties between *j* and *m* for *i's* ties to *k* weighted by the regular equivalence of *k* and *m* from the previous iteration (Wasserman and Faust, 1994). Thus, the algorithm determines the best possible matching of ties between *i* and *j* weighted by the equivalence of their alters, and divides that value by the maximum possible value of the numerator. It is important to remember that the equivalence of each pair of actors is revised after each iteration $(t+1)$. I have specified three iterations, with the third serving as the measure of regular equivalence for each pair of countries.[9] It is highly unlikely that any two nations would be exactly equivalent, so applying a regular equivalence algorithm to five matrices including the sum of all the values of the 12 commodity categories produces an equivalence measure for each pair of countries between maximally dissimilar (0) and regularly equivalent (1).[10]

In order to scale the resulting matrix of regular equivalences and quantify the similarity/difference between countries, the second step uses the equivalence matrix as input for correspondence analysis.[11] Correspondence analysis represents actors in a multi-dimensional Euclidian space by assigning coordinates to actors that place them close to those with whom they are similar and far from those with whom they are dissimilar (Weller and Romney, 1990). Interpreting the results from

correspondence analysis depends on the amount of variation explained by each Eigenvalue/dimension and the observed spatial pattern of objects in the Euclidian space. Thus, one can have a relatively simple structure (few significant dimensions) or a complex one (many significant dimensions). Once the significant dimensions are delineated from this analysis, I can use these dimensions to make general observations about the latent structure contained in the data.

The third and fourth steps in this research process seek to delineate which world-system zones countries occupy and examine the relationship between zones with block models. A block model is simply a means to group actors who have similar patterns of relations together, and analyze the relationships between relatively equivalent groups (Borgatti and Everett, 1992; Sailer, 1978). I establish zonal location by clustering the matrix of regular equivalencies into groups of relatively equivalent countries. I apply two complementary hierarchical clustering algorithms to the matrix of regular equivalencies—complete link and average link—that are available in UCINET.[12] The resulting groups are the basis for fitting block models in each time point. I use these block models to analyze the patterns of trade between world-system zones by separately fitting them to each matrix of the twelve commodity categories. The result is twelve separate block models for each of the five time slices that represent the four levels of processing. By examining the pattern of commodity exchange separately for different levels of processing, I can begin to answer questions about continuity in a qualitative gap between the types of industries that dominate in advanced industrial countries versus those that dominate in historically poor countries.

The final step in this study assesses patterns of mobility in the 35-year period from 1965 to 2000. Once correspondence analysis assigns coordinates to each country, these coordinates can be used as a measure of position in the world economy. Upwardly mobility can be measured as the change in rank-ordered position between years for each country. In order to measure mobility, I first correlate the positions between 1965 and 2000 to suggest an overall level of change. I then regress the rank order measure for 2000 on the measure for 1965 to locate countries that demonstrate significant mobility.

Hierarchy from 1965 to 2000

Table 1 contains the Eigenvalues and percentage of explained variance for the first through fifth dimensions of the correspondence analysis of regular equivalence for the years 1965 to 2000.

Table 1. Correspondence Analysis of Regular Equivalence by Dimension and Year.

The first dimension of this analysis explains nearly all the variance in regular equivalence between countries. This is apparent by comparing the amount of variation explained by the first dimension, with that explained by subsequent dimensions. The pattern is such that the first dimension accounts for between 95.2 and 97.4 percent of the variance in each time period, while each subsequent dimension accounts for less and less of the variance.[13] Tables 2a and b contain the first dimensional coordinate for each country in each of the periods. The country columns list the countries ordered from highest to lowest correspondence analysis coordinate in each year, with rich countries like the United States on the top and relatively poorer countries like Jordan and Togo on the bottom. Tentatively, this configuration suggests a hierarchical interpretation (Borgatti and Everett, 1999; Mahutga, 2005).[14]

Table 2a: Network Measure of World-System Position by Country and Year* (N=27)

Table 2b: Network Measure of World-System Position by Country and Year* (N=26)

Network analysis provides an intuitive notion of a core/periphery structure. Specifically, “the intuitive conception entails a dense, cohesive core and a sparse, unconnected periphery” (Borgatti and Everett, 1999). A continuous core / periphery model implies that actors are either “more or less” core-like. This notion presumes that interaction decreases monotonically for actors that are less core-like. The continuous notion of a core/periphery structure is closest to the empirical expectations of the world-system perspective that trade patterns reflect an underlying continuum in the international division of labor between core (capital intensive) to peripheral (labor intensive) production processes. Thus, if the data conforms to a core/periphery structure, interaction should decrease as one moves away from the core block in a block model.

In order to assess whether or not the pattern of relations conforms to the above conception of a core/periphery structure, I collapse individual countries into relatively equivalent blocks. From 1965 to 1980, there were five major blocks among countries for both the average and complete link routines.[15] The years 1990 and 2000 produced four instead of five block solutions.[16] Tables 3a and 3b detail which block contains each country, by year. In the years 1965 through 1980 I have five blocks labeled core, strong semi-periphery, weak semi-periphery, strong periphery and weak periphery. In 1990 and 2000, I have only the periphery in place of the strong and weak peripheries. These are the most useful and interpretable blocks that correspond to the complete and average link hierarchical clustering routines.[17]

Table 3a: Block Membership by Country, Position and Year* (N=27)

Table 3b: Block Membership by Country, Position and Year* (N=26)

Table 4 shows the block model for the aggregate trade in 1965 and demonstrates the continuous core/periphery pattern of interaction for 1965, which holds throughout each year analyzed. The heaviest interaction between blocks is that between each block and the core, and levels of interaction decrease as you move away from the core.

Table 4: Block Model of Aggregate Trade for 1965*

Table 4, along with tables 1, 2a and 2b yield a clear and robust interpretation concerning the overall structure. The latent structure of the data conforms well to the conception of core/periphery from network theory. However, it is important to assess the consistency between this measure of the core/periphery hierarchy and previous results that included other theoretical considerations. Some argue that international trade is not the only kind of relationship that matters in delineating where countries reside in the core/periphery hierarchy (Chase-Dunn and Grimes, 1995; Kentor, 2000). These authors suggest that military, diplomatic and legal relations are as important to the reproduction of the core/periphery hierarchy as trade. Kentor (2000) produced the most systematic and longitudinal attempt to determine the location of countries in the core/periphery hierarchy using this logic. Kentor (2000) estimated an index of location in the core/periphery hierarchy between 1800 and 1990 by combining measures of a nation's capital intensiveness, gross domestic product (GDP), military power, labor productivity, total exports, internal foreign capital penetration, etc. Two of Kentor's periods overlap with mine: in 1970 we have 34 identical countries, and in 1990 we have 49. In both years there were significant ($p<.001$) positive correlations between my measure and Kentor's. For 1970, my measure is only 13.4 percentage points away (.866) from a perfect one to one matching of rank orders. In 1990, when the data is more complete, my measure is only 5.7 percentage points away (.943) from a perfect one to one matching of rank order. Thus, my measure of position in the world-system is robust when considering variables associated with other conceptualizations of the world-system.

In sum, the first dimension of the analysis explains nearly all the variation of relational difference between countries. Second, the patterns of trade in the block models conform to the notion of a continuous core/periphery structure. Finally, there is a nearly one to one correlation between this measure and Kentor's operationalization of the core/periphery hierarchy. Together these findings provide robust evidence that the world economy continues to operate within the confines of a hierarchical, core / periphery structure. Therefore, these results suggest that the period from 1965 to 2000 should not be characterized as eradicating the hierarchical structure of the world economy. The next section assesses the extent to which levels of processing differentiate the core from the periphery in this hierarchy.

Segmented International Division of Labor

Industrialization in one world economic zone may not be equal to industrialization in another. Drawing distinctions between levels of processing remains important for their tendency to either encourage or constrain the whole of a nation's productive capacity. Consequently, when authors point to a rise in "industry" and fail to differentiate between certain kinds of industry, this potentially misrepresents the type of industrialization underway in the developing world.[18] If there is a systematic pattern in which commodities produced at higher levels of processing originate at higher zones of the structure and commodities produced at lower levels of processing originate at lower zones of the

structure, this would suggest that the international division of labor remains bifurcated between countries with advanced industry and countries with less advanced industry. Such a bifurcation would suggest that unequal terms of trade still benefit the advanced industrial group over the less advanced group (Delacroix, 1977; Stokes and Jaffee, 1982). [19]

Table 5: Index of Asymmetrical Levels of Processing as Log of Exports to Imports from Higher to Lower Blocks.

Table 5 reports a summary index of asymmetrical levels of processing for the years 1965 to 2000. This index assess whether or not the core/periphery structure conforms to a segmented division of labor by dividing the sum of the cells above the diagonal (flows directed down the hierarchy) by the sum of the cells below the diagonal (flows directed up the hierarchy) for each of the 60 block models estimated in the previous section. I log the ratio so that it is 0 at parity, positive when commodities flow up the hierarchy and negative when they flow down. The key to interpreting the logged ratio is on the bottom of the table.

Overall, the pattern of trade asymmetry in which goods with high levels of processing are exchanged between the core and higher zones of the hierarchy for goods with low levels of processing from lower zones has not changed. The ratios for "High Technology/Heavy Manufacture" indicate that these commodities flow down the hierarchy at a ratio ranging from 10/1 to 1.3/1. Commodity categories "Plastics in non-Primary forms" and "Manufactures of Metals, n.e.s." decrease in the ratio of asymmetry between 1980 and 1990, but reverse this trend in 2000. The Extractive category demonstrates the tendency for commodities at low levels of processing to originate at lower zones in the world-economy. "Paper, paperboard and articles of paper pulp" are variable, while "Pulp and waste paper" is stable and "Gas, natural and manufactured" increases the positive trade balance between lower blocks and higher blocks. Likewise, the category "Low Wage/Light Manufacturing" reveals a consistent pattern of commodity flows that move up the hierarchy, though "Footwear" is highly variable throughout the thirty-five year period.

The contrast between the categories "High Technology/Heavy Manufacture" and "Low Wage/Light Manufacturing" suggests that industrial expansion in developing nations is highly uneven. While industrialization has occurred in non-core countries, not all countries have industrialized to the same degree in terms of levels of processing. As Amsden notes, "there are also different degrees of convergence between North and South for different industries. The South accounts for 43.8 percent of world shoe production, for example, but for only 28.3 percent of world steel production" (Amsden, 2003: 35).

It is important to note that the magnitude of flow asymmetry within the class "High Technology/Heavy Manufacturing" decreases between 1965 and 2000. Overall, the magnitude decreases by 52% for this class. However, the categories "Plastics in non-Primary forms," and "Manufactures of Metals, n.e.s.," reverse this trend by 2000. Furthermore, the very dramatic decrease of trade asymmetry for "Power Generating Machinery and Equipment" itself accounts for 54% of the class' overall decrease. Further analysis shows that the strong-semi periphery is responsible for this decrease. The ratio in trade asymmetry for "Power Generating Machinery and Equipment" between the core and strong semi-periphery moves from a ratio of 3.2/1 in 1965 to parity in 2000, while the ratio between the core and both peripheries remains stable at 25/1 in 1965 and 20/1 in 2000. This shows that countries that were already relatively advantaged *vis-à-vis* lower peripheral countries benefited from globalization in ways that the poorest countries have not.[20] Finally, the upward flow for Extractive and Low Wage/light Manufacturing categories decreases by only 8 and 13 percent respectively. Such a finding is consistent with the possibility that a few stereotypical semi-peripheral countries were able to move up the hierarchy by "upgrading" to advanced industries (Gereffi et. al., 2001).[21] The next section on mobility will assess this possibility. Overall, the contrast in levels of processing between the upper and lower zones of the core/periphery hierarchy, and the uneven pattern of change therein, demonstrates that the era of globalization is far from an even diffusion of industrial technology.

Mobility

The previous sections found that the world economy is organized into a core/periphery hierarchy and the upper zones of the hierarchy tend to specialize in advanced industry. Therefore, patterns of mobility are another dimension on which to gauge the alleged change via globalization and the NIDL. If countries tend to move from lower to higher zones of the core/periphery hierarchy, then this would suggest that structural inequality is decreasing. Alternatively, if an unequal structure is characterized by little long-term upward mobility, it reflects an underlying stability in the distribution of industrial technology and structural inequality.

Table 6: Country mobility between 1965 and 2000 (N=53)

Tables 6 displays upward and downward mobility measured as the change in rank order position from 1965 to 2000, as well as the positions of each country for the same years. Considering the whole system, there is a high level of continuity. Again, the correlation of .856[22] indicates that the structural position of countries was highly stable throughout the period. Furthermore, there is a tendency for higher stability at the top of the structure. This is obvious when looking at the top five positions of the hierarchy. The US and Germany[23] remain the top two economies from 1965 to 2000, while the UK, France and Italy only drop one spot to accommodate the upward mobility of Japan. There is no stronger pattern of stability among any five consecutive positions than that displayed by the top five. Interestingly, the second most stable set of positions is the bottom five. Of these bottom five positions, Ecuador displays the most upward mobility at four positions. The other four positions would have remained in the bottom five if it were not for the moderate downward mobility of Iceland and the extreme downward mobility of Senegal. Overall, the high level of stability that is especially pronounced at the upper and lower ends of the continuum suggests further that the equalizing effect of globalization and the NIDL tend to be overstated.

It is important to assess temporal variability in the overall amount of structural stability detailed above. Importantly, the expansion of neo-liberal trade policy since the 1980s could account for much of the change between 1965 and 2000. If this were the case, the curtailment of statist protection policies could enhance the NIDL, which could suggest that significant change began more recently. In other words, the structure of the world economy may be on a trajectory of change that will produce greater amounts of mobility in the future than occurred in the years leading up to 2000.

Figure 1: Temporal variability in structural change

To assess this possibility, I examine the ten-year increments in terms of their share of the overall 14.4 percent change. Figure 1 shows the amount of the 14.4 percent change accounted for by each time period. Rather than increasing the amount of mobility in the system, increasing trade liberalization correlates with decreasing mobility. Of the overall 14.4 percent change, the highest period of change (6.1 percent) is between 1970 and 1980, with a substantial return to stability during the two subsequent ten-year periods (3.1 and 2.9 percent respectively). Therefore, the evidence does not support the contention that "opening up to trade and exporting should accelerate [mobility]" (Kim and Shin, 2001: 449).

Within the high level of stability that characterizes the whole world-system, it is important to identify countries that experienced significant mobility. As table 6 demonstrates, it is difficult to differentiate between significant mobility and that which would occur given the upward/downward mobility of a few countries.[24] In order to identify countries with significant levels of mobility, I regress the 2000 measure of position on the 1965 measure. Since the constant is insignificant,[25] I exclude it and include a 90 percent confidence interval for the individual observations.[26] Countries above the upper interval demonstrate significant upward mobility, and countries below the lower interval demonstrate significant downward mobility. Figure 2 shows the scatter plot, along with the confidence interval for the years 1965 and 2000.

Figure 2: Scattergram showing significant mobility between 1965 and 2000

Only South Korea (b), Singapore (qq) and Turkey (yy) demonstrate significant upward mobility. The exceptional performance of these countries should come as no surprise. South Korea and Singapore are among the manufacturing miracles of East Asia, and are often studied as exemplars of third world development (Gereffi and Wyman, 1990; Haggard, 1990). Though Turkey began to develop later than

some of the prototypical East Asian "NICs", its ability to demonstrate such upward mobility is directly related to its shift from lower to higher levels of processing (Amsden, 2001: 139 and 159). The performance of these three countries suggests that development is a viable goal for some poor countries, and claims that development is impossible are incorrect. At the same time, however, the small number of upwardly mobile countries suggests that mobility is the exception rather than the rule. Upward mobility within the core/periphery hierarchy is exceedingly difficult and rare. Future research would benefit by comparing these three countries to those demonstrating less success in terms of their efforts to engage in "industrial upgrading" (Gereffi et. al., 2001).

Conclusion

This study produced several important findings. The first dimension of my analysis of the variance of regular equivalence between countries provides a robust structural measure of the world economy. This measure captures the continuous hierarchical nature of the world economy and is highly correlated with the core/periphery concept from the world-system perspective. Second, the analysis of commodity exchange suggests that unequal levels of processing continue to create structural inequality through the reproduction of a segmented international division of labor. Third, there is a high level of structural stability between 1965 and 2000, with the more recent decades demonstrating the most stability. Within this high level of stability, three countries demonstrated significant upward mobility.

Together, these findings yield some important generalizations. First, the hierarchical nature of the world-system remained stable from 1965 to 2000, both in terms of core/periphery patterns of interaction and production processes. The most important change within this general tendency was the rise of labor-intensive manufacturing in non-core zones of the core/periphery hierarchy. Thus, the old world of a manufactured goods/raw materials dichotomy co-exists with a low value added/high value added dichotomy. Second, upward mobility in the world economy is rare through a period that many referred to as undergoing massive restructuring.[27] However, the exceptional performance of South Korea, Singapore and Turkey show upward mobility is possible. Third, the expansion of neo-liberal trade regulations is associated with less structural change than the period before this policy expansion. In general, the processes associated with globalization and the NIDL have not reversed structural inequality.

The global restructuring that began in the 1960's had the potential to undercut the historical dominance of core countries. By providing more sophisticated production technology amenable to spin-offs and the development of domestic capital, the NIDL could have spelled the end to centuries of world inequality. However, the changes brought about by these global shifts instead produced "winners" *and* "losers." The winners are the core countries that maintained their dominant positions throughout these global shifts. Another group of winners are the few semi-peripheral countries that were able to move up the value added hierarchy and bring their populace's standard of living along with them (Amsden, 2001; Haggard, 1990). However, there is a rather large group of losers from this process. As Peter Dicken notes,

> "the already affluent developed countries have sustained – even increased – their affluence, some developing countries have made very significant progress, but there is a hard core of exceptionally poor countries that remains stranded… " (Dicken, 2003: 514).

Thus, future macro level research on the consequences of globalization can benefit from attempts to generalize as to the contingent impediments / conduits to technological upgrading and upward mobility in spite of generalized structural inequality. Finally, while this study was limited to assessing whether or not there were significant alterations to the structure of economic-relations between individual nations in the whole world economy, it may also be interesting to explore variations in regional performance, as well as competition between hegemonic core states (i.e. the U.S.) and potential rivals, including the EU and the East Asian region headed by Japan, China and South Korea. Asking these kinds of questions would further clarify our understanding of the causes of inequality (structural or otherwise) in the world economy today.

NOTES

[1] The dependency and world-systems perspectives often speak of "unequal exchange," rather than unequal terms of trade. However, the exact meaning of "unequal exchange" is itself open to debate. O'Hearn (2001) nicely differentiates between an "exploitative" and "oppressive" understanding. The exploitative form occurs through the appropriation of surplus labor across zones of the world economy when low wage earners in poor countries exchange their wages for high value goods on the world market. The oppressive understanding occurs when poorer regions are excluded from the most innovative and profitable activities, which is closer to the meaning described here. O'Hearn suggests that the predominance of one form over the other occurs cyclically and thus they are intimately connected. I would suggest that, since low levels of processing are associated with low wages, these are perhaps even more intimately connected than the literature suggests.

[2] The Uruguay rounds began in 1986 and culminated in 1993. The institutionalization of the WTO was finalized in 1994. Furthermore, the US-Canada free trade agreement was signed in 1988 and the North American Free Trade Agreement (NAFTA) was signed in 1993. Many other regional free trade agreements came into effect throughout the 1980's and 1990's.

[3] Indeed, there has been an almost universal recognition in studies of global political economy that the best ways to conceive changes in the world economy use the concept of networks, whether they be global city networks (Sassen, 2002; Taylor, 2001); commodity chains linking nodes within production networks (Gereffi and Korzeniewicz, 1994); or entire orienting perspectives like the "Network Society" (Castells, 1996). Recent empirical research has also shown that the structure of world-cities and that of nation-states are strongly associated (Alderson and Beckfield, 2004), suggesting that the use of nation states as nodes in network analysis remains a relevant methodological strategy.

[4] Network Centralization scales linearly with mean degree, such that graphs with high mean degree cannot have high centralization. This is because degree centrality is equal to:

$$1) \qquad C_d(G) = \frac{\sum_{i=1}^{N}(\Delta - d_i)}{(N-1)(N-2)},$$

where Δ is the maximum actor degree centrality. One can re-express the numerator in terms of mean degree with

$$2) \qquad \sum_{i=1}^{N}(\Delta - d_i) = N(\Delta - \bar{d}),$$

where $\bar{d}$ is the mean degree. Substituting equation 2 for the numerator of equation 1 gives

$$3) \qquad C_d(G) = \frac{N(\Delta - \bar{d})}{(N-1)(N-2)}$$

Clearly, degree centralization falls linearly with mean degree (see Butts, 2005 for a complete derivation and discussion of the determinants of exact bounds for centrality measures). Obviously, rising mean degree (or density) reflects rising connectivity, which in many ways is the *definition* of globalization. In other words, since decreasing network centrality values only reflect greater connectivity (globalization), this finding only verifies that globalization has indeed occurred and leaves open the question as to the benefit of globalization for developing countries.

[5] These data were purchased from the United Nations Statistical Office in electronic form, and therefore represent the most up to date information for both new countries, as well as upgraded information for older nations.

[6] One digit categories such as "Manufactured goods classified chiefly by material" include commodity types as diverse as "Textile yarn, fabrics, made-up articles" and "Iron and steel."

[7] These commodity categories consistently loaded high on the first factor of Smith and Nemeth's (1988) factor analysis, and remained stable through the fifteen years they analyzed (1965-1980). Using these twelve over the thirty-nine possible (that consistently loaded high on the first factor) reduces the number of trade matrices to analyze from 195 (thirty nine categories X five years) to 60 (twelve categories X five years). My own unreported analysis

corroborates their findings for these twelve categories. See Amsden, (2001) and Gereffi & Wyman, (1990) for discussions of the importance of these kinds of industries.

[8] Two anonymous reviewers were concerned over the absence of China from this analysis. The reason for China's exclusion is straightforward: it only appears in 1990 and 2000. This is because China did not report this information to the UN before engaging in economic reforms in the 1980s.

[9] Faust (1988) finds that three iterations are sufficient in most cases.

[10] I used the program, UCINET (Borgatti, Everett and Freeman, 2002). I used the base 10 log of the dollar amounts to re-scale the variance in commodity exchange between countries. This maintains the relative differences between countries while aiding the algorithm in convergence.

[11] UCINET (Borgatti, Everett and Freeman, 2002).

[12] Hierarchical clustering starts by putting each actor in an NXN matrix into its own cluster so that the similarity between clusters equals the similarity between each actor. The procedure then finds the most similar pair of actors and merges them into one cluster. The third step computes similarities between the new cluster and each of the other actors. The second and third steps are carried out until all actors have been merged into a single cluster of size N (Borgatti, 1994).

[13] The highest scoring dimension after the first is the second in 2000, which explains only one thirty-fourth of the variance of the first dimension.

[14] Graphic displays of the relative position of countries delineated with correspondence analysis are available from the author upon request.

[15] In general, complete and average link clustering agree on the partitioning of actors at each level of regular equivalence. Correlations are well above .900 in every case. Therefore, the block models reported here are the results of only the average link algorithm. Substantive conclusions were the same in both cases.

[16] The years 1990 and 2000 are different in that most of the successive block solutions after a four-block solution would split individual peripheral countries into their own blocks. Therefore, in the year 2000 I collapsed several individual country blocks into the peripheral block. This decision does not bias the analysis, and in fact provides for rather conservative estimates of trade asymmetries because it creates one periphery rather than breaking it down into tiny one and two member blocks.

[17] While choosing the appropriate number of blocks can sometimes seem arbitrary, Wasserman and Faust (1999) note that "the 'trick' is to choose the point along the series that gives a useful and interpretable partition of actors into equivalence classes [blocks]" (383). The reader should also note the likelihood that the following analysis will yield lower ratios of trade asymmetry because the clustering routines are breaking apart countries that would likely be kept together if more variability was introduced by the numerous poor countries precluded from the data set because of missing data.

[18] Amsden (2003) provides a table that lists the industry shares in terms of the gains and losses by developing countries. Amsden fails to draw attention to the fact that all of the industries for which the developing world gains ten percent or more of the world share are of the labor-intensive type. For example, footwear, textiles, wearing apparel, leather/fur products, non-ferrous metals, minerals, etc.

[19] The assumption of this article is that if asymmetrical patterns of exchange characterize the world economy, then either the "exploitative," (unequal exchange) the "oppressive," (unequal terms of trade) or *both* processes occur. See Note 1 for further discussion.

[20] Since semi-peripheral countries have, by definition, a much more equal mix of "core" and "periphery" production processes than do peripheral countries, some or all of them are much more likely to have the necessary basic infrastructure to develop advanced industry (Chase-Dunn, 1998).

[21] If the spread of advanced industry was even throughout the network, then all categories would experience a similar decrease in magnitude. However, if only a few countries developed, then that would explain the divergent decreases: most historically poor countries continue to produce and export less advanced industry while a few of them "upgraded" to advanced industrial processes.

[22] Significant ($p<.001$); two-tailed test.

[23] West Germany in 1965, 1970 and 1980.

[24] Ordinal rank orders are sensitive to mobility because one upwardly mobile country would cause every country passed in rank order to lose one position.

[25] This would be expected given the nature of rank order measures discussed above.

[26] The 95% confidence interval decreases the number of upwardly mobile countries to two (South Korea and Singapore) and the 99% interval delineates one upwardly mobile country (South Korea).

[27] Two anonymous reviewers pointed out correctly that the inclusion of China could change the substantive interpretations. Data on China were only available for the two periods, 1990 and 2000. Taking the reviewer's

comments into consideration, I reanalyzed these periods and included China. Indeed, China did display upward mobility, but it was not significant. Furthermore, China appears in the strong semi-periphery in 1990, and remains there in 2000. While this lends tentative support to my findings, future studies might narrow the temporal range to periods in which data is available to examine the performance of China, especially in comparison to countries that perform well. See note nine for a discussion of China's absence.

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Tables

Table 1. Correspondence Analysis of Regular Equivalence by Dimension and Year.

	Year				
Dimensions	**1965**	**1970**	**1980**	**1990**	**2000**
Dimension 1					
Eigenvalue	.035	.038	.025	.032	.029
Explained Variance*	97%	97%	97.40%	97%	95.20%
Dimension 2					
Eigenvalue	.004	.004	.003	.004	.005
Explained Variance*	1.20%	1.10%	1.40%	1.50%	2.80%
Dimension 3					
Eigenvalue	.003	.003	.002	.003	.003
Explained Variance*	.70%	.60%	.60%	.90%	1%
Dimension 4					
Eigenvalue	.002	.003	.001	.002	.002
Explained Variance*	.30%	.60%	.20%	.40%	.50%
Dimension 5					
Eigenvalue	.001	.002	.001	.001	.001
Explained Variance*	.08%	.30%	.20%	.10%	.10%

* Explained Variance for each Dimension is calculated as $100 \times \frac{\lambda_m^2}{\sum_{m=1}^{M} \lambda_m^2}$, where $_M$ is dimension 1, 2, 3, … $_M$

Table 2a: Network Measure of World-System Position by Country and Year* (N=27)

YEARS									
1965		1970		1980		1990		2000	
USA	.079	USA	.079	USA	.056	USA	.063	USA	.053
Germany	.073	Germany	.073	Germany	.051	Germany	.054	Germany	.045
UK	.068	UK	.068	UK	.041	Japan	.048	Japan	.040
France	.053	France	.056	Japan	.039	France	.046	UK	.039
Italy	.051	Italy	.053	France	.038	UK	.045	France	.036
Sweden	.044	Japan	.052	Italy	.035	Italy	.043	Italy	.035
Japan	.041	Sweden	.048	Netherlands	.026	Netherlands	.035	Netherlands	.029
Netherlands	.041	Netherlands	.044	Belgium	.026	Sweden	.030	Belgium	.026
Canada	.039	Belgium	.040	Sweden	.026	Belgium	.030	Spain	.025
Switzerland	.034	Canada	.039	Switzerland	.022	Spain	.025	South Korea	.021
Denmark	.033	Switzerland	.034	Canada	.021	Switzerland	.024	Canada	.020
Belgium	.033	Denmark	.033	Spain	.016	Canada	.023	Sweden	.019
Argentina	.031	Argentina	.028	Finland	.015	South Korea	.022	Brazil	.016
Australia	.026	Finland	.026	Denmark	.015	Austria	.020	Singapore	.016
Finland	.022	Norway	.025	Norway	.014	Denmark	.019	Hong Kong	.015
Austria	.022	Austria	.025	Brazil	.014	Singapore	.019	Thailand	.015
Norway	.021	Australia	.025	Austria	.014	Finland	.017	Switzerland	.014
Hong Kong	.012	Spain	.022	Argentina	.011	Hong Kong	.016	Ireland	.013
New Zealand	.011	Hong Kong	.019	Hong Kong	.009	Brazil	.015	Austria	.013
Thailand	.010	New Zealand	.017	Australia	.009	Thailand	.013	Malay	.012
Mexico	.006	Brazil	.015	South Korea	.009	Norway	.012	Mexico	.012
Spain	.004	Portugal	.005	Ireland	.006	Australia	.011	Australia	.012
Philippines	.004	Ireland	.003	Singapore	.006	Ireland	.010	Denmark	.011
Brazil	.002	Hungary	.003	New Zealand	.005	Portugal	.009	Turkey	.009
Ireland	.000	Thailand	.003	Mexico	.004	Mexico	.007	Hungary	.008
Malay	-.002	Mexico	.003	Greece	.004	Malay	.006	Finland	.008
Hungary	-.007	South Korea	.001	Hungary	.003	New Zealand	.003	Norway	.006

Table 2b: Network Measure of World-System Position by Country and Year* (N=26)

YEARS									
1965		1970		1980		1990		2000	
Portugal	-.010	Israel	-.003	Philippines	-.001	Greece	.003	Portugal	.005
Peru	-.012	Philippines	-.006	Portugal	-.002	Turkey	.003	Argentina	.004
Israel	-.012	Malay	-.010	Thailand	-.004	Hungary	-.002	Philippines	.003
Morocco	-.013	Greece	-.012	Malay	-.006	Israel	-.002	Israel	.000
Guatemala	-.014	Singapore	-.014	Israel	-.006	Philippines	-.004	New Zealand	-.003
Singapore	-.014	Chile	-.014	Venezuela	-.008	Argentina	-.004	Greece	-.003
South Korea	-.015	Peru	-.017	Columbia	-.009	Pakistan	-.006	Morocco	-.009
Senegal	-.016	Columbia	-.017	Tunisia	-.012	Morocco	-.007	Venezuela	-.010
Chile	-.018	Guatemala	-.019	Chile	-.012	Columbia	-.007	Columbia	-.010
Greece	-.018	Costa Rica	-.020	Morocco	-.013	Tunisia	-.008	Tunisia	-.010
Pakistan	-.019	Nicaragua	-.020	Pakistan	-.013	Chile	-.013	Costa Rica	-.012
Turkey	-.019	Turkey	-.022	Turkey	-.014	Costa Rica	-.014	Chile	-.012
Nicaragua	-.019	Morocco	-.023	Guatemala	-.018	Venezuela	-.018	Peru	-.013
Venezuela	-.022	Pakistan	-.024	Costa Rica	-.019	Peru	-.023	Guatemala	-.015
El Salvador	-.023	Venezuela	-.027	Paraguay	-.021	Guatemala	-.024	El Salvador	-.016
Honduras	-.024	Honduras	-.032	Iceland	-.022	Paraguay	-.030	Pakistan	-.020
Costa Rica	-.024	Senegal	-.032	Malta	-.022	Malta	-.034	Honduras	-.020
Iceland	-.026	El Salvador	-.035	El Salvador	-.023	El Salvador	-.036	Ecuador	-.025
Paraguay	-.030	Iceland	-.038	Honduras	-.024	Honduras	-.041	Nicaragua	-.028
Tunisia	-.036	Paraguay	-.041	Nicaragua	-.024	Ecuador	-.045	Paraguay	-.037
Columbia	-.039	Malta	-.044	Peru	-.027	Jordan	-.045	Malta	-.038
Ecuador	-.053	Ecuador	-.055	Bolivia	-.032	Bolivia	-.051	Bolivia	-.038
Malta	-.067	Tunisia	-.063	Ecuador	-.044	Nicaragua	-.052	Jordan	-.041
Bolivia	-.069	Togo	-.080	Jordan	-.045	Iceland	-.053	Iceland	-.055
Togo	-.070	Jordan	-.081	Senegal	-.049	Senegal	-.060	Senegal	-.068
Jordan	-.071	Bolivia	-.094	Togo	-.064	Togo	-.109	Togo	-.116

Table 3a: Block Membership by Country, Position and Year* (N=27)

	Country	Blocks				
		1965	**1970**	**1980**	**1990**	**2000**
USA	USA	1	1	1	1	1
P	Germany	1	1	1	1	1
zz	UK	1	1	1	1	1
O	France	2	1	1	1	1
Y	Italy	2	1	1	1	1
tt	Sweden	2	1	1	2	2
Z	Japan	2	1	1	1	1
g	Netherlands	2	1	1	1	1
G	Canada	2	1	1	2	2
uu	Switzerland	2	2	2	2	2
K	Denmark	2	2	2	2	2
D	Belgium	2	1	1	2	1
A	Argentina	2	2	2	3	3
B	Australia	2	2	2	2	2
N	Finland	2	2	2	2	3
C	Austria	2	2	2	2	2
jj	Norway	2	2	2	2	3
T	Hong Kong	2	2	2	2	2
h	New Zealand	3	2	2	2	3
vvv	Thailand	3	2	3	2	2
e	Mexico	3	2	2	2	2
s	Spain	3	2	2	2	1
n	Philippines	3	3	2	3	3
F	Brazil	3	2	2	2	2
W	Ireland	3	2	2	2	2
cc	Malaysia	3	3	3	2	2
U	Hungary	3	2	2	3	2

Notes: *1=Core; 2=Strong Semi-Periphery; 3=Weak Semi-Periphery; 4=Strong Periphery (1965-1980); 4=Periphery (1990 and 2000); 5=Weak Periphery (1965-1980). Letters denote countries in subsequent scattergrams.

Table 3b: Block Membership by Country, Position and Year* (N=26)

Country		Blocks				
		1965	**1970**	**1980**	**1990**	**2000**
oo	Portugal	3	2	3	2	3
m	Peru	3	3	4	3	3
X	Israel	3	3	3	3	3
f	Morocco	3	3	3	3	3
R	Guatemala	3	3	4	3	3
qq	Singapore	3	3	2	2	2
b	South Korea	3	2	2	2	2
Q	Greece	3	3	2	2	3
kk	Pakistan	3	3	3	3	4
yy	Turkey	3	3	3	2	2
i	Nicaragua	3	3	4	4	4
H	Chile	4	3	3	3	3
pp	Senegal	4	4	5	4	4
aaa	Venezuela	4	3	3	3	3
M	El Salvador	4	4	4	3	3
S	Honduras	4	3	4	3	4
J	Costa Rica	4	3	4	3	3
V	Iceland	4	4	4	4	4
ll	Paraguay	4	4	4	3	4
I	Columbia	5	3	3	3	3
xx	Tunisia	5	5	3	3	3
L	Ecuador	5	5	5	4	4
d	Malta	5	4	4	3	4
E	Bolivia	5	5	5	4	4
ww	Togo	5	5	5	4	4
a	Jordan	5	5	5	4	4

*1=Core; 2=Strong Semi-Periphery; 3=Weak Semi-Periphery; 4=Strong Periphery (1965-1980); 4=Periphery (1990 and 2000); 5=Weak Periphery (1965-1980). Letters denote countries in subsequent scattergrams.

Table 4: Block Model of Aggregate Trade for 1965*

Sending Block	Receiving Block				
	Core	**Strong Semi-Periphery**	**Weak Semi-Periphery**	**Strong Periphery**	**Weak Periphery**
Core	585106	296705	72803	42776	10174
Strong Semi-Periphery	213205	34506	7656	3284	1308
Weak Semi-Periphery	19241	1511	486	339	41
Strong Periphery	1333	638	220	252	65
Weak Periphery	797	89	8	14	0

***Values are constant US dollars in units of 1000**

Table 5: Index of Asymmetrical Levels of Processing as Log of Exports to Imports from Higher to Lower Blocks.

Commodity Type	Log of Export/Import from Higher/Lower Blocks*				
	1965	**1970**	**1980**	**1990**	**2000**
High Technology/Heavy Manufacture					
71 Power Generating Machinery and Equipment	-.68	-.77	-.66	-.32	-.10
58 Plastics in non-Primary forms	-.62	-1.05	-.80	-.26	-.41
69 Manufactures of Metals, n.e.s.	-.43	-.60	-.38	-.18	-.26
Extractive					
64 Paper, paperboard, articles of paper pulp	.44	-.23	.05	.27	.16
25 Pulp and waste paper	.62	.11	.34	.60	.56
34 Gas, natural and manufactured	.50	-.36	.54	.63	.74
Low Wage/light Manufacturing					
84 Articles of apparel and clothing accessories	.43	.37	.55	.50	.60
85 Footwear	.72	.28	.38	.50	.29
83 Travel goods, handbags, similar containers	.24	.12	.31	.28	.19
Food Products					
01 Meat and meat preparations	1.01	1.04	.97	.53	.30
02 Dairy products and birds egg	.50	.20	-.05	.04	.14
29 Crude animal and vegetable materials, n.e.s.	.48	.26	.25	.15	.15

Notes: * Key to conversion from logs to ratios

Fractional part of log:	.9	.8	.7	.6	.5	.4	.3	.2	.1	.0
Integer Part of Log: 0.	7.9	6.3	5.0	4.0	3.2	2.5	2.0	1.6	1.3	1.0
1.	79	63	50	40	32	25	20	16	13	10

Table 6: Country mobility between 1965 and 2000 (N=53)

1965 position	*CHANGE*	2000 position	1965 position	*CHANGE*	2000 position
1 USA*	0	1 USA*	28 Portugal*	0	28 Portugal*
2 Germany*	0	2 Germany*	29 Peru	-11	29 Argentina
3 UK*	-1	3 Japan*	30 Israel	-1	30 Philippines
4 France*	-1	4 UK*	31 Morocco	-3	31 Israel
5 Italy*	-1	5 France*	32 Guatemala	-9	32 New Zealand*
6 Sweden*	-6	6 Italy*	33 Singapore	**19**	33 Greece*
7 Japan*	4	7 Netherlands*	34 South Korea*	**25**	34 Morocco
8 Netherlands*	1	8 Belgium*	35 Senegal	-17	35 Venezuela
9 Canada*	-2	9 Spain*	36 Chile	-3	36 Columbia
10 Switzerland*	-7	10 South Korea*	37 Greece*	4	37 Tunisia
11 Denmark*	-12	11 Canada*	38 Pakistan	-5	38 Costa Rica
12 Belgium*	4	12 Sweden*	39 Turkey*	**15**	39 Chile
13 Argentina	-16	13 Brazil	40 Nicaragua	-6	40 Peru
14 Australia*	-8	14 Singapore	41 Venezuela	6	41 Guatemala
15 Finland*	-11	15 Hong Kong	42 El Salvador	0	42 El Salvador
16 Austria*	-3	16 Thailand	43 Honduras	-1	43 Pakistan
17 Norway*	-10	17 Switzerland*	44 Costa Rica	6	44 Honduras
18 Hong Kong	3	18 Ireland*	45 Iceland*	-6	45 Ecuador
19 New Zealand*	-13	19 Austria*	46 Paraguay	-1	46 Nicaragua
20 Thailand	4	20 Malaysia	47 Tunisia	10	47 Paraguay
21 Mexico*	0	21 Mexico*	48 Columbia	12	48 Malta
22 Spain*	13	22 Australia*	49 Ecuador	4	49 Bolivia
23 Philippines	-7	23 Denmark*	50 Malta	2	50 Jordan
24 Brazil	11	24 Turkey*	51 Bolivia	2	51 Iceland*
25 Ireland*	7	25 Hungary*	52 Togo	-1	52 Senegal
26 Malaysia	6	26 Finland*	53 Jordan	3	53 Togo
27 Hungary*	2	27 Norway*			

*OECD member countries

Figures

Figure 1: Temporal variability in structural change

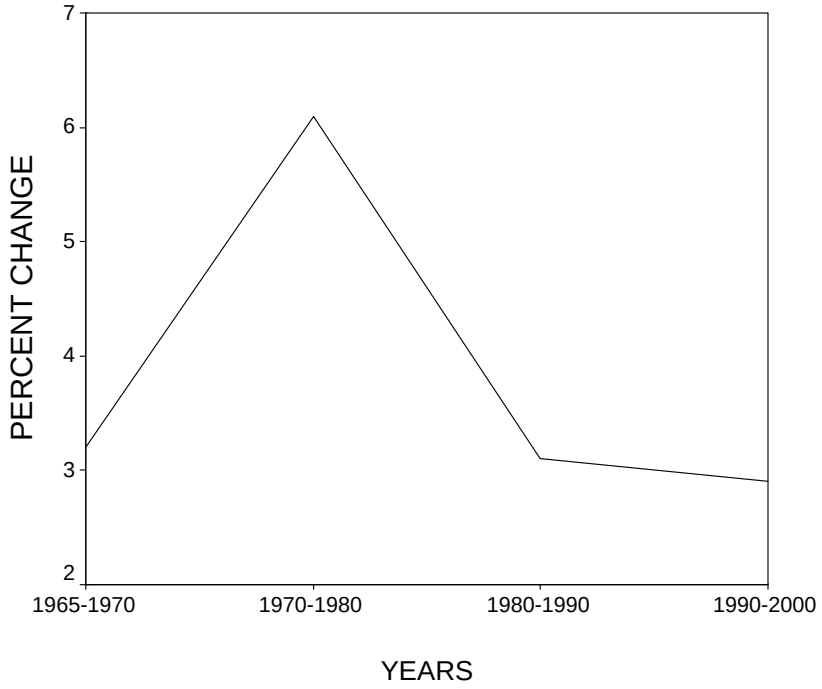
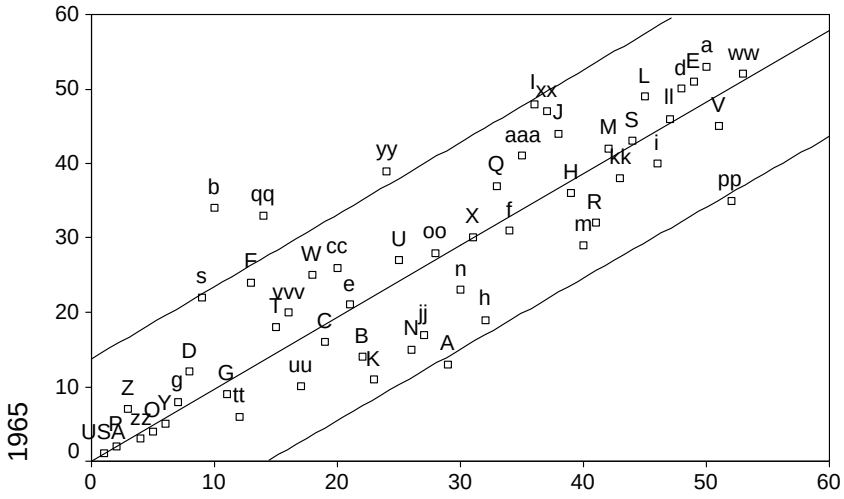


Figure 2: Scattergram showing significant mobility between 1965 and 2000



Notes: See tables 3a and 3b to match labels with countries

Appendix

Table 8: Inter-year Correlations of Rank Order Position, and Correlations with Kentor (2000) for available years.

	Rank Order Positions				
	1965	1970	1980	1990	2000
Rank Order Positions					
1965	1.00***	----	----	----	----
1970	.969***	1.00***	----	----	----
1980	.910***	.952***	1.00***	----	----
1990	.882***	.919***	.962***	1.00***	----
2000	.856***	.889***	.928***	.971***	1.00***
Kentor (2000)					
1970	----	.866***	----	----	----
1990	----	----	----	.943***	----

***p<.001, two-tailed test