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MULTINATIONAL CORPORATIONS, DEMOCRACY AND CHILD MORTALITY: A QUANTITATIVE, CROSS-NATIONAL ANALYSIS OF DEVELOPING COUNTRIES

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ABSTRACT. This study presents quantitative, sociological models designed to account for cross-national variation in child mortality. We consider variables linked to five different theoretical perspectives that include the economic modernization, social modernization, political modernization, ecological-evolutionary, and dependency perspectives. The study is based on a cross-lagged effects regression analysis of a sample of 59 developing countries. Our preliminary analysis based on additive models replicates prior studies to the extent that we find that indicators linked to economic and social modernization have beneficial effects on child mortality. We also find support for hypotheses derived from the dependency perspective suggesting that multinational corporate penetration fosters higher levels of child mortality. Subsequent analysis incorporating interaction effects suggest that the level of political democracy conditions the effects of dependency relationships based upon multinational corporations. Transnational economic linkages associated with multinational corporations adversely affect child mortality more strongly at lower levels of democracy than at higher levels of democracy–that is intranational, political factors interact with the international, economic forces to affect child mortality. We conclude with some brief policy recommendations and suggestions for the direction of future research.

KEY WORDS: child mortality, cross-national, dependency theory, modernization theory

INTRODUCTION

Over the past two decades, a number of quantitative, cross-national studies within sociology have been published examining the factors that influence child mortality (Cutright and Adams, 1984; Caldwell, 1990; Wimberley, 1990; Bradshaw and Huang, 1991; Bradshaw et al., 1993; Lena and London, 1993; Firebaugh and Beck, 1994;

Shen and Williamson, 1997). Many of these studies (Cutright and Adams, 1984; Firebaugh and Beck, 1994) have emphasized predictors linked to the modernization perspective or measures we refer to as intranational or internal factors such as gross national product per capita and energy consumption per capita. Other scholars (Caldwell, 1990; Bradshaw and Huang, 1991; Bradshaw et al., 1993) have emphasized international or external factors stressed by dependency theory including variables pertaining to exports, multinational corporations, and international financial institutions. However, these studies generally neglect most internal predictors linked to the modernization perspective just as studies in modernization theory generally neglect the external factors linked to dependency theory.

A smaller number of quantitative, cross-national analyses (Wimberley, 1990; Lena and London, 1993; Shen and Williamson, 1997) conclude that predictors linked to both modernization theory and dependency theory are important when attempting to account for cross-national variation in child mortality. While some of this research has found support for both theoretical perspectives simultaneously, very few studies in this genre have attempted to specify the theoretical articulations between these seemingly divergent development theories when accounting for cross-national variation in child mortality.

We seek to address this gap in the literature by elaborating a contextual model of the characteristics of nations that influence child mortality throughout the developing world. First, we review five of the most frequently used theoretical frameworks in the development literature – the economic modernization perspective, the social modernization perspective, the political modernization perspective, the ecological-evolutionary perspective, and the dependency perspective. Second, we review a number of past quantitative, cross-national studies of child mortality to identify various demographic, economic, political, and social factors that have been useful in prior attempts to account for cross-national variation in child mortality. We then construct quantitative, cross-national models in which we test a number of hypotheses suggested by the relevant development literature and quantitative, cross-national studies of child mortality. In doing so, we seek to specify how international, economic factors suggested by dependency theory interact with intranational, political factors suggested by political modernization theory to influence child mortality.

CHILD MORTALITY IN THEORETICAL PERSPECTIVE

Economic Modernization Perspective

Arising from neo-classical economic contentions that scarce goods are most efficiently distributed through markets, economic modernization theory emphasizes internal or intranational financial factors in its analysis of development processes (Rostow 1990). Economic modernization theory views development as bridging the gap between developed nations and developing countries through an imitative process. From this perspective, economic growth is viewed as the driving force behind development within countries. Economic development fosters greater levels of industrialization and urbanization. Increases in industrialization and urbanization tend to generate a higher standard of living and greater access to advanced medical technology that should decrease child mortality (Rostow, 1990). Several prior cross-national studies have modeled and found support for the inverse relationship between economic modernization predictors such as the level of development and child mortality (Lena and London, 1993; Firebaugh and Beck, 1994; Shen and Williamson 1997).

Social Modernization Perspective

Another strand of modernization theory stresses the role education plays as an intranational factor in the development process within a country. As the average education level increases in a developing country, first productivity and then wages tend to increase. This eventually results in increases in the rate of economic growth (Bellew and Raney, 1992). Economic growth, in turn, augments levels of industrialization, which often yields a higher standard of living and greater access to advanced medical technology. As noted previously, increases in standards of living and technological advancements may decrease child mortality throughout the developing world (Rostow, 1990). The results of several prior studies support the hypothesis that education helps to reduce child mortality in developing nations (Lena and London, 1993; Shen and Williamson, 1997).

Decreases in child mortality may also be connected to the education of women via fertility reductions – see Caldwell (1982) for a

complete discussion on how education tends to reduce fertility levels in the developing world. Under conditions of limited resources, reducing the number of children allows the provider to allocate more time and finances to each child. These children will be better fed and clothed, generally better cared for, and, therefore, healthier. In addition, better-educated mothers will be more knowledgeable about health and safety risks as well as nutrition, all of which improve the health of children and reduce mortality. Several cross-national studies offer evidence supporting the hypothesized beneficial impact of female educational attainment on child mortality (Lena and London, 1993; Shen and Williamson, 1997).

Political Modernization Perspective

No examination of the modernization perspective is complete without considerations of certain non-economic dimensions such as political factors (Bollen and Jackman, 1985). The level of political democracy should influence the level of child mortality in developing countries. In particular, some scholars suggest that democracies in the developing world are more likely to be responsive to public opinion, social movements, and special interest groups concerned with health related issues like child mortality, while non-democracies tend to respond to transnational corporate interests not associated with such health outcomes – see the discussion of dependency theory below for elaboration on this point (Ryan, 1991; Gamson, 1992; Rich, 1994; Crenshaw and Jenkins, 1996; Karliner, 1997; Fischer, 1999). Because democracies are typically more responsive to the social concerns of civil society, child mortality should be lower in democratic societies. Conversely, political repressiveness or a lack of democracy can lead to increases in child mortality, as repressive regimes are less likely to respond to public opinion, social movements, and interest groups concerned with health issues (Leonard, 1988; London and Ross, 1995). To our knowledge, only one study has found support for the hypothesized inverse relationship between democracy and child mortality (Lena and London, 1993).

Another aspect of political modernization theory that deserves attention is the state's relationship to the economy (Moon and Dixon, 1985; Bradshaw and Tshandu, 1990). Yet, political mod-

ernization scholars disagree about the effect of government spending on child mortality. Neo-classical economic scholars working within the political modernization perspective hypothesize an inverse relationship between state spending and child mortality. According to neo-classical economic theory, any increase in state size, as measured by either government spending or revenues, is undertaken at the expense of the private sector. State size increases impede economic growth and lower the standard of living in a developing country (Friedman and Friedman, 1980). Lower standards of living are often associated with higher child mortality rates as there is limited access to health care and other basic social services. Some studies have found the hypothesized adverse relationship between indicators of government spending and child mortality (Lena and London, 1993).

While neo-classical economic theorists argue that an increase in the size of government spending is undertaken at the expense of the private sector, other scholars working in the political modernization tradition view government spending as an important corrective to undesirable effects of private market activity (Moon and Dixon, 1985). In this view, increased government spending should be associated with lower levels of child mortality as money is invested in health, education, and other social services. A few studies support the hypothesis that government spending tends to lower child mortality (Hill and Pebley, 1989; Wimberly, 1990; Shen and Williamson, 1997).

Ecological-Evolutionary Perspective

Ecological-evolutionary theory stresses the link between high levels of agricultural production and high levels of industrialization (Lenski and Nolan, 1999). High levels of agricultural production are contingent upon the early utilization of plow technology, which allows nations to produce crop surpluses and develop a "techno-ecological advantage" in terms of spatial organization (Crenshaw and Jenkins, 1996). Higher population densities, larger cities, more complex economic differentiation and specialization, more developed bureaucratic institutions, and greater infrastructure investment produce more highly developed social and economic activities (Crenshaw and Jenkins, 1996). This allows these

societies to have higher levels of industrialization and economic development and, consequently, lower levels of child mortality (Boserup, 1981).

Dependency Perspective

According to dependency theory, the capitalist world system perpetuates a global division of labor that distorts the domestic economy of many developing nations, reduces the rate of economic growth, increases income inequality, and adversely affects well-being for a substantial portion of a population (Frank, 1967; Wallerstein, 1974; Gereffi, 1989). Dependency theorists argue that trade dependence has aggravated the gap between core and peripheral countries because the exchange of raw materials for processed goods is inherently unequal and prices for primary goods have experienced long term decline relative to prices for processed goods (Frank, 1967). As a result, the state's ability to raise revenues is weakened and the resulting lack of revenues affects the funding of health and other basic social service programs. Without the availability of such programs, child mortality is likely to increase. Many prior studies have found the hypothesized, harmful effects of trade dependence on child mortality (Cutright and Adams, 1984; Lena and London, 1993; Shen and Williamson, 1997).

Within the dependency literature, scholars have noted the changing nature of international economic exchanges of core-periphery relations that have taken place in the last three or four decades, as the tendency for multinational corporations to invest in industrial production in the periphery has increased (Frank, 1967; Bornschier and Chase-Dunn, 1985; Ross and Trachte, 1990). They suggest that foreign direct investment promotes underdevelopment in developing countries. Specifically, multinational corporations obstruct education, health, and other social programs, by hampering government policies that are beneficial to much of the population but harmful to the interests of multinational corporations (Evans, 1979; Bornschier and Chase-Dunn, 1985; Ross and Trachte, 1990). In particular, less developed countries are often viewed as "cheap" factors of production for multinational corporations that are headquartered in the core (Crenshaw and Jenkins, 1996; Karliner, 1997). Peripheral countries – eager to attract foreign investment in efforts to expand

local production, employment, and technology – are often in the position of competing with one another. As a result, peripheral countries offer a variety of economic incentives including wage and tax reductions (Leonard, 1988; Ross and Trachte, 1990; London and Ross, 1995). Consequently, multinational corporate investment erodes tax revenues used to fund basic social service programs, which may lead to an increase in child mortality. Some quantitative, cross-national studies have found the hypothesized, positive relationship between multinational corporate penetration and increased child mortality (Wimberley, 1990; Lena and London, 1993; Shen and Williamson, 1997).

METHODOLOGY

Research Design: Cross-Lagged Effects Model

We use cross-lagged effects regression to compare alternative models designed to account for cross-national variation in child mortality rates. In this type of analysis, the dependent variable at one point in time is regressed on itself at an earlier point in time (the lagged dependent variable) and the other independent variables of interest at that same earlier point in time. This method estimates the effects of the independent variables on change in the dependent variable between two time points. This is widely regarded as a powerful tool for making causal inferences with non-experimental data (Finkel, 1995).

A cross-lagged effects design helps rule out reciprocal effects and reduces the threat of spuriousness due to an apparent effect that can be accounted for by another variable causally prior to both the dependent and independent variable of concern. Further, since there is usually a high correlation between the lagged dependent variable and the dependent variable, analyses of this sort assign maximum explanatory power to the lagged dependent variable. This produces a conservative test of the effect of the independent variables on change in the dependent variables, making it appropriate to discuss effects that are significant at the $p < 0.10$ level as well as the more conventional $p < 0.05$ level (Schafer, 1999). Finally, cross-lagged effects regression improves on unconditional change score models, which assume that the lagged endogenous variable has no effect on later values. This assumption is unrealistic with a phenomenon like

child mortality that tends to remain relatively stable over time with small incremental change. A lagged dependent variable model is also superior to fixed effects models or "the method of first difference" insofar as it allows us to examine independent variables that are long-standing structural conditions as well as trends (Finkel, 1995).

Our dependent variable is child mortality in 1995 and the lagged dependent variable is child mortality in 1980. Data for the independent variables were obtained around 1980. Finding quality data for comparative analysis can be difficult, and it requires some adjustments to ideal models. While it would be preferable to collect all the data for one year, the range represented should not substantively alter the results (Ehrhardt-Martinez, 1998). This design has the following mathematical notations:

$$Y_t = B_0 Y_{t-1} + B_1 + B_2 X_{t-1} + E_t$$

The dependent variable (Y_t) is hypothesized to be determined by the lagged dependent variable (Y_{t-1}), the constant (B_1), the lagged value of the independent variable (X_{t-1}), and an error term (E_t).

Countries Included

The population for this study is defined as all non-core nations according to Bollen's (1983) reclassification of Snyder and Kick's (1979) classification of world system position.[1] There is ample precedent in the quantitative, cross-national literature for restricting samples to only non-core countries for a variety of reasons (London and Ross, 1995; Ehrhardt-Martinez, 1998; Shandra et al., 2003). A key insight of both development theory and certain quantitative development studies is that forces originating outside of non-core nations (in other words, originating in core nations) have significant, measurable impacts on outcomes in poorer nations. Quantitative studies model this by restricting their samples to non-core nations and, then, by controlling for a number of "external" determinants of the dependent variable under consideration. Our study accomplishes this by including several independent variables that measure the impact on non-core nations of processes that emanate from the core. Specifically, our various measures of dependency relationships (i.e., commodity concentration and multinational corporate penetration) fall into this category.

As is standard in studies of this sort, countries with any missing information are excluded from the analysis. In the initial set of equations that include all controls, complete data for our models yield a case base of 50 to 59 developing countries. To maximize the use of available data, we allow our sample size to vary from one model to another depending on data availability. Caution should be taken when interpreting differences between models. Various scholars have offered sample size guidelines that concern the appropriate ratio of cases to predictors. Tabachnick and Fidell (2001) suggest standard multiple regression may be conducted with as few as five cases to every one predictor. Polit (1996) argues it is necessary to have 10 cases for every predictor. When constructing our models, we maintain a ratio between 5 and 10 cases to every predictor.

Regression Diagnostics

In addition to the basic ordinary least squares analysis, we make extensive use of various regression diagnostics such as Cook's D to test for the presence of influential cases. In cross-national analysis, there is a very real risk that regression results will be highly sensitive to a small number of influential cases (Polit, 1996; Kennedy, 2001). When our regression diagnostics suggest the presence of highly influential cases, we rerun the analysis deleting those cases. If the basic pattern of results is not dramatically changed, confidence in the validity of the initial equations is enhanced. If the pattern is substantially changed, we call this to the reader's attention and present our results excluding these cases.

In any quantitative, cross-national study of this sort, there is also a potential problem of multicollinearity. Kennedy (2001) suggests a test for multicollinearity in which each independent variable is regressed on all other independent variables – see also Lewis-Beck (1980). It is common not to worry about collinearity unless the R-squares from these equations exceed the R-squares in the original analysis (Lewis-Beck, 1980; Rudel, 1989; Kennedy, 2001). In addition, we examine the variance inflation factor scores produced for each variable in our models. If the values of the variance inflation factor scores do not exceed a value of ten, then multicollinearity should not be a problem (Tabachnick and Fidell, 2001).

MEASUREMENT

Dependent Variable

Child mortality rate

When comparing social development in less developed countries, child mortality rather than infant mortality is recognized as a more reliable indicator of the general level of well-being among children (Caldwell, 1990; Bradshaw et al., 1993). Caldwell (1990) asserts that in high mortality countries, at least one-quarter of all births result in deaths before age five, and because of the age structure of the population, half of all deaths occur to persons under age five. Infant mortality severely underestimates hardship for children in these countries because many die between ages one and five. Therefore, we use child mortality rate or the number of children that die between the ages of one and five per one thousand live births as our dependent variable. The lagged dependent variable is child mortality rate in 1980. We log both the dependent and lagged dependent variable to reduce the potential problem of heteroskedasticity in our analysis (Kennedy, 2001).

Independent Variables

Level of economic development

As is standard in such analyses, it is incumbent for the researcher to take into account a nation's level of economic development in order to make sure that any effects discovered are independent of a nation's level of wealth. In this regard, we employ a measure of gross national product per capita for 1980. This variable is logged to correct for its highly skewed distribution. These data may be obtained from the World Bank (2000). All other things being held equal, economic modernization theory suggests that the level of economic development should have a beneficial impact on child mortality.

Level of educational attainment

To assess the importance of education on child mortality, we include the level of gross secondary school enrollment in a developing country for 1980. These data may be obtained from the World Bank

(2000). Social modernization theory suggests a beneficial relationship between the level of educational attainment and child mortality rates.

Level of female educational attainment

As an alternative indicator of educational attainment, we use the level of female gross secondary school enrollment for 1980. We log this variable to correct for its highly skewed distribution. These data may be obtained from the World Bank (2000). This use of alternative model specifications or the building of dimensions of variation into an analysis is a useful tactic in conducting cross-national research (London and Ross, 1995). The sequential use of cognate but distinct indicators of one or more independent variables can shed considerable light on the complexity and dynamics of the issue under examination. If our various indicators of education exhibit similar effects on child mortality, then our confidence in the generality of the beneficial impact of education on child mortality suggested by the social modernization perspective is enhanced. Social modernization theory predicts female education may reduce child mortality rates in the developing world.

Level of political democracy

Bollen's (1983) index of political democracy for 1980 is used to test the degree to which freely elected and open regimes respond to popular demands for solving development problems such as child mortality. Varying between zero and one hundred, this measure is a composite index based upon six indicators: (1) freedom of the press, (2) government sanctions, (3) tolerance of political opposition groups, (4) fairness of elections, (5) methods of selecting executives, and (6) methods of selecting legislators. These data may be obtained from Bollen (1983). Political modernization theory would expect an inverse relationship between this variable and child mortality.

Level of expenditures on public health

We operationalize state involvement in the economy as public health expenditures as a percentage of gross national product for 1978. These data may be obtained from Taylor and Jodice (1983). Public

health expenditures include all current expenditures by all levels of government for the provision of medical services. The political modernization perspective predicts state expenditures to have either an adverse or beneficial impact on child mortality.

Level of population density

We include a measure of population density to examine the effects of hypotheses suggested by the ecological-evolutionary perspective. These data are measured from 1980 and may be obtained from the World Bank (2000). Ecological-evolutionary theory suggests that a high level of population density should decrease child mortality.

Level of commodity concentration

Commodity concentration is the value of a nation's most important export commodity measured as a percentage of its total exports. This measure may be obtained from Taylor and Jodice (1983). This is a widely used indicator of export or classical dependency theory (London and Williams, 1990; Ehrhardt-Martinez, 1998). This variable is measured for 1975 and indicates the degree to which peripheral nations rely on a single commodity and are vulnerable to market fluctuations for their export earnings. According to dependency theory, commodity concentration should increase child mortality.

Level of multinational corporate penetration

This variable is the end of year stocks of a developed country's foreign direct investments in a given host country. This measure may be obtained from Muller (1988). This measure, frequently employed in previous quantitative cross-national studies, is available for 1975 (Schafer 1999). The variable is logged to correct for its skewed distribution. According to dependency arguments, foreign investment should increase child mortality.

RESULTS

Table I presents the results for our regression analysis estimating the effects of both intranational and international variables on child

TABLE I

Estimates of Additive Regression Models of Child Mortality in 1995

	Equation 1.1 Child Mortality 1995	Equation 1.2 Child Mortality 1995	Equation 1.3 Child Mortality 1995	Equation 1.4 Child Mortality 1995
Intranational Determinants				
Lagged Dependent Variable, 1980	0.764** 0.641 (6.771)	0.879** 0.717 (6.060)	0.875** 0.671** (8.262)	0.921** 0.701 (6.951)
Level of Economic Development, 1980	−45.050** −0.160 (2.033)	−51.213** −0.181 (2.089)	−39.260* −0.130 (1.817)	−51.342** −0.168 (2.072)
Level of Educational Attainment, 1980	−0.285** −0.194 (2.756)		−0.326** −0.217 (3.620)	
Level of Female Educational Attainment, 1980		−0.183 −0.050 (0.565)		−0.354* −0.092 (1.502)
Level of Political Democracy, 1980	−0.002 −0.079 (1.400)	−0.004** −0.118 (2.091)	−0.001 −0.007 (0.149)	−0.002 −0.059 (1.075)
Level of Public Health Expenditures, 1978	0.014 0.015 (0.273)	0.076 0.017 (0.286)	−0.140** −0.110 (2.400)	−0.154** −0.120 (2.220)
Level of Population Denisty, 1980	−0.026 −0.033 (0.648)	−0.014 −0.018 (0.289)	−0.039 −0.050 (1.114)	−0.043 −0.054 (0.941)
International Determinants				
Level of Commodity Concentration, 1975	−0.018 −0.005 (0.092)	−0.017 −0.004 (0.078)		

TABLE I

Continued

	Equation 1.1 Child Mortality 1995	Equation 1.2 Child Mortality 1995	Equation 1.3 Child Mortality 1995	Equation 1.4 Child Mortality 1995
Level of Multinational Corporate Penetration, 1975			0.101** 0.105 (2.335)	0.146** 0.145 (2.800)
Adjusted R-Squared	0.889	0.872	0.920	0.900
Number of Cases	59	57	53	50

Note: The first number reported is the unstandardized regression coefficient, the second number is the standardized regression coefficeint, and the third number in parentheses is the t–value.
**$p < 0.05$; *$p < 0.10$.

mortality in 1995.[2] Equations (1.1) and (1.3) include the lagged dependent variable, the level of economic development, the level of educational attainment, the level of political democracy, the level of public expenditures on health, the level of population density, and one of the measures of dependency. As an alternative indicator of educational attainment, we substitute the level of female gross secondary education for the level of gross secondary education in equations (1.2) and (1.4). Equations (1.1) and (1.2) include the level of commodity concentration, while we include the level of multinational corporate penetration in equations (1.3) and (1.4). In doing so, we follow the common rule of thumb of maintaining a ratio between five and ten cases to every predictor in order to increase the stability of our findings, thus enhancing confidence in the robustness of our results.

Consider first the significant internal variables suggested by the economic and social modernization perspectives. In all equations in Table I, the level of economic development maintains an inverse relationship with the child mortality rate. This lends support to economic modernization arguments that improvements in the

standard of living, greater access to health care, and advancements in medical technology accompanied by increases in the level of economic development tend to lower child mortality. In Equations (1.1) and (1.3), the level of educational attainment maintains an inverse relationship with the dependent variable. This supports social modernization arguments that countries with high levels of education are likely to have lower levels of child mortality. Additionally, the level of female secondary education has a beneficial impact on child mortality, as the coefficients for this variable are negative and significant in Equation (1.4). This finding suggests that increases in the level of education generally rather than increases in the level of female education specifically tend to reduce child mortality.

To this point, we have only considered the significant effects of intranational variables. However, the level of multinational corporate penetration has a significant, adverse effect on child mortality in Equations (1.3) and (1.4). These findings suggest support for dependency arguments that foreign direct investment leads to adverse development outcomes (in this case higher child mortality) in non-core nations.

Surprisingly, the level of political democracy does not have a significant effect in any of the equations in Table I. This unexpected result calls for further comment. Because previous cross-national research (Lena and London, 1993) suggests the importance of including a measure of political democracy when estimating models of development processes, the failure of this measure to predict any significant variation in child mortality is unexpected. So far, we have only considered the additive relationship political democracy has on child mortality. Some development theory suggests that dependency relations may interact with the political conditions within a developing country (Evans, 1979). As such, further research pertaining to the inclusion of political democracy and its relationship to the dependency measures is warranted.

Peter Evans (1979) describes the existence of a ''triple alliance'' in Brazil of multinational capital, local capital, and the state. He argues that multinational investors are attracted to states that promote ''good business climates.'' This sort of regime repressiveness produces the political stability that investors prize.

Much case study (Ross and Trachte, 1990) and cross-national evidence (London and Ross, 1995) suggests that such an "alliance" among transnational economic actors, state officials, and economic elites plays a key role in shaping a wide range of development policies in the poorer countries of the world. Of most relevance are those cases in which repressive or non-democratic regimes pursue policies that serve the interests of transnational actors (e.g., good business climate, austerity programs, imposed political stability, and so on).

When regimes provide regulatory concessions, financial incentives, and tax holidays or when they outlaw strikes, protests, and unions – all policies that serve the interests of transnationals – many relevant consequences ensue (Hurst, 1990; Ryan, 1991; Gadgil and Guha, 1992; Korten, 1995). For example, tax revenues decline (Hurst, 1990) and less state money is available for social and health programs. This inability to provide adequate basic needs to local populations may well be reflected in higher levels of child mortality (London and Williams, 1990; Lena and London, 1993). In addition, repressive regimes often provide transnationals with exemptions to occupational safety and environmental laws (London and Ross, 1995). Such concessions may increase the exposure of employees to toxic working conditions, increasing the prevalence of reproductive problems and causing some child deaths (Clapp, 2001). These concessions may also lead to higher levels of pollution and improper disposal of hazardous wastes, both of which have a disproportionate impact on pregnant women and children. Finally, imposed political stability (e.g., outlawing protests) is an obviously non-democratic policy that minimizes both the prevalence and power of grassroots activism. When civil society is powerless to organize in pursuit of the public interest, basic needs will go unattended, and higher levels of mortality may well be one of the outcomes (Tarrow, 1998; Fisher, 1999; McAdam et al., 2001). In sum, the alliance of multinational corporations and repressive regimes reduces funding, diminishes protections, and produces powerlessness – all factors that translate readily into higher levels of child mortality than would otherwise be the case.

The results presented in Table II can be used to test a number of hypotheses linked to the above line of analysis. Table II has the

same pattern of variable organization as the preceding table. However, we show the results testing for the interactive effects of commodity concentration and democracy in Equations (2.1) and (2.2). In Equations (2.3) and (2.4), we show the results testing for the interactive effects of multinational corporate penetration and democracy. As is standard in analyses of this sort, we enter the interaction term and each component of the interaction term simultaneously into each equation (i.e., we enter the level of commodity concentration, the level of political democracy, and the interaction term between these two variables at the same time in Equations (1.1) and (1.2)). In Equations (1.3) and (1.4), we enter the level of multinational corporate penetration, the level of political democracy, and the interaction term between these two variables simultaneously into the regression analysis. These equations have the following mathematical notations:

$$Y_t = B_0 Y_{t-1} + B_1 + B_2 X_{t-1} + B_3 X_{t-1} + B_2 B_3 X_{t-1} + E_t$$

The dependent variable (Y_t) is hypothesized to be determined by the lagged dependent variable ($B_0 Y_{t-1}$), the constant (B_1), the lagged value of an independent variable ($B_2 X_{t-1}$), the lagged value of an additional independent variable ($B_3 X_{t-1}$), the interaction term between the two independent variables ($B_2 B_3 X_{t-1}$), and an error term (E_t).

In order for high levels of dependency to correspond with low levels of democracy, we multiply the level of political democracy by negative one. High scores on Bollen's (1983) index of political democracy are now indicative of a low level of democracy. We then construct the interaction term by centering the moderator variable, the inverse of level of democracy, around its mean and multiplying the centered version of the moderator variable by a given measure of dependency. To facilitate interpretation, we provide estimates of the effect of each type of dependency relationship at low (one standard deviation below the mean), at medium (the mean), and at high (one standard deviation above the mean) levels of democracy. By centering the level of political democracy (the moderator variable), the effect of dependency on child mortality at the mean level of democracy is equal to the unstandardized regression coefficient for a given dependency measure presented in each equation of Table II.

TABLE II

Estimates of Interaction Regression Models of Child Mortality in 1995

	Equation 2.1 Child Mortality 1995	Equation 2.2 Child Mortality 1995	Equation 2.3 Child Mortality 1995	Equation 2.4 Child Mortality 1995
Intranational Determinants				
Lagged Dependent Variable, 1980	0.783** 0.641 (6.772)	0.867** 0.707 (5.720)	0.881** 0.683 (9.454)	0.952** 0.733 (8.039)
Level of Economic Development, 1980	−44.058** −0.156 (2.000)	−50.728** −0.179 (2.042)	−39.209* −0.124 (1.915)	−52.171** −0.163 (2.177)
Level of Educational Attainment, 1980	−0.302** −0.206 (2.890)		−0.304** −0.207 (3.842)	
Level of Female Educational Attainment, 1980		−0.232 −0.063 (0.638)		−0.184 −0.050 (0.745)
Level of Political Democracy, 1980	0.004* −0.136 (1.773)	0.004* 0.140 (1.538)	−0.002 −0.066 (1.053)	−0.001 −0.033 (0.448)
Level of Public Health Expenditures, 1978	0.021 0.022 (0.396)	0.018 0.019 (0.037)	−0.225** −0.177 (4.010)	−0.239** −0.185 (3.553)
Level of Population Density, 1980	−0.034 −0.043 (0.827)	−0.022 −0.027 (0.392)	−0.039 −0.051 (1.200)	−0.031 −0.040 (0.727)
International Determinants				
Level of Commodity Concentration, 1975	−0.285 −0.075 (0.879)	−0.120 −0.030 (0.299)		

TABLE II

Continued

	Equation 2.1 Child Mortality 1995	Equation 2.2 Child Mortality 1995	Equation 2.3 Child Mortality 1995	Equation 2.4 Child Mortality 1995
Level of Multinational Corporate Penetration, 1975			0.031** 0.306 (2.729)	0.040** 0.297 (3.038)
Corresponding Dependency Measure x Political Democracy, 1980	−0.006 −0.106 (1.022)	−0.002 0.038 (0.310)	0.001* 0.223 (1.743)	0.001** 0.315 (2.125)
Calculated Interaction Effects				
Corresponding Dependency Measure at Low Levels of Democracy	–	–	0.062	0.071
Corresponding Dependency Measure at High Levels of Democracy	–	–	0.001	0.009
Adjusted R−Squared	0.889	0.869	0.934	0.916
Number of cases	59	57	53	50

Note: The first number reported is the unstandardized regression coefficient, the second number is the standardized regression coefficient, and the third number in parentheses is the *T*-value.
As discussed in the text, the effect of each dependency measure at medium levels of democracy is equal to the unstandardized regression coefficient for the dependency measure included in each equation.
**$p < 0.05$; *$p < 0.10$.

Let us now turn our attention to Table II. In Equations (2.3) and (2.4), we find a statistically significant relationship between multinational corporate penetration and political democracy on child mortality, as the interaction terms in both equations are significant. In these equations, we find that multinational corporate penetration has a stronger detrimental effect on child mortality in less democratic regimes than more democratic regimes. This provides support for Evan's (1979) hypothesis pertaining to the existence of a "triple alliance" in which multinational corporations adversely affect child mortality more strongly in repressive regimes or at lower levels of democracy than in non-repressive regimes or at higher levels of democracy. To illustrate this point, consider the following coefficients from Table II. In Equation (2.3), the coefficient indicating the effect of multinational corporate penetration at low levels of democracy is 0.062, the coefficient indicating the effect of multinational corporate penetration at medium levels of democracy is 0.031, and the coefficient indicating the effect of multinational corporate penetration at high levels of democracy is 0.001. Clearly, the harmful effects of multinational corporate penetration on child mortality are stronger at lower levels of democracy (the coefficient at low levels of democracy equals 0.062) than at higher levels of democracy (the coefficient at high levels of democracy equals 0.001). In Equation (2.4), multinational corporate penetration again has a stronger adverse effect on child mortality at lower levels of democracy than at higher levels of democracy. The coefficient indicating the effect of multinational corporate penetration at low levels of democracy is 0.071, the coefficient indicating the effect of multinational corporate penetration at medium levels of democracy is 0.040, and the coefficient indicating the effect of multinational corporate penetration at high levels of democracy is 0.009.

Turning our attention to Equations (2.1) and (2.2), we do not find any support for an interactive relationship between commodity concentration and democracy. In Equation (2.1), the interaction term between these two variables is not significant. This finding is also discernable in Equation (2.2) with the interaction term not reaching statistical significance again. Obviously, only the harmful effects of transnational economic linkages associated with multinational corporations on child mortality, as suggested by some

dependency theory, are greater at lower levels of democracy than at higher levels of democracy.

It is important to note that the major findings from Table I remain stable and consistent across these new model specifications. First, the level of economic development tends to decrease child mortality, as the coefficients for this variable are negative and significant in all equations of Table II. Second, the level of gross secondary school enrollment continues to maintain an inverse relationship with child mortality, as the coefficients for this variable are negative and significant in Equations (2.1) and (2.3). The continued significance of these key variables enhances our confidence in our initial findings presented in Table I.

DISCUSSION AND CONCLUSION

Various economic, political, and social factors found to predict child mortality in past cross-national studies continue to do so in our study as well. First, our results confirm economic and social modernization hypotheses that high levels of development as well as education help to decrease child mortality in the developing world. Second, we find support for the dependency perspective. Specifically, dependency relationships based upon multinational corporations lead to higher levels of child mortality.

Although previous research (Cutright and Adams,1984; Caldwell,1990; Wimberley,1990; Bradshaw and Huang,1991; Bradshaw et al., 1993; Lena and London, 1993; Firebaugh and Beck, 1994; Shen and Williamson, 1997) has provided invaluable insights into developing an understanding of child mortality, these studies have not adequately specified the contexts in which intranational, political factors interact with international, economic factors that influence child mortality in the developing world. We begin to fill this gap in the literature by conducting the first study of child mortality to include interaction terms between the level of democracy and transnational economic linkages associated with exports and multinational corporations. In doing so, our results suggest that dependency relationships based upon multinational

corporations adversely affect child mortality more strongly at lower levels of democracy than at higher levels of democracy, all other things being held equal. Clearly, variables measuring international-external, economic factors and intranational-internal, political factors point to a highly interdependent process influencing child mortality.

Therefore, the ultimate theoretical contribution of this paper pertains to the emergence of both international or external and intranational or internal factors in an analysis of child mortality. In other words, international and intranational dynamics are so interpenetrating in the modern world system that any analysis that does not consider the effects of both sets of factors is seriously deficient and offers at best a partial explanation (London and Williams, 1990). There must be willingness by social scientists to self-consciously rid themselves of the sort of "theoretical blinders" that lead to the categorical analysis of either intranational or international factors, of either modernization or dependency theories. This is the case because these ostensibly antithetical approaches are related to each other in a specifiable and meaningful manner (London, 1987).

We conclude with a few suggestions for readers who might be interested in building upon the research presented here. More multivariate studies are needed in which models are run that involve more than the five or so predictors we have been able to include at one time in our models. Although panel regression is a powerful tool for this genre of research, we need more longitudinal data both for our dependent and independent variables to understand the effects of these determinants on child mortality. This would make it possible to pool cross-sectional data so as to increase the number of degrees of freedom making it possible to include more control variables in one model. We need data for more countries and for more time points making it possible to do more by way of regional comparisons. We could then replicate our findings across both time and space.

APPENDIX A

Bivariate Correlation Matrix For All Variables Included in the Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Child Mortality, 1995	1.000								
(2) Child Mortality, 1990	0.927	1.000							
(3) Economic Development, 1980	−0.563	−0.674	1.000						
(4) Secondary School Enrollment, 1980	−0.766	−0.718	0.412	1.000					
(5) Female Secondary School Enrollment, 1980	−0.685	−0.705	0.65	0.678	1.000				
(6) Public Health Expenditures, 1980	−0.459	−0.413	0.139	0.250	0.320	1.000			
(7) Population Density, 1980	−0.261	−0.290	0.093	0.190	0.084	0.012	1.000		
(8) Commodity Concentration, 1975	−0.060	−0.005	0.482	0.001	−0.045	0.031	−0.032	1.000	
(8) Multinational Corporate Penetration, 1975	−0.166	0.041	0.156	0.197	0.201	0.318	0.058	−0.052	1.000

NOTES

[1] The following countries are included in our analysis: Algeria, Argentina, Bangladesh, Benin, Brazil, Bulgaria, Burundi, Cameroon, Central African Republic, Chile, Columbia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, India, Israel, Ivory Coast, Jamaica, Jordan, Kenya, Lesotho, Malawi, Malaysia, Mali, Mauritius, Mexico, Morocco, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Senegal, Sierra Leone, Singapore, South Korea, Sri Lanka, Syria, Thailand, Togo, Trinidad, Tunisia, Turkey, Uruguay, Venezuela, Zambia, and Zimbabwe.

[2] As a check for multicollinearity, we began by examining a bivariate correlation matrix among all of the variables included in the analysis. See Appendix A. All of the bivariate correlations were low to moderate with the exception of the high correlation (0.927) between the dependent variable and the lagged dependent variable. This is to be expected when employing a cross-lagged effects model (Kennedy, 2001). As noted above, the high correlation between the lagged dependent variable and the dependent variable results in analyses of this sort assigning maximum explanatory power to the lagged dependent variable. This produces a conservative test of the effect of the independent variables on change in the dependent variables, making it appropriate to discuss effects that are significant at the $p < 0.10$ level as well as the more conventional $p < 0.05$ level (Schafer, 1999). Second, the Lewis-Beck (1980) test for multicollinearity is applied for all equations in Tables I and II. Results of this test (not presented but available upon request from the authors) showed no R-squares exceeding the original R-squares. Third, none of the variance inflation factor scores (not presented but available from the authors upon request) exceeded a value of ten. Given the results of all of these regression diagnostic procedures, multicollinearity did not appear to be a problem in this analysis (Lewis-Beck, 1980; Rudel 1989; Kennedy 2001).

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