ABSTRACT

THOMPSON, GRETCHEN HARDEE. A Macro-Comparative Analysis of Global Hunger across Developing Countries: The Integrative Impacts of Global and National Development, Gendered Inequalities, Conflict and Militarization, the Global Food System, and Environment. (Under the direction of Dr. Edward L. Kick).

This study offers a synthetic analysis of global hunger from the perspective of global and national theories of development within the sociological discipline—namely world-systems/dependency and modernization theories. Additionally, this research integrates virtually isolated themes on global hunger present in the current body of literature. These are identified as gender inequality, conflict and militarization, the global food system, and the environment. Using structural equation modeling techniques, this dissertation analyzes a new and comprehensive indicator of global hunger among 70 developing countries—the Global Hunger Index (2010). Results indicate that global hunger is conditioned in an interrelated fashion by each of these themes. Global positions of power, positions within the world-system more closely associated with the core, have a strong and favorable impact on national modernization levels, which in-turn is one of the most important factors found to reduce hunger among countries included in the sample. On the other hand, a history of violent conflict and gender political inequality both impede national modernization levels and indirectly serve to worsen hunger. In a similar vein, military spending in the forms of arms imports and number of soldiers, as well as food import dependency worsen hunger directly. Interestingly, neither militarization nor military participation rates have apparent pay-offs for national modernization as theorized by military Keynesians. However, improving educational access for women does have an ameliorative impact on hunger. These relationships are contextualized by a global environment where more temperate locales and

land endowments are associated with reduced hunger. The results of this study point to the need for more integrative theorization and testing within the global hunger literature, particularly in macro-comparative sociological studies. Implications of the current study in regards to hunger and alleviating this endemic global social problem, suggest that efforts to combat hunger would be remiss to negate the significance of gender inequality, the role of the military institution, and the global food system in a comprehensive manner. Each of these themes importantly contribute to the hunger problem, and as such are fertile grounds for addressing this most severe and abhorrent social ill.

A Macro-Comparative Analysis of Global Hunger across Developing Countries: The Integrative Impacts of Global and National Development, Gendered Inequalities, Conflict and Militarization, the Global Food System, and Environment

by
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DEDICATION

To Mama

BIOGRAPHY

I was born in the summer of 1975 in Greenville, NC to Pansy Sue Hardee and Wayland Jerome Hardee. I grew up in rural eastern North Carolina just outside of Ayden, NC as the daughter of dairy farmers caught in the midst of the great agricultural transition of the 1980's. I spent my formative years enjoying the southern countryside, playing outside in the fields behind my home with my dogs and horses. I attended a small community elementary school, Chicod, where I had nurturing mentors and teachers, many of whom I remember fondly today. I went to high school at D.H. Conley and graduated in 1993. Following high school, I enrolled at the local university, East Carolina University, intent on becoming a veterinarian. Although I could no longer inherit my mother and father's dairy farm, I strove to recreate the romanticized pastoral life of a farmer through my desires to become a large animal veterinarian.

Thankfully, the liberal arts education that I received during my undergraduate studies awoke in me a social consciousness that propelled me towards my currently chosen discipline, even if my path was somewhat circuitous. In 1996 I married John Thompson and transferred to North Carolina State University (NCSU) in Raleigh, NC. My two children, the absolute lights of my life, were born during my studies at NCSU, Nora Lace Thompson (1999) and Eva Sue Thompson (2007).

My substantive, academic interests focus primarily on Rural and Community Sociology and Global Social Change and Development. As a scholar, I am intensely concerned with the vast global inequalities that privilege a few at the expense of many. I first remember being exposed to the physical manifestation of these inequalities while perusing a

National Geographic issue on the Ethiopian famine of the 1980s that was in my father's office. At such a young age I could not understand how these atrocities were possible, and today I still find their existence hard to comprehend as famine sweeps across the Horn of Africa once again. It is my hope that through my scientific exploration the processes that perpetuate hunger can be further understood and hopefully someday dismantled.

ACKNOWLEDGMENTS

I once heard Dr. Ron Wimberley, a dear mentor of mine and an exemplary sociologist, begin an award acceptance speech with the words, “I feel like the proverbial turtle on a fence post. I didn’t get here by myself.” This colloquialism fits my situation to a “T.” I most certainly would not have been able to complete this project without the invaluable support, mentorship, and patient guidance of a number of people, many of whom are dedicated mentors and teachers at my current institution, North Carolina State University. I have also had the distinct privilege and pleasure to participate in an intellectual community of colleagues and friends who have provided seemingly endless amounts of collaboration, encouragement, and camaraderie. Also counted among my support networks are friends and family who helped me juggle so many of life’s glass balls while I conducted my research and completed my studies. I feel as if I should offer my apologies for the long acknowledgements that follow, except that these words are woefully inadequate to pay homage to the people that have helped me bring this project to its fruition.

First and foremost, I owe a huge debt of gratitude to Dr. Edward Kick for his enthusiastic encouragement and belief in me as a scholar and a scientist. I never fully understood the hours and commitment involved in the relationship between a doctoral student and their dissertation advisor until I was immersed in it. I am astounded by the amount of energy and dedication Dr. Kick has devoted to my dissertation research and professional development. He has taught me how to be a more sophisticated critical thinker, careful methodologist, and an overall better social scientist through his years of mentorship. I have had the privilege of publishing with him, completing my dissertation research under his guidance, and co-teaching with him. I have also benefitted immeasurably from bantering with him for numerous hours during office visits discussing, and often debating, the multitude of scientific questions that interest us. I simply could not have asked for a more engaged, caring, and dedicated advisor and chair than Dr. Kick. Thank you from the absolute bottom of my heart. I look forward to our continued work and collaborations.

Also important in the development of my present research are my other committee members: Dr. Sarah Bowen, Dr. Brett Clark, and Dr. Theodore Greenstein. Each of you has offered your time and thoughtful comments to my project. You have spent hours reading the dissertation and contributed to making it a generally better and more relevant product. You all have offered insightful critiques and challenged me to think more comprehensively about the debates I engage in my research and the present day applications of these debates. You have helped me to situate my own voice in the work that I am doing. Your reviews have also helped to ensure the integrity and quality of the research developed in this project. Thank you for your time and efforts.

Other faculty members at North Carolina State have been crucial to my professional development. In particular, Dr. Robert L. Moxley, my research assistantship advisor and early mentor, was in his own words “responsible for getting me in this mess.” Thank you for that. My life has been immeasurably changed because of it, and for the better. Another valued mentor and teacher, Dr. Ron Wimberley provided thoughtful, compassionate mentorship and guidance for me early in my studies, setting me more firmly on the trajectory to complete my present research. His untimely death has been a painful loss for me personally, and a loss to our field generally. And finally, my early graduate advisor and chair, Dr. Bob Patterson provided an invaluable guiding hand in helping find a direction to pursue my interests in global development and hunger early in my graduate studies. I am a better sociologist and a better person for having known and studied with each of these exemplary scholars. This project would not have unfolded in the same way without their input.

Beyond supportive faculty mentors, I have had the pleasure of joining a community of graduate student colleagues at North Carolina State where a culture of support and encouragement abounds. Central to this community for me is the cohort of 2003-2004. Dear friends—Dr. Olena Antonaccio, Brandy Farrar, Kendra Jason, Kylie Parrotta, Sarah Rusche, R.V. Rikard, Dr. Elizabeth Seale, and Heather Shay—I could not have done this without you. Our shared laughter, tears, frustrations, and triumphs have marked so many of the critical milestones that have led to the culmination of this project. You have been my village. Thank you. Also, I would like to thank my dear friends and colleagues Dr. Gregory Fulkerson and Dr. Karl Jicha. Our numerous conversations and research collaborations have been a source of great joy and intellectual fulfillment for me. Dr. Laura McKinney, your generosity and collaboration has helped me immeasurably as well dear friend. Thank you all. I am genuinely moved by my good fortune to have gotten to know each of you through my work over the past several years.

Last, but certainly not least, I owe a debt of gratitude to my family and friends. To start, it is difficult to capture the many ways that my mother and father have nurtured and supported me, so I will mention what is most salient to me at the present. Although my mother, Pansy Hardee, is no longer with me, her unwavering faith in my abilities and her fierce love and devotion to me while she was living undoubtedly gave me the courage and confidence to begin and complete this journey. I miss her immeasurably. My father, Wayland Hardee, helped to develop in me a healthy dose of critical thinking and skepticism which currently serves me well, even though I know there were many times the curiosity and boldness that it inspired proved to be a challenge. My sister, Kristy Whitford, has always been one of my biggest cheerleaders. Your optimism and enthusiasm have been contagious when I have needed it most. My dear and closest friend, Nancy Hulbert, without you and your girls I would have never made it through. You all have been so many things for me through this journey from proof-reader (sorry!), to baby sitter, to sounding board, to therapist. The glass balls that I juggle in my life would be scattered shards if not for my family and friends. Thank you all.

Finally, to my husband and children, you are at the heart of what I do. For my children, Nora and Eva, when I think of the kind of world I want you to inhabit there are so many things that I want to change. You motivate me to do research that matters. I want to make a difference because of you, for you. You are my treasures. My husband, John Thompson, you are *everything*. How else can I say it? Of all the people that I owe a debt of gratitude to, you are the greatest. My clumsy attempt to verbalize your contributions to my work, my life leaves me overwhelmed. You are my partner in every sense of the word, walking all journeys with me. How incredibly lucky am I? Thank you love.

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CHAPTER 1

INTRODUCTION AND PROJECT OVERVIEW

Nearly 1 billion people worldwide currently experience hunger (World Food Programme 2012). This population is roughly equal to the combined population of North America and Europe (World Food Programme 2012). This means that early one-seventh of humanity on a daily basis experiences the hunger pangs of not having enough to eat, the malnutritional deficiencies and associated ailments from not having good nutritious foods to eat, and the perpetual fear of not knowing from where and when their next meal will come. It is the world's number one health risk, killing more than AIDS, tuberculosis, and malaria combined (World Food Programme 2012).

Protracted hunger has a number of biological consequences for those who suffer including starvation, developmental stunting, and even death. The associated problems are particularly acute for children, and one-quarter of all children in developing countries are presently underweight (World Food Programme 2012). Children who are severely undernourished are more susceptible to disease and less likely to achieve their full physical and cognitive development potential. As Russel (2005: 180) states, "When an adult is hungry, it happens in the present tense. When a child starves there is another dimension. It also happens in the future. For a child is potential, in the act of becoming." As a social problem, hunger not only has dire consequences for societies presently, it also represents a threat and a barrier to the future development of nations.

Hunger provides a vivid and tangible illustration of the ramifications of socio-economic inequality, political oppression, and environmental crises (Davis 2002; Vernon

2007). Human bodies ravaged by starvation are imprinted on the minds of many world citizens through media representations of famine crises, such as those in Ethiopia during the 1970s and 1980s, and current famines sweeping across the Horn of Africa (Rice 2011). Horrific photographs of the Victorian era Bengal famine remain reminders of the perils of colonialism and severe hunger (Davis 2002; Vernon 2007). Also fueling the contemporary hunger debates are the current famines unfolding across many parts of sub-Saharan Africa, including the countries of Somalia, Ethiopia, and Kenya (Rice 2011). These nations are notably caught in political and ecological turmoil, experiencing political corruption, violent conflict, and record droughts. Factors which I will explain later in this dissertation are integral causes to global hunger.

Hunger is a part of the fabric of human history and remains an enduring and intractable global problem. It has been examined by classical theorists such as Malthus (1798), Marx (1867), and Kautsky (1899). More recently, Jean Zieglar (2002: 9) observed that, “In the world today, it is an affront to human dignity that many people starve to death, or live a life not worthy of the name, in conditions of squalor and unable to escape, with minds and bodies that are not whole.” It is clear that the condition of hunger is intimately tied to global inequality and processes that prohibit or promote the national development of nations (Buttel 2000). As such, social scientists need to further examine the uneven distributions across the global system that reproduces the conditions of squalor, hunger, and death to which Zeiglar (2002) refers. Sociologists need to empirically establish the connections between global social change, national dynamics, and human well-being. This includes a further examination of political and economic development and hunger. The global capitalist system, core agricultural exports, and global economic inequality have been previously identified as important causes of hunger (Cleaver 1977). What is needed, however, is a synthetic analysis that ties these and other important determinants of hunger together. Social research must model together the interdependent causes of hunger as they are drawn from the more ad hoc explanations that now characterize much of the literature. A careful integrative approach would provide a more holistic examination of the global hunger problem, better suited for public policy decision making. Such an approach also answers the call from many sociologists to integrate what they view as a currently fractured sociological discipline (Merton 1968; Giddens 1979; Ritzer 1981; Tittle 1995; Turner 1991).

When the literature on hunger is taken as a whole, it is clear that a variety of causal antecedents to hunger are specified, including non-sociological ones that relate to the natural environment. Yet, there remains a gap in the literature of how the antecedent processes to hunger unfold across the global system and in an integrated fashion. Put another way, current theorizations fail to adequately contextualize the interdependent national processes as they situated within the current global political and economic system (e.g. Jenkins and Scanlan 2001; Jenkins, Scanlan, and Peterson 2007; Scanlan 2004, 2003, 2001a, 2001b; Wimberley and Bello 1992). It is customary among most of the sociological research on development and hunger to frame the debate between modernization and world-systems/dependency theory as being in competition with one-another and as inherently incompatible. This, however, does not most adequately reflect the ontological conditions within which hunger unfolds. Rather than treating these two theoretical traditions as oppositional, the present research aims to demonstrate how they in fact inform one another, synthetically, through an examination of global hunger. As such, this study moves present theorizations on hunger forward by presenting a synthetic model of global hunger that also accounts for each of the themes presently found in the literature and discussed subsequently. This type of exercise is touted by theory constructionists as a fundamental way in which science progresses (Tittle 1995: 89), and as such marks a major contribution of the present study.

More specifically, the quantitative cross-national literature on hunger does not adequately address the theoretical implications of supra-national processes, especially as they are related in an integrated fashion to the global organization of food production and consumption, the nature and origins of violent conflict and militarization, and gender inequality structures across the modern world system.

Those studies that examine the impacts of a global food system and regime (Friedmann and McMichael 1989), have only more recently begun to develop the theoretical connection to food insecurity (Campbell 2009; McMichael 2009a, 2009b; Messer and Cohen 2006). The impacts of intense violent conflict domestic development and global hunger have not been examined previously in the same manner as in the present research. Also, gender inequality, a focus of many non-governmental agencies addressing the global hunger problem today (e.g. Von Grebmer, Nestorova, Quisumbing, Fertziger, Fritschel, Pandya-Lorch, Yohanes 2009), is still under-tested in the quantitative macro-comparative literature on development and hunger. However, these relationships generally have not been tested across a larger sample of cases that would aid generalizations to multiple settings across the world. This project aims to mend these shortcomings in the literature.

Global Hunger and the World Food Crises

In 2011 the world entered another global food crisis[1], marked by escalating food prices and rates of hunger, just three years after the global food crisis of 2008 (Brown 2011). The *State of Food Insecurity in the World* (2008) Food and Agriculture report says that world hunger has increased dramatically during recent years. Roughly 150 million people transitioned into extreme poverty and hunger as a result of the 2008 and 2011 global food crises (World Bank 2011). This accumulation is in addition to an existing nearly one billion hungry people world-wide. In January 2011 the Food and Agriculture Organization reported that its food price index for December 2010 hit an all-time high, indicating the potential severity of the 2011 crisis (Brown 2011). Given recent trends, global hunger is clearly one of the most important issues of the present day. As Josette Sheeran, director of the World Food Programme, stated in January 2011, "We're in an era where the world and nations ignore the food issue at their peril (Bjerga 2011)." The rise of urban hunger riots, in nations such as Egypt, Cameroon, Haiti, and Burkina Faso, are examples of the instabilities that emanate from food crises which could potentially spill over national boundaries and have global impacts (Food and Agriculture Organization 2008).

Although the escalation in hunger rates related to the recent global food crises appear to be episodic in nature, they are largely conditioned by more enduring rates of malnourishment and under-development across the developing regions of the world. It is no accident that the famine sweeping across the horn of Africa (Rice 2011)—a direct result of the most recent global food crisis—is transpiring in a part of the world's most peripheral and

[1] This refers to the precipitous increase in global food commodity prices, and associated food shortages, that contributed to escalating rates of hunger and food insecurity worldwide (Washington Post 2008).

impoverished zones. Thus, to understand episodic and severe hunger and starvation, we should begin by further analyzing the more endemic social problem of prolonged hunger and malnourishment. As we gain a deeper understanding of the global and national development processes that contribute to more prolonged hunger we begin to get a better handle on the larger foundation of the problem, including its acute manifestations in the form of famines. As an analogy, examining prolonged hunger (as measured by the Global Hunger Index in this study) enables researchers to know better the larger foundation of the proverbial ice-berg that supports its peak. Famines may represent the peak of the iceberg above the water conspicuously jutting high into the air, but the underlying problem is much more expansive and perhaps not as easily seen.

Like many other indicators of well-being, hunger is most prevalent throughout semi-peripheral and peripheral nations and is best contextualized in a stratified world-system (Moore 2008; Mihalache-O'Keefe and Li 2011). Sub-Saharan Africa, the world's most peripheral region, has the highest prevalence of hunger, based on percentage of population (Food and Agriculture Organization 2010) and the most alarming scores on the Global Hunger Index—an index that accounts for the prevalence of undernourishment, underweight children, and child mortality (International Food Policy and Research Institute 2010). Countries in this region experiencing the most dire of circumstances include the Democratic Republic of Congo, Chad, Burundi, and Eritrea where hunger rates have soared (International Food Policy and Research Institute 2010). Although the prevalence of hunger is highest in sub-Saharan Africa, Southeast Asia has the largest population of people suffering from hunger; additionally, many parts of South and Central America, as well as some nations in Eastern Europe, continue to face the threat of hunger.

The map shown in figure 1 depicts the distribution of hunger across the world using data gathered from the 2010 Global Hunger Index (Global Hunger Index), the measure employed in the current study (International Food Policy and Research Institute 2010). Note that the severity of hunger clusters throughout the developing world, and especially on the African sub-continent. Examining the geographical distribution of modern hunger reveals a spatial association with former colonial regions, thus by extension a spatial inequality between the global North and global South. It is also concentrated in tropical zones. The recent outbreak of severe hunger and starvation across the Horn of Africa occurred, not coincidentally, in one of the world's most socially, economically, and politically vulnerable locales throughout the global periphery. As such, the global positioning and related under-development of nations experiencing pronounced hunger is a central, organizing theme of the present study.

[Figure 1 about here]

Where hunger persists, its ravages are not equally borne by all members of society. In addition to the global, spatial distribution of hunger, it is also socially distributed in patterns within nations that mirror some of the socio-economic inequalities observed at the global level. Hunger is a critical concern for women and children in particular (International Food Policy and Research Institute 2009). Rural people in the global periphery are also among the most likely to suffer from poverty and hunger (International Fund for Agricultural Development 2011). Paradoxically, the majority of rural inhabitants and women depend on food and fiber production for their livelihood, yet many of them starve. Marginalized, female-headed households bear the brunt of food crises such as those that have recently unfolded (International Fund for Agricultural Development 2011). Women are critically vulnerable to hunger because they often lack adequate access to income, education, and land all of which are important in ensuring food security (von Grebmer et al. 2009; von Braun 2008). Importantly, when women are denied adequate nutrition and resources children are more likely to also suffer as well (Scanlan 2004). Given the demographics and geography of hunger (de Castro 1952) what then does the current literature contribute to our understanding of this grave global social problem?

Prominent Themes in Research on Global Hunger

Macro-comparative studies analyzing global hunger primarily consider the causal role of global development and dependency processes (e.g. Kick, McKinney and Thompson 2011; Jenkins and Scanlan 2001; Wimberley and Bello 1992). These comprise the foundation for the unequal distribution of food across the global system (Cleaver 1977). As such, indicators of global development constitute the most exogenous factors affecting hunger across nations. These effects are theorized as both direct and indirect. There are also a number of theoretically specified mediating factors identified in the literature that moderate the impact of global development on national hunger rates. These factors could be categorized into four primary themes and include: (1) gender inequality in hunger (International Food Policy and Research Institute 2009; Scanlan 2004), (2) conflict and militarization (Jenkins et al. 2007; Kick et al. 2011), (3) the global food regime (Pechlaner and Otero 2010; Weis 2007), and (4) ecological context (Diamond 1997, 2005; Ponting 2007). These are treated serially in the ensuing passages.

The first theme identified and subsequently analyzed in the present research is the role of gender inequality. The gendered disparity in hunger discussed earlier points to deeper, more systemic socio-cultural, economic, and political processes that cause hunger, in part, by perpetuating gender inequality and its resulting impacts on development and hunger (Dunaway 2000; Dunaway and Macabuac 2007; Shiva 2001, 1989). The International Food Policy Research Institute's *2010 Global Hunger Index* report (International Food Policy and Research Institute 2010: 29) concludes that gender inequality and hunger go "hand in hand." The World Food Programme (2011) reports that women and girls are more likely to suffer chronic hunger, comprising roughly 60% of the global undernourished. Women are also more likely to die from hunger during times of disaster, such as the current global food crisis (Neumayer and Plumper 2007). This is true despite the fact that women cultivate and/or harvest an estimated 60-80 percent of the food in most developing countries (Food and Agriculture Organization 2011). These higher rates of undernourishment and malnourishment adversely affect the entire population of nations, as women who experience nutritional deficiencies often have birth complications and are more likely to have children suffering from nutritional deficiencies (World Food Programme 2011). Specifically, across all nations, malnourished mothers are much more likely to give birth to underweight babies who are, in turn, 20 percent more likely to die before the age of five (World Food Programme 2011). There is ample evidence that improving the status of women has broader societal impacts that can promote development and the sustainability of societies (e.g. Food and Agriculture Organization 2011; Scanlan 2004, 2010). Recent sociological research demonstrates the importance of accounting for gender in development studies, especially those concerning hunger and child mortality (Scanlan 2004; 2010). Based on these findings, gender inequality one of the main themes examined in this dissertation.

Conflict and militarization, the second identified theme, have had an ongoing presence in the macro-comparative food security literature (Jenkins and Scanlan 2001, Jenkins et al. 2007; Kick et al. 2011b; Scanlan 2001; Scanlan and Jenkins 2001). Recent studies suggest that a new form of militarization is emerging, which relies on capital intensive technologies that have fewer spin-off effects for broader society. Consequently, there is a changing role of the military in shaping societal outcomes, including hunger (Kentor and Kick 2008; Kick et al. 2011). The tensions within the literature on military and food security are reflected in what many depict as competing positions in a “guns or butter” vs. “guns and butter” debate. Some studies contend military spending is an avenue to promote societal development—guns and butter—(e. g. Looney 1990a, 1990b), especially when these expenditures are directed towards personnel as opposed to high-technology weaponry. Others counter that military spending presents transaction costs to resources that could have otherwise been allocated to the promotion of societal well being, including efforts to reduce hunger (e.g. Albrecht et al. 1977). Kick et al. (2011) extensively cover this debate within the literature, while also importantly identifying the impact of conflict on societal development directly, and hunger indirectly. Other researchers identify conflict as an important cause of hunger in a series of case-study and qualitative analyses (e.g. Bello and Baviera 2009; Jenkins et al. 2007). As such, the impacts of militarization and conflict are examined in this dissertation as an important theme. In addition to militarization and conflict, the global food system is another important theme.

The emergence of a global food system and/or regime (Freidmann and McMichael 1989; Weis 2007), including its impact on the contemporary global food crises and hunger, has recently gained attention in the media (Brown 2011; World Bank 2011). Some have described this global system of production and trade in agriculture and food as creating an environment where hunger now persists despite adequate surpluses in global food production (Araghi 2000; Weis 2007; Ziegler 2002). In particular, a study of the 2008 food crises found that the global integration of food production and trade contributed to nations' vulnerability to food prices shocks and undermined their food security (Heady and Fan 2010). Dependency on food imports has been identified as one of the primary culprits in contemporary global food crises (Heady and Fan 2010; World Bank 2010). As such, the third theme examined in the present study includes the impact of food import dependency on hunger, drawing especially on the global food regime literature (e.g. Pechlaner and Otero 2010; McMichael 2009). This literature suggests that the increasing rates of globalization in agricultural trade resulting from neoliberal development policies integrate the production and distribution of food globally but, oftentimes, at the expense of food security among developing nations (Pechlaner and Otero 2010). A central component of this integration includes the fostered dependency on food imports among developing nations as part of development strategies among more powerful nations looking to capitalize on industrialized agricultural outputs. Thus, when food price shocks occur the poorest and most food import dependent nations suffer the brunt of ensuing crises and experience the highest rates of hunger (Heady and Fan 2010). In addition to a global food regime, ecological context is the fourth and final theme treated in this dissertation.

Related and recent macro-comparative research has begun to take into account the impact of ecological context, including biogeography[2] and climate, on social outcomes and processes (e.g. Jorgenson and Clark 2010; McKinney et al. 2010; York, Rosa, and Deitz 2003), including hunger (Davis 2002, Kick et al. 2011). This is, in part, an answer to the call for a shift to a new ecological paradigm by environmental sociologists who seek to re-integrate the natural environment into the sociological research lexicon (Dunlap and Catton 1979). As well, prior theorizing has expressly linked social-ecological environmental antecedents and consequences to social development and human well-being (Duncan 1961; Hawley 1950). More recently, Diamond (1997; 2005) innovatively identifies the impacts that ecological conditions can have on development trajectories, showing that the horizontal physical orientation and temperate latitude of Northern hemisphere nations contributed to their long-term and contemporary advantages, both globally and nationally in a variety of ways ranging from diet to conquest. These advantages accumulate over time, resulting in today's highly unequal, spatially-associated state of development across nations. Consequentially, lower levels of contemporary development and social sustainability persist in much of the global South and are clustered in tropical zones. Ecological context also impacts growing conditions and food production which have a direct impact on hunger. Agricultural research examining the effects of climate and environmental change on food production indicates these are important factors that affect food availability, a component of

[2] Biogeography is the study of living organisms and ecologies throughout space and time (Dansereau 1957).

food insecurity (Alteri 2009, 1996; Lal 2004; Gregory, Ingram, Brklacich 2005; Uphoff 2002). Also, given that much of the rural periphery relies on agricultural production for both sustenance and income, this is a crucial aspect of understanding food insecurity because environmental degradation often destroys arable land and undermines productive capacity (Burns, Kick and Davis 2003; Jorgenson and Kuykendall 2008; Longo and York 2008). In addition to these connections, some sociologists have indicated militarization and conflict across the world system leads to environmental degradation, potentially eroding the ecological foundation needed for food production, referred to as the treadmill of destruction (Hooks and Smith 2004, 2005; Jorgenson and Clark 2009).

In accordance with the works of earlier theorists (Duncan 1961; Hawley 1950) and recent macro-comparative sociologists (e.g. Jorgenson and Clark 2009; Kick et al. 2011b; McKinney et al. 2010), I also examine the impacts of ecological context across all three thematic models—(1) gender inequality, (2) conflict and militarization, (3) the global food system. Thus, while this is identified as a fourth and important theme in the global development literature and extended to hunger here, it is not analyzed separately but across all models in accordance with recent research and the call for a new ecological paradigm (Dunlap and Catton 1979).

Contributions and Outline of the Present Study

In the present study I analyze a recent under-examined indicator of hunger, the Global Hunger Index (International Food Policy and Research Institute 2009). This measure is multi-dimensional and captures the complexity of hunger across developing countries. It accounts for both the prevalence of undernourishment as well as the associated child mortalities. As such, it is able to address the spread of hunger as well as the severity of hunger for those nations studied.

This study also makes unique contributions to the development and hunger literatures by quantitatively examining a contemporary global social problem—hunger—as it is embedded within structures of gender inequality, the global food system, contemporary militarization and conflict processes, and biogeographical environment. Prior studies on hunger have not analyzed the themes identified here in a systematic or synthetic way, nor have they employed the analytic technique used here, which, as discussed later, is superior relative to others for this type of inquiry.

Substantively, this research makes a number of contributions. The present analysis extends central debates in development sociology by testing the tenets of modernization and dependency/world-system approaches synthetically (McKinney et al. 2010; Kick et al. 2011). As such, a number of hypothesized relationships between global positions of power and dependency are able to emerge as they related to national development, and ultimately hunger. Consistent with the new ecological paradigm within environmental sociology, I examine the impact of ecological context in these analyses, thus contributing to the environmental sociology literature. My analysis of the impact of gender inequality on hunger improves upon prior efforts that analyze the impact of contraceptive prevalence (Jenkins et al. 2007; Scanlan 2004) with theoretically justified measures, including access to power and education for women employed previously (Noorgard and York 2005). Also, while many studies acknowledge that global and national development processes condition hunger outcomes, quantitative, macro-comparative research on the sociology of hunger has not fully connected these processes to the global organization of food production and trade. My introduction of food import dependency as a determinant of hunger, a posited leading cause in the 2008 food crisis (Heady and Fan 2010), addresses this gap. The current research also contributes to the literature on conflict, militarization, and development by introducing a theoretically nuanced measure of conflict, battle deaths, that captures the intensity of violence rather than the duration alone, as is typically the case in studies such as the present one (see Kick et al. 2011; Jenkins et al. 2007). I also identify the importation of arms and military participation as driving forces behind the militarization of developing countries, both which deleteriously impact hunger.

I extend the macro-comparative literature on hunger by testing an integrated theorization of the impacts of societal development, including world-system position and national modernization. Thus, each theme presented subsequently is most broadly situated within the sociology of development literature. Individually, the analyses examining the impacts of gender inequality, the global food system, and conflict and militarization are presented as deductive models derived from their relevant literatures. Then a final, trimmed model that is optimally robust is presented that integrates each of these themes into one comprehensive model.

Following, I first present the literature review for each identified theme in the global hunger and food security literatures—(1) gender inequality, (2) conflict and militarization, and (3) global food system, and (4) ecological context —in Chapter 2. Chapter 3 describes the data and analytical methods utilized in the present study. In Chapter 4, I present a discussion of results, and finally in Chapter 5 I draw pertinent conclusions highlighting contributions to sociology generally and hunger research specifically. I now turn to the literature review on global hunger, beginning most broadly with the central hunger and global development debates and then proceeding to a discussion of the identified themes. After the literature review, this dissertation presents the methods and data employed in the current study followed by analyzes and a discussion and conclusions chapter.

CHAPTER 2

LITERATURE REVIEW

This study is situated within the broader literature on development and hunger while identifying four primary themes within the hunger literature in particular. Debates central to this literature include the production versus distribution debate on the primary causes of global hunger. Also important, is the long-standing debate on the causes and consequences of global development and national modernization. Both of these debates can be seen in the global hunger literature that will be subsequently reviewed. As such, I begin by reviewing each of them. Following this, the identified themes within the hunger literature (gender, war and conflict, globalized food system, and bio-geographical environment) are examined.

The Production vs. Distribution Debate

It is important to address the historical context within which hunger has been debated and policies addressing it have emerged, including especially the Green Revolution. After World War II, the Rockefeller and Ford Foundations developed new plant breeding technologies that would become the foundation of the Green Revolution, which extended from the 1940s until the late 1970s (Cleaver 1977; Friedmann 1982; McMichael 2004). These new developments consisted of high yielding seed varieties that when coupled with other cultivation technologies including fertilizers, pesticides, irrigation, and mechanized harvesting yielded considerable increases in plant productivity (Conway 1997). Production gains from these cultivation technologies and practices substantially increased world production levels of grains and cereals (Ehrlich, Ann and Daily 1993; Smil 2000), and primarily operated through subsidized production in United States and other developed nations where industrialized agricultural practices were wide-spread (Freidman and McMichael 1989).

My review of the development of the Green Revolution is largely informed by critical appraisals (Brown 2005; Pilcher 2006). However, there were a number of positive outcomes, including primarily the substantial increase in world food production on a scale that enabled vast numbers of people to escape persistent hunger (Conway 1997; Pilcher 2006). In fact, the leading plant biologist most often attributed with discovering the benefits of hybridized seeds, Norma Borlaug was the recipient of a Nobel Peace Prize (Pilcher 2006). Unfortunately, it is often overlooked that his discoveries were made possible by prior generations of peasant farmers and their cultivation practices (Pilcher 2006). Borlaug's work represents the productionist argument that global hunger is a result of declining or inadequate food production. However, one of the most influential studies on hunger includes Sen's (1981) analysis of the Bengali famine. In his study, he makes a strong case, albeit from a methodological individualist approach of microeconomics (Tauger 2003), that famine and hunger emanate from inadequate access too food, not too little production.

An important component of Green Revolution and associated efforts included domestic modernization through agricultural industrialization in peripheral zones (McMichael 2004; Pilcher 2006). The Green Revolution also entailed other objectives more directly aimed at developing countries. These objectives included aims to raise farmer incomes, employ rural laborers, and feed the world's growing population (Alteri 1996; de Janvry 2010; Erlich et al. 1993; Uphoff 2002). Associated development strategies encompassed the implementation of centers for agricultural development, such as the Consultative Group on International Agricultural Research, promoted an anti-poverty and anti-hunger agenda (Consultative Group on International Agricultural Research 2012).

Much of the Green Revolution efforts, not by coincidence, were fueled by the Cold War and US foreign policy strategy to stave-off a “red revolution”[3] by creating a preemptive “Green Revolution” (Athanasiou 1998; Das 2002, 1998; Ehrlich and Holden 1971; Foster 1998a; Freebairn 1995; Liodakis 1997). The Green Revolution provided the ideal complement to U.S. cold-war foreign policy directed at the U.S.S.R. It entailed national economic and agricultural policies that sought to promote domestic national development based on agricultural industrialization and an organized production of a surplus food aid regime (Freidmann 1982; McMichael 2009). Essentially, surplus food produced in the U.S. was exported to developing countries as part of the PL 480 program, and was used as leverage to avert socialist uprisings (Winders 2004). This significantly transformed the production and trade of food on a global level. Friedmann (1982) argues that the international food regime in the post WWII era was responsible for the emergence of the global organization of agricultural production, trade, and consumption in today’s world capitalist system.[4] Based on the foundation of supporting surplus agricultural production in the center (in particular, the U.S.), global grain trade in the form of feedstuffs to Europe and food aid to developing countries created the conditions for the emergence of a globalized agricultural and food system or global food regime (Bonnano and Constance 2006;

[3] Here, my reference to “red revolution” highlights the efforts by the U.S. to politically gain leverage in developing countries through agricultural and food aid. The fear was that through assisting these countries, and by fueling peasant uprisings, the USSR would facilitate the emergence of communist (red) regimes in developing countries (Hazell 2009). Thus, U.S. food aid was a counter-strategy.

[4] I address the global food regime in more detail later in the dissertation.

Freidmann 1982; Freidmann and McMichael 1989; Heffernan 1998; Murphy 2009; Weis 2007).

Under the global food regime, newly agricultural countries have been increasingly competing in global food markets, Brazil and the growth in soybean production being a prime example (Llambi 1993). Friedland (2004) outlines the emergence of a new globalization in agriculture as the production of fresh produce for the permanently in-season market in the global North.[5] Thus, an important factor contributing to the transformation of global agrarian structures is export production and concentration in high value commodities, such as fruits and vegetables. For globalization scholars, the global food regime marks the transition from a nationally-based Green Revolution that focuses on grains and basic food stuffs, to internationally-based global restructuring of agriculture that focuses on production for trade, thereby altering local agricultural production practices and outcomes (Bowen and Gerritsen 2007). This has a direct impact on hunger as will be later discussed.

Many have argued that the dependency on chemicals and irrigation technologies and advancements in agriculture have created ecological problems—ranging from water pollution to soil salinization—that potentially may offset production gains (Alteri 1996, 2000; Jorgensen and Kuykendall 2008). However, global grain production increased threefold in the latter part of the 20th century, while fertilizer and pesticide use increased more than tenfold during the same period as a result of the spread of high-yield seed varieties and their associated production technologies (Ehrlich et al. 1993; Jorgenson and Kuykendall 2008). The effects of these technological and industrial changes has been well documented in

[5] Food exports were included in preliminary analyses but yielded unfavorable results, either poor model fit or insignificant impacts.

studies on US agriculture, broadly describing a transition in agriculture from small farm, labor intensive production to large farm, machine and chemical intensive production (for a review see Lobao and Meyer 2001). Research on these transitions provides conclusive evidence that the Green Revolution marks the most capital and chemical intensive structure of agricultural production in the history of humankind (Mazoyer and Roudart 2007). Although the genetic or bio-revolution has begun to alter agricultural production structures, it has not eliminated the reliance on capital-intensive and ecologically destructive inputs (Buttel, Kenny, and Kloppenberg 1985; Newell 2009). While agroecological production developments, such as urban and small scale agricultural strategies implemented in Cuba (Koont 2009) or agroforestry in Africa (Sanchez 1995), provide some promise for more sustainable production practices (Alteri 1996, 2000; Uphoff 2003; Lal et al. 2004), these have yet to be adopted widely. In fact, many conclude that technological development alone will not be sufficient if world poverty and hunger is to be reduced by half by 2015 (Uphoff 2002).

On the one hand, proponents of Western-led development, or modernization theorists, suggest that global agricultural production and trade improves human well-being and sustainability (World Bank 2008). On the other hand critics of the global capitalist system, namely political economists, posit that global agricultural production and trade is predicated on a system that exploits peripheral areas for the benefit of the core (e.g. Burns et al. 2003; Freidmann 1982; McMichael 2004). As a result of contemporary hunger and poverty crises throughout the globe, especially in peripheral economies dominated by rural industries, the development of agriculture has again become an increasingly important area of research. However, contemporary analyses of agricultural development as it relates to hunger needs to be situated within the broader historical context of national and global development agendas, as well as other determinants of hunger identified in the literature. The evolution of these development approaches draws upon classical theories of social change and their explanations of the emergence, spread, and contradictions within the global capitalist system. Let me now turn to these theories of global social change as they relate to hunger and the present research. Table 1 presents these debates using Buttel's (2000) framework, based on the assumptions about the role of production and distribution in agriculture and food.

[Table 1 about here]

Development Debates and Macro-comparative Examinations of Hunger

Theoretical explanations for variation in modernization in development among nations have been widely discussed within the sociological literature (e.g. Brady, Kaya, and Beckfield 2007; Chase-Dunn 1977, 1989, 2006; Chirot and Hall 1982; Dixon and Boswell 1996a and 1996b; Firebaugh 1996; Snyder and Kick 1979; Tsai 2007; Wimberley and Bello 1992). Prominent theories of global development, modernization and dependency/world-systems theories, also provide the theoretical framework for the vast majority of macro-comparative studies on hunger in the literature (Jenkins and Scanlan 2001; Jenkins et al. 2007; Kicket al. 2011; Michalache-O'Keefe and Li 2010; Scanlan 2001, 2002, 2004; Wimberley and Bello 1992).

Typically world systems/dependency theory and modernization theory have been pitted against one another as contending explanations. This debate has especially centered on the effects of foreign direct investment (FDI), economic growth, and human well being. For example, specifically related to food insecurity, Wimberley and Bello (1992) found that FDI deleteriously affects food supply, while Jenkins and Scanlan (2001) discovered a net positive effect on food supply in the absence of domestic investment. The famous Firebaugh and Dixon/Boswell debate in *American Journal of Sociology* during the 1990's also emphasized competing views of FDI in relation to economic growth and human well being. Firebaugh (1996) asserted that FDI was better than no investment at all in developing countries, and he argued that viewing it as only a pernicious effect was narrow sighted. Dixon and Boswell (1996), in contrast, emphasized the relative impact of FDI is structured so that disadvantaged countries lose from global development patterns because economic benefits are disproportionately captured by the core. While surely it is important to consider why these findings are contradictory, it is also important to keep our analysis firmly grounded theoretically.

The two major theoretical paradigms, from which research on the development and integration of global capitalism originates, are reviewed in the following sections outlining the contours, contributions, and critiques of sociological literatures of social change and development, primarily centering on modernization and political economic theories. After these reviews, I expand upon how these two are related to my current research on global hunger, and ultimately to each other. Finally, I examine mediating processes such as gender inequality, conflict and militarization, the global food regime, and the biogeographical environment as they are each related to hunger.

Modernization Theories of Social and Economic Development

Modernization theory explains development based on the progression of human values, culture, technology, and the Westernization of developing societies, which are processes predominantly *internal* to nation-states. Theorists in this tradition observe that developed economies are more likely to have modern values, work ethics, and superior technologies (Inkles and Smith 1974; Rostow 1960). Modernization theorists have considered Western nations as the blue-prints for how nations should industrialize and develop modern economies. This is because from the modernization perspective Western societies had "achieved" levels of development and industrialization that were valued as superior compared to non-Western societies (Rostow 1960).[6] Modernization theory's origins can be traced back to the classical writings of Comte (1842), Durkheim (1893), Smith (1776), Ricardo (1817) and Spencer (1887) among others, whose work focused on the evolutionary characteristics of social change, often viewed as linear and as progressing from less to more advanced.

Early formulations of modernization theory have much of their roots in the structural functionalist approach which grew out of the liberal economics of Ricardo (1817) and classical theories of social development based on biological analogies (Comte 1824; Spencer 1887), as well as conceptions of rationalization (Weber 1904). In The *Division of Labor in Society*, Durkheim (1893) observed, while crediting Smith (1776), a transition from mechanical to organic solidarity that emerges from increasing population growth and a more highly complex division of labor. Later, Parsons (1964) picked up Spencer's and

[4] This judgment was reached despite the level of development of various civilizations throughout the globe that were encountered during colonial periods of expansion (Amin et al. 1982, Wallerstein 1974).

Durkheim's evolutionary thinking and proposed that societies followed through a process of increasing differentiation, interdependence, and adaptive capacity. Similarly, Rostow (1955) proposed stages of economic growth through which societies would progress and develop. More recently Nolan and Lenski (1996) outlined a generalized theory of social change from an evolutionary perspective that identifies several stages of development that increase in level of complexity based on the advancement of technology and economic production.

Structural functionalism is most notably identified as the theoretical root to more contemporary modernization theories (Peet and Hartwick 2006; So 1990). This theorization, most notably proposed by Talcott Parsons (1964), combines the work of classical thinkers such as Comte (1824), Durkheim (1893), and Spencer (1882), who employed an organismic analogy to societal change, with the work of Weber (1904), whose approach to social change focuses on bureaucracy, rationality, and culture as the basis for human agency. Modernization theory posits that the differences between societies in degree of modernity—as exemplified by socially and economically developed countries in the West or North—is explainable by a combination of natural and cultural factors (e.g. Rostow 1960; Smelser 1962). Classical modernization studies proposed that social change is linear, progressing from traditional to modern, homogenizing, irreversible, and ideally following Western societies (Comte 1824; Durkheim 1893; Parsons 1964; Spencer 1882). Early modernization studies—such as those by Inkeles and Smith (1964), who studied the psychological and cultural values of modern men, and Lipset (1963), who studied political democratization—were heavily criticized for assuming unidirectional development processes and characterizing traditional values as "backwards."

In response, more recent modernization studies have sought to account for these critiques, as in the case of Huntington's (1984) study of democratic development in Third World countries; yet they still do not adequately account for the effects of global economic and political structures. Other examples of modernization studies examining the development of societies include Mol's and Spaargaren's (2000) research on ecological modernization, Inglehart's and Wezel's (2005) study of world values, and studies on the developmental potential of global integration by World Bank scholar's Goldin and Reinert (2006). Additionally, Crenshaw, Ameen and Christensen (1997) examine the role of population growth and dependency on economic development, finding that baby boomers contribute to increased development as a labor resource. Recent globalization studies, following a neoliberal theorization that posits unfettered global economic integration, often via free-trade, promotes societal development. These studies have found positive impacts of FDI on economic development, namely income (Bollen and Appold 1993; Firebaugh 1996). Although these studies were largely framed as analyzing the impact of globalization on societies, the organizing theme and causal mechanisms identified have clear connections to earlier renditions of modernization theory.

Modernization theories of development have varied based on their conceptualization of the relationship between the economy and the state. Recent neoliberal versions of modernization development theory have emphasized a removed role of the state and the rein of the free market. This economic policy has been coined the Washington Consensus (Gore 2000) and began with the fall of the Bretton-Woods agreement under the Nixon administration (Frieden and Lake 2000). It continued to gain momentum during the Regan-

Thatcher era as an economic development principle, and strongly influenced the development and lending policies of multi-lateral agencies such as the World Bank and International Monetary Fund (Chase-Dunn 2006). By capitalizing on a nation's comparative advantage, a proposition drawn directly from the pages of Adam Smith's *The Wealth of Nations* (1776: 22), neoliberal theories of development have sought to promote development of the Third World through unfettered global trade and integration and the ultimate removal of the state from the economic infrastructure and regulatory framework (Appelbaum and Robinson 2005; Chase-Dunn 2006; Krugman 2009; Turner and Babones 2006). More recently, as a result of the failure of neoclassical theories of economics and the global financial crisis of 2008-2009 (Krugman 2009), modernization strategies of development have returned to Keynesian policies, as evidenced by President Obama's fiscal stimulus plan. These may mark the re-emergence of state-centered development (Krugman 2009), and these new Keynesian policies may very well mark the return to structural-functionalist models of development as old-ideas continue to be recycled. Furthermore, with Greece facing a national debt default (Papadimas 2011), the way in which loans will be restructured in the face of a revival of the Keynesian approach will surely be an interesting turn of events if not a struggle between political powers.

The modernization approach is also reflected in the agricultural development literature. Modernization of agriculture as a strategy for national development was a mainstay for multilateral agencies during the Green Revolution era, and has recently had a resurgence on the national development stage marked by the World Bank's development publication, *World Development Report 2007*, as addressed earlier (World Bank 2008). Much like broader theories of development, agricultural development theories have mirrored the transition from the development to globalization project (McMichael 2004) within the modernization theoretical camp. This includes the transition from a primary focus on agricultural technological development, such as in the early development of the Green Revolution technologies, to agricultural free-trade production strategies and, more recently, Bio-Revolution genetic technologies (Buttel et al. 1985; Perlancher and Otero 2010). The basic premise of this project is that by adopting Western technologies, and by industrializing production in agriculture, national economies could develop. This has now been extended to include export oriented production strategies for development (Frieden and Lake 2000).

Early agricultural development approaches, steeped in modernization theory, proposed that increasing food availability would be achieved through technological innovation and adoption of Green Revolution agricultural technologies, and, indeed, Green Revolution technologies increased productivity. This increased agricultural production also potentially increases demand for food and overall national economic growth as rural incomes and infrastructures modernized (Mellor 1966; Lipton 1977). Therefore, countries that adopted the new high yield seed varieties (grains such as rice, corn, and wheat) and the technological packages required to produce these Green Revolution varieties were predicted to develop much the same way that countries of the West had developed—through a transition from agrarian, small-scale production to industrial, large-scale production. More recent applications of this theoretical approach to agricultural production and trade assert that agricultural production for global markets is the pathway to economic prosperity (World Bank 2007). These approaches advocate export-oriented production of food, fiber, and biofuel products over subsistence or domestic oriented production. Neoliberal agricultural development policies also set the foundation for food import dependence, as food grown for domestic consumption declines. These types of policies set the foundation for structures of food and fiber production that do not necessarily ensure the nutritional health of those who are the direct producers.

Modernization theorists (Durkheim 1893; Rostow 1955; Inkeles and Smith 1974) view hunger in the non-core resulting from domestic dynamics where inadequate economic, technological, and infrastructure development leads to hunger (Buttel 2000; Scanlan 2003; Firebaugh 1996; World Bank 2007). In the specific context of food production and distribution, agriculture and rural infrastructure are both influenced by domestic modernization; meaning the connections between national modernization and rural and agricultural development are important considerations in studies of hunger (Fan and Rosengrant 2008; Timmer 2005).

Solutions to hunger utilizing a modernization theoretical approach propose that, in addition to technological development and industrial growth, global economic integration of peripheral nations into trade networks capitalizes on all nations' "comparative advantage" (Smith 1776). It is noteworthy that while Ricardo (1817) may have postulated an equity and equality resulting from these transactions, Adam Smith does not. For Smith (1776), each nation maximized its potential trading value through open markets; the exchanges that attend this need not result in economic parity for the partied involved. For peripheral nations this advantage is often purported to be primary sector production activities such as agriculture

(Fan and Rosengrant 2008; World Bank 2007), since natural capital abounds outside the core, and the core is willing to pay, often dearly, for it.

The comparative advantage tenet of the modernization perspective is employed to promote neoliberal trade policies, under the guise of what McMichael terms the "Globalization Project" (2004), whereby peripheral nations are encouraged, indeed required via austerity and structural adjustment policies (Stiglitz 2002), to integrate into global free-trade structures. In response, many developing countries have lowered agricultural trade barriers through global and regional trade agreements increasing economic and trade globalization precipitously (McMichael 2004). As a result of this de-regulation, a number of peripheral countries have become net food importers despite having vast natural endowments for domestic food production (Pechlaner and Otero 2010). These processes are deemed as part of the solution to global hunger according to modernizationist arguments, which contend food security is best met through agricultural production for global trade rather than local consumption because this is what best promotes domestic economic growth (McMicheal 2005:6; Pechlaner and Otero 2010; World Bank 2007).

Comparative examinations of hunger have consistently found that modernization processes, as indicated by per capita income levels (among others) and percent urbanization, improve food availability and reduce child hunger (Brady, Kaya and Beckfield 2007; Jenkins et al 2007; Jenkins and Scanlan 2001; Scanlan 2001a, 2001b, 2004; Scanlan and Jenkins 2001). Firebaugh (1996) find that economic integration, via foreign capital penetration, leads to higher industrial productivity and household incomes. As a result, he conclude that higher wages, per capita incomes, increases purchasing power and encourages caloric consumption

(Firebaugh 1996). Similarly, Jenkins and Scanlan (2001) find that economic globalization, via foreign investment and modernization, improves both caloric availability and child hunger. Precipitous increases in domestic incomes, coupled with dramatic increases in agricultural productivity levels, indeed enabled much of humanity to escape the threat of starvation, especially in Europe, Asia and parts of Latin America (Fan and Rosengart 2008; Fogel 2004; Johnson 1997). Thus, national modernization has a ameliorative impact on hunger. However, the relationship between modernization and hunger must be contextualized within its global context. Political economic theories directly address this issue.

Understanding the relationship between modernization and dependency/world-systems theorizations of development, as well as resulting explanations of hunger, is an important task for sociological research on hunger. On the one hand historical analyses have revealed the importance of technological modernization in increasing food supply (Conway 1997; Ehrlich 1993; Pilcher 2006; Scanlan 2001), economic modernization in increasing household incomes to purchase food (Devereux 2007; International Food Policy and Research Institute 2011; Sen 1981; 1999), and political modernization (democratization) in increasing access to food (Jenkins and Scanlan 2001; Jenkins et al 2007; Sen 1981, 2001; Sen and Drez 1989). This suggests that there are important and consistent positive effects of modernization on hunger.

On the other hand, these developments were not without notable costs, such as environmental degradation that likely undermine food production (Jorgenson and Kuykendall 2008; Mancus 2007; Longo and York 2008; Smil 2001), socioeconomic restructuring in rural areas that exacerbates vulnerability (Araghi 1995, 2000; Bryceson 2009; 2000; Moyo and Yeros 2007), increasing conflict and militarization in semi-peripheral and peripheral areas (Kick 1980, 1983, 1987), and the growing gap of global inequalities as global capitalism expands (Milanovic 20007). The aforementioned developments take place within the world capitalist system where core countries, and the corporations based in these countries, organize global trade and production to maximize their own economic gain. As such, it is critical to examine the relationship between modernization and hunger within its global context. This is best done through a review of the dependency/world-systems literature that can be subsequently employed to inform an integrative and synthetic theorization and empirical analysis.

Dependency and World-Systems Theories of Social and Economic Development

Political economy theorists counter many of the claims and research findings of modernization scholars. They originate from a conflict perspective on social change and development most heavily influenced by classical scholars such as Marx (1867), Kautsky (1899), and Lenin (1917). Dependency (Amin 1976; Frank 1966) and world-systems (Chase-Dunn 1989; Wallerstein 1974) theories explain inequitable power relationships among nations resulting from unjust trading relations and access to the global economy. Dependency scholars theorize the world as consisting of core and peripheral zones (Amin 1976; Cardoso and Faletto 1979; Frank 1966). Building on this, Wallerstein (1974) amended these zones by suggesting a three tiered world system of core, semi-peripheral, and peripheral countries. Overall, these theories argue that the core extracts surplus value, from cheap labor and raw materials from the periphery, thus enabling economic and social development for core countries, while the non-core experiences economic and social underdevelopment (Amin 1976; Frank 1967). As a result of unfair trading relationships with the core, peripheral nation-states are less able to promote development from within through domestic savings and taxation (Chase-Dunn 1989). In turn, limited domestic funds hinder the amount of investment that can go into social welfare, including investments to promote development, resulting in severe social problems, such as hunger and poverty (Baran 1957; Evans 1979; Chase-Dunn 1989).

Dependency and world-systems studies have most explicitly linked development to global economic and political structures. Originating in Latin America and in the Economic Commission for Latin America (ECLA) dependency theorists (Cardoso and Falleto 1979; Dos Santos 1971; Frank 1969) posited that the economic, political, social, and cultural institutions of underdeveloped countries were the result of capitalist exploitation rather than a lack of modernizing values and technologies. Early research focused on the dualism of traditional and modern sectors of national economies, asserting that capitalism undermined social systems even as it developed globally (Frank 1969).

World-systems theorists indicated that the dynamics of a global political and economic system—resulting in an international division of labor tiered as the core, semi-periphery, and periphery—began centuries prior to the modern era at the birth of colonialism and mercantilism (Galtung 1979; Wallerstein 1974). In fact, Wallerstein (1974) traces the origins of the capitalist world system to agricultural production and trade during the 16^{th}, while other world-systems theorists have traced it to earlier eras (Chase-Dunn and Hall 1997;

Abu-Lughod 1989). World-systems research has found that trade and investment integration generally has negative effects for economic development in semi-peripheral and peripheral countries, especially when compared to domestic investment (e.g. Bergesen and Bata 2002; Chase Dunn 1989; Dixon and Boswell 1996a and 1996b; Kentor and Boswell 2003). While a great many world-systems scholars emphasize the important of economic exchanges that benefit the core, other theorists within this tradition emphasize political arrangements, such as imperialism (Galtung 1979), that afford the core uneven global power and influence over peripheral nations. Thus, political and economic processes taken together contribute to the underdevelopment of the non-core.

Most recently, critical globalization scholars have pointed out how the effects of foreign economic and political domination have been increasing and are more directly affecting sub-national localities around the globe (Harvey 2005; Robinson 2004; Sassen 2007; Sklair 2005). McMichael (2004) has outlined the transition from the "development project" to the "globalization project" as a transition from nationally led economic development to a globally organized economic system controlled by multinational corporations and centered on global markets of production and consumption. As a whole, these two projects can be seen as the further spread and integration of global capitalist systems and the accompanying retreat of the nation state. Critical globalization researchers (e.g. Harvey 2005; McMichael 2004; Winant 2005) have asserted that the military occupation of Iraq and Afghanistan marks the reemergence of an imperial project on behalf of the United States in response to waning hegemony which further undermines peripheral nation-states and exacerbates North-South and West-East cleavages (Winant 2005). This imperial project, based primarily on the quest for control over natural resources, especially oil, suggests that nations who are naturally endowed will be disproportionately subjected to imperial occupation, influence, and/or violence (Harvey 2005; Thompson 2000; Winant 2005). These exploitative processes are expected to worsen as climate change and the global energy crisis ensues (Foster 2002; Roberts and Park 2007). Each of these factors affects global hunger.

Political economic research has linked human well-being measures to global structures of capitalism, as well as to structures of agriculture production and trade. Wimberley (1990) found that peripheral countries were more likely to have higher rates of infant mortality, often used as an indicator of basic social development. Also, research has indicated that peripheral countries are more likely to have agriculturally dependent economies (Jorgenson and Kuykendall 2008; Lonogo and York 2008; Moore 2003, 2008). In a cross-national study of peripheral countries (non-OECD) Burns et al. (2003) found that export commodity concentration had an indirect effect on infant mortality via organic water pollution. Thus, not only has world-system position been linked to development indicators, but also to the scale of the agricultural sector. These theorizations suggest that the impacts of economic and political globalization on peripheral zones are at best modest gains compared to the core, and at worst core gains are achieved at the expense of peripheral nations (Arrighi 1994; Chase-Dunn 1989; Kick et al. 2011; Moore 2003; Snyder and Kick 1979; Wallerstein 1974). These uneven development outcomes result in unequal environmental, social, economic, and political disruptions in the non-core. Persistent hunger in the periphery is one of these disruptions.

Political economic theoretical perspectives conclude that hunger is an outcome of uneven development processes inherent in the operation of the modern global capitalist system. An excellent point of departure for this approach is Wallerstein's (1974) three-tiered system, where semi-peripheral and peripheral countries are integrated into a global system of production supporting consumption and economic growth in the core. Furthermore, the very nature of global agricultural production in the periphery undermines the developmental outcomes in these nation-states, including hunger, while simultaneously enabling luxury and excessive food consumption in the core (Shiva 2001; Rosset 2009). Some indicate that this has resulted in a "hunger/obesity paradox" (Dinour, Berger, Yeh 2009). Devereux (2007) reports that modern famines are a consequence of increased vulnerability due to globalization processes of integration and marginalization. Furthermore, food import dependent economies are increasingly vulnerable to commodity price fluctuations. This vulnerability is heightened in severely marginalized regions, in particular sub-Saharan Africa, experiencing exceedingly high levels of poverty and political instability that contribute to endemic hunger and famines (Devereux 2007). Each of these new vulnerabilities due to globalization is further aggravated by global economic and political structures, causing peripheral nations to suffer the most extreme cases of hunger. Because the effects of modernizing technologies, economic institutions, and democratic governance are conditioned by international political economic structures, sociological research on hunger must account for this theoretically and empirically.

Generally, political economists, including dependency/world-systems theorists (Wallerstein 1974; Frank 1969), view under-development and its outcomes, including hunger, as resultant of capitalist exploitation of the periphery by the core (e.g. Dixon and Boswell 1996a, 1996b; McMichael 2004; Moore 2008; Wallerstein 1974; Wimberley and Bello 1992). Global integration of peripheral nations serves to promote development in the core while coterminously creating development deficits in the non-core (Amin 1976; Wallerstein 1974). Thus, while the core experiences food surpluses and permanently in-season markets, peripheral nations experience chronic hunger (Bello and Bavaria 2009; McMichael 2009b; Murphy 2009). In contrast to modernization policies that promote global integration as a strategy to combat hunger, political-economic policy implications suggest that hunger is best addressed through reducing global and domestic inequality perpetuated by uneven structures of power and dependency across the world-system.

Not coincidentally, proponents of this perspective often decry the impacts of liberalized trade agreements. They point out that "free trade" agreements, a form of economic globalization, reduce trade barriers, and that this occurs on a very uneven playing field of international actors where more economically and political powerful nations disproportionately benefit. Thus, the de-regulation of agricultural trade, mandated by the World Trade Organization's Agreement on Agriculture, supports an "informal mercantilism" of "*constructing* a comparative advantage" (McMichael 2005: 267). The cooperation of peripheral countries, in an effort to improve their foreign currency and meet multilateral debt demands, "opens domestic markets for Northern products and advantages core countries in the international division of labor in agriculture (McMichael 2005: 267)." The attendant rollback of trade protections and production subsidies in peripheral zones has strengthened agribusiness in the North, and has exported "food dependency (and insecurity) to the South via dumping. By the mid 1990's, *half* of the foreign exchange of the Food and Agriculture Organization's eighty-eight low-income deficit countries went to food imports (emphasis added) (McMichael 2005: 8)."

The relationship between dependency and hunger has been inconsistent in the empirical literature. Some studies find that global integration and dependency deleteriously impact hunger outcomes (Mihalache-O'keef and Li 2011; Wimberley and Bello 1992), while others have found a favorable relationship (Firebaugh and Beck 1994) or null associations (Jenkins and Scanlan 2001).[7] More recently, Kick et al. (2011) find that the impacts of world-system position condition the positive effects of national modernization. Thus, they find support for the inclusion dependency/world-systems perspectives in empirical analyses, and further demonstrate the utility of synthetic theorizing and analyses.

Modernization and dependency/world systems perspectives on hunger and global inequality are not by necessity polar opposites. In fact, one could theoretically relate the two by accounting for the effects of each on a development outcome such as hunger. To accomplish this endeavor, I plan to analyze the way in which modernizing processes—largely internal to countries—are conditioned by world-system properties within each of the

[7] Most of these studies employ foreign direct investment (FDI) as an indicator. However, there are a number of methodological difficulties with using this measure in the present study. First, the data for net FDI inflows are highly skewed and kurtotic, yielding a nearly one-modal distribution for the present sample. Even log-transforming this measure does not effectively yield a distribution close to normal, violating a central assumption of most multiple regression techniques. Substantively, a number of authors have indicated the importance of accounting for the sector (tertiary, secondary, or primary) within which FDI is flowing (Jorgenson and Kuykendall 2008; Mihalache-O'keff 2011). However, these data are too sparse for a structural analysis and are only applicable in macro-comparative studies (where the population size is only 213) to the extent that multiple observations over three or more time points are used to increase sample size in a longitudinal design. Furthermore, FDI is but one dimension of global dependency that is more comprehensively captured by measuring world system position as is done in the present analysis. Arguably studies that differentially employ only one proxy measure such as FDI produce misleading results for this very reason. Finally, focusing only on primary sector FDI, ignores a central component of dependency identified by the global food regime literature and a central cause of the most recent global food crises: food import dependency.

identified themes. Thus, world-system position is seen as the most exogenous causal indicator while modernization and other identified internal processes operate as endogenous predictors of hunger. This follows the theorization set forth by political economic scholars, while also accounting for the positive impacts of societal modernization posited by modernization and neoliberal economic scholars. Internal pathways specify mediating factors and processes that condition the effects of global processes on local outcomes. Urbanization and economic growth, food import dependency, gender inequality, environment, and conflict, militarism and militarization are connected to hunger, and mediate the effects of the global capitalist structure on national rates of hunger. In this respect hunger is comparable to other measures of global inequality, such as economic development, life expectancy, or infant mortality (e.g. Brady, Kaya and Beckfield 2007). Looking at these processes through the lens of the identified pathways allows a more illuminating investigation of the world capitalist system and global organization of trade as it affects human well-being. It also highlights the paths through which the international hierarchy of nations indirectly, as well as modernization and other natural attributes directly affect hunger the world over.

Fundamental to both of these theoretical perspectives is the role of the nation-state in addressing societal well-being. As such, this unit of analysis remains applicable in macro-comparative research. In addition, global context is increasingly important as international financial dynamics and investments, including commodity speculation, can spark enormous fluctuations in food markets and precipitate events such as the recent food crises (Brown 2011). Therefore, it is instructive to examine hunger globally using the nation-state as a unit of analysis. Whole societies are impacted by both domestic dynamics and their relative structural location within the world system, as it is comprised by international linkages of power and dependency (Kick, McKinney, McDonald and Jorgenson 2011a). Taken together, these linkages constitute a global hierarchy that plays an important role in the development of nations across multiple dimensions, including national food security and hunger (Galtung 1971; Kick et al. 2011; Snyder and Kick 1979). Scanlan (2003: 88) states that food security is embedded within structures of the international political economy making it "keenly sociological" and well suited to macro-comparative inquiry.

To summarize, comparative examinations of hunger have consistently found that modernization processes, as indicated by per capita income levels (among others), improve food availability and reduce child hunger (Jenkins et al. 2007; Jenkins and Scanlan 2001; Scanlan 2001a, 2001b, 2004; Scanlan and Jenkins 2001). However, the relationship between dependency and hunger has been inconsistent in the empirical literature. Some studies find that global integration and dependency deleteriously impact hunger outcomes (Mihalache-O'Keef and Li 2011; Wimberley and Bello 1992), while others have found a favorable relationship (Firebaugh and Beck 1994) or null associations (Jenkins and Scanlan 2001).

Furthermore, conflict, militarism, and militarization have been identified as key causal factors in studies examining food security and hunger (e.g. Bullock and Firebaugh 1990; Jenkins and Scanlan 2001; Jenkins et al. 2007). The guns and/or butter debate (e.g. Firebaugh and Bullock 1990; Kick, McKinney and Thompson 2011; Scanlan 2001) and military famines (e.g. Jenkins et al. 2007) have been analyzed within the sociological literature. Within this body of empirical literature, violent conflict is consistently found to worsen hunger outcomes (Jenkins et al 2007; Jenkins and Scanlan 2001; Scanlan 2001b;

Scanlan and Jenkins 2001), but it has only been examined as a predictor of societal development by Kick et al. (2011). Similarly, the present study accounts for the impact of violent conflict on development directly and hunger indirectly using a theoretically relevant measures.

Women have for quite some time been identified as central to both development and the alleviation of hunger (Boserup 1970; Mies 1986; Momsen 2010; von Grebemer et al. 2009). Women play central roles in both food production and preparation across the globe (Acosta-Belen and Bose 1990; Sachs 1996, 2002; Scanlan 2004), but they are more likely to experience hunger than their male counterparts (von Grebemer 2009). Shiva (1989) identifies ways in which technological advances in agricultural production, served to undermine women's roles in food production further exacerbating hunger. The food security literature broadly accounts for gender inequality, but the macro-comparative quantitative analyzes have only recently included its impacts (Scanlan 2004). He found a significant and favorable impact of female empowerment, measured primarily as contraceptive prevalence, on child hunger and mortality (Jenkins et al 2007; Scanlan 2004, 2010). A further examination of the impact of gender on hunger globally, including what I argue are more theoretically relevant measures of gender inequality (access to political power and educational resources), is warranted to extend these findings.

I explore these and other connections identified in the hunger literature further in the following sections that examine hunger from the perspective of the four primary organizing themes—gender inequality; conflict and militarization; and the global food system. Following this review of the literature, I offer a structural analysis of hunger across developing nations that examines each of these themes separately, then comprehensively in a final trimmed model. Based on these analyses, I then discuss the results and draw conclusions relevant to the sociological literature on development and global hunger.

Gender Inequality and Hunger

The gendered disparity in hunger rates discussed earlier points to globally systemic processes that serve to disadvantage women at the expense of society as a whole. Although some social researchers identify a convergence in regards to gender inequality trends (e.g. Dorius and Firebaugh 2010; Firebaugh and Goesling 2004; Sala-i-Martin 2006; Wilson 2001), a gap between the well-being of women and men remains (Momsen 2010). Women experience higher rates of hunger largely due to discrimination in access to educational, economic, and political resources (Food and Agriculture Organization 2008; International Fund for Agricultural Development 2011; Shiva 1989, 2001). The highest rates of gender inequality are located throughout the African and Asian continents (von Grebemer et al. 2006). The International Food Policy and Research Institute (von Grebemer et al. 2009: 21) estimates that if the status between men and women were equalized throughout South Asia and Sub-Saharan Africa the number of malnourished children would be reduced by over 14 million.

Women play a critical role in food production the world over. Throughout many parts of the global periphery women lack adequate access to despite comprising the majority of the agricultural labor force (Food and Agriculture Organization 2011; Gawaya 2008; Sachs 1996, 2002; Shiva 1989; World Food Programme 2011). A recent study by the

International Labor Organization (2009) estimates that if women had improved access to land, resources, and information agricultural productivity could be improved by an estimated 22 percent. However, women are often under-prioritized in agricultural development aid projects and funding, despite rhetoric indicating the contrary (Holmes and Slater 2008; Ransom and Bain 2011). That is, they are less likely to be directly included as recipients or participants in these projects despite reports and policies that indicate a concerted effort to specifically include women (Ransom and Bain 2011).

Women are also often denied access to educational resources. Girls comprise nearly two-thirds of the children world-wide who are not enrolled in primary schools (UNICEF 2007). In rural Africa, where hunger is most endemic, nearly 70 percent of girls do not complete a primary level education, and parity between boys and girls education at the primary and secondary levels has yet to be achieved (UNICEF 2007). This is particularly alarming because research demonstrates educational attainment for women greatly benefits their children in terms of nourishment, health, and future educational attainment (Food and Agriculture Organization 2005). Education, especially for women, is critically important since it can increase a person's income earning potential and improve their overall capacity to make informed decisions (Scanlan 2004; Subbarao and Raney 1995). This is crucial given that in one out of three households world-wide women are the sole breadwinners (World Food Programme 2011). Relatedly, Safilios-Rothschild (1985) discovered that a mother's income is more important than overall household income, including men's, when determining children's nutritional status. As summarized by the World Bank (2011:1),

"More educated women also tend to be healthier, participate more in the formal labor market, earn more income, have fewer children, and provide better health care and education to their children, all of which eventually improve the well-being of all individuals and lift households out of poverty. These benefits also transmit across generations, as well as to their communities at large."

Understanding how hunger is embedded within social, political, and economic structures that reproduce inequality both globally and domestically necessitates an analysis of gender. Theoretically, the social science literature debating the relationship between women and development has been articulated across a few different perspectives, including the Women in Development (WID), Gender and Development (Gender and Development), and Women and Development (Women in Development) approaches (Momsen 2010; Peet and Hartwick 2010; Scanlan 2004, 2011).

The WID approach began with Boserup's (1970) work, in which she asserts that modernization approaches to development excluded women and resulted in the further marginalization of women in both the development process and society. Critics claim that this perspective fails to recognize the subordination of women "as part of a wider global system of capital accumulation (Peet and Hartwick 2010)." In reaction, the Marxian-influenced Women in Development perspective emerged. This perspective problematizes gendered roles and accounts for the impacts of colonialism in contributing to the overwhelming poverty of women in the global South (Momsen 2010; Peet and Harwick 2010). In comparison, the Gender and Development perspective seeks to examine global development in terms of gendered relations, rather than just women (Peet and Hartwick 2010). All of these perspectives provide a feminist outlook on the relationship between development, women and men, and societal well-being. However, only from within the Women in Development and Gender and Development perspectives are global processes of development and histories of colonialism taken into account. In a similar fashion, feminist world-systems treatments suggest that processes of global accumulation, embedded within colonial histories and structures of patriarchy (institutions dominated by male power), undermine women's subsistence strategies (e.g. Dunaway 2001; Ward 1994).

Empirical studies span these perspectives and employ various analytic techniques. Most recently, Scanlan (2004; 2010) employs the WID perspective and finds that gender equality and contraceptive use both improve hunger and child mortality outcomes in quantitative cross-national studies. His findings are important, but they do not adequately account for the impact of the world-system. Gender and Development and Women in Development analysts have identified global structures of power and dependency across the world system as crucial in conditioning gender inequality and attendant societal outcomes largely using case-study or comparative-historical approaches (e.g. Acosta-Belen and Bost 1990; Chowdry 1995; Dunaway 2001; Dunaway and Macabuac 2007; Mies 1986; Misra 2001; Moser 1993; Nash 1990; Ward 1984). The integration of women in peripheral nations into the global economy as a source of cheap labor is identified as an important dynamic (Dunaway and Macabuac 2007; Momsen 2010; Ward 1984; Ward and Pyle 1995). In fact, Dunaway and Macbuac (2007) report a decline in food security after the arrival of export shrimp industries. Moreover, Hopkins and Wallerstein (1987) conclude that other household income generating activities, many of which are led by women, subsidize the low-wages earned through export-oriented production. These studies suggest that gender inequality is embedded within the broader world system, and processes of global development. Furthermore it is an important factor in determining hunger insofar as women are disproportionately denied access to power and educational resources. This has an overall depressive effect on development and serves to worsen hunger.

Conflict, Militarization, and Hunger

Previous cross-national research on food-security has indicated the importance of conflict and militarization (e.g. Bullock and Firebaugh 1990; Jenkins and Scanlan 2001; Jenkins et al. 2007). Based on previous findings and theorizations in the literature, violent conflict and militarization affect human well being, and thus hunger, through various processes. Given Kick's (1980) model of violence across the world system, there is also justification for framing the effects of conflict and militarization on hunger within a world-systems perspective.

The guns and/or butter debate deals with the effects, positive or harmful, of state military expenditures on development (e.g. Andreski 1968; Albrecht 1977; Benoit 1973; Bullock and Firebaugh 1990; Davis, Kick, and Keifer 1989; Kentor and Kick 2008; Sivard 1993 and 1996; Weede 1983, 1986, 1993). Kick and colleagues have found that types of militarization, such as soldiers per capita (Kick et al. 1998), can positively affect development, while intensive military expenditures negatively impacts development (Kentor and Kick 2008). To the extent that military expenditures are invested in human capital, national development can positively be influenced, but when these expenditures are diverted to more technological-intensive militarization efforts, human capital is not improved, and development is undermined (Kick et al 1998; Kentor and Kick 2008). Kick and Kentor (2008) importantly find that the negative relationship between intensive militarization and development are more pronounced in developing countries. Furthermore, in countries where agricultural industries are substantially supported through public funding of state institutions—often peripheral countries—there will be a negative impact on hunger if state revenues are diverted to defense expenditures.

The pernicious effects of military spending on hunger may also further contribute to environmental degradation resultant of the treadmill of destruction processes (Hooks and Smith 2005). In particular, capital-intensive military expenditures—namely bombs, artillery, and weapons—adversely affect the environment through releasing toxins and destroying natural landscapes (Hooks and Smith 2005; Jorgenson and Clark 2009). Intensive militarization degrades the environment and destroys arable land undermining food insecurity, and military expenditures on technologies such as bombs and artillery may divert public funds that could otherwise be used to combat hunger.

In addition to the effects of military growth and spending, it is important to account for the impact of violent conflict on hunger (Jenkins et al. 2007). Dependency and world-systems theorists have analyzed the impact of economic and political dependency on inequality and conflict (Boswell and Dixon 1990; Jenkins 1992; Kick 1980; 1983). Kick (1980; 1983) theorizes and identifies supportive evidence for the hypothesis that the nature and origins of violent conflict will vary across the structure of the world system, with the periphery being most vulnerable to external originations of violent conflict, and the core subject to violent engagement as aggressors. He posits that the semi-periphery is most prone to internal originations of violent upheaval because of its concomitant levels of economic growth and relative state weakness; whereas the core can buy out internal rebellions and effectively repress any uprisings (Kick 1980: 180-182). That is, the economic growth needed to bring populations beyond a daily existence of fulfilling basic needs and into a political consciousness is most likely to occur in nations ascending to or already in the core. Thus, he surmises that internal political rebellions due to perceived inequalities or injustices can be effectively bought-out in core nations, through the provisions of public goods and services or the off-shoring of externalities related to the exploitation of labor and resources. Semi-peripheral nations are not economically or politically equipped to buy-out such rebellions and are thus more prone to the incidence of internal uprisings (Kick 1980). This is illustrated in the many urban food riots that erupted as the global food crises worsened and peripheral nations were caught in the midst of both skyrocketing food prices and shortages alongside austerity policies and the roll-back of state provided goods and services (Berja 2011; Brown 2011).

Jenkins et al. (2007) find that settling violent domestic conflict is significantly related to lower levels of subsequent child hunger and that increases in military spending increases child hunger; these findings are similar to Jenkins and Scanlan's previous study of food insecurity (2001). Jenkins and Scanlan (2001) importantly identify how internal armed conflicts disrupt agricultural production, markets, and food distribution, all of which worsen hunger as food is commonly used as a political weapon, and ensuing "food wars" can severely threaten food insecurity (Bello and Baviera 2009; Jenkins et al. 2007).

The ravages of violent conflict on societal well-being and development are readily evident. Beyond the more obvious war-related deaths are the costs to longer term development levels. Recent research has shown that the impacts of violent conflict throughout the world do in fact include impediments to societal development and modernization (Imai and Weinstein 2000; Kick et al. 2011). In addition to this, societal disruptions caused by violent conflict and the destruction of national infrastructures significantly undermine national modernization processes, including economic and technological growth (Imai and Weinstein 2000). This relationship has been relatively understudied in the sociological literature, therefore, its effect has been omitted in the bulk of macro-comparative research within sociology (see for an exception Kick et al. 2011). The food security literature has consistently found that internal, and often related, interstate wars undermine food security directly through processes such as “food wars” (Bello and Baviera 2009) and increased loss of access among vulnerable populations, including women (Jenkins et al. 2007; Messer and Cohen 2006; Scanlan 2001). These findings are extended to include the impacts on development in the present research.

One could expect that where violent conflict is endemic development deficits are more likely to occur, and this relationship should be amplified the more violent the conflict becomes. An increase in war-related deaths marks not just the cost of human life, which in and of itself is terrible, but it also marks the expenditures of monies on war machines as opposed to social safety nets. It marks a loss of human expertise and contributions to the labor force, and instead places prospective workers on the battle field. It shackles a society and the communities within it to an atmosphere that includes the very frightening threat, if not the realization, of violence and loss of life. How many lives lived in these conditions are harmed? How many people, who might have otherwise been civically engaged and a contributing citizens, become relegated to maintaining the war-machine or afraid to leave their homes and surrounding areas? These types of conditions, to be sure, impede overall national development and modernization. Violent conflict has far-reaching impacts beyond the immediate deaths and injuries that occur.

Kick et al. (2011) enumerate the various inter- and intrastate conflicts around the globe in recent decades, including nations from virtually every continent. As detailed by Sivard (1993), a multitude of nations have experienced the threat of interstate war and invasion, as well as a variety of domestic security threats. These threats include civil wars, insurrections, revolutions, national liberation and independence movements, and civil unrest or ethnic conflicts. Global development theorists link violence in these primarily peripheral and semiperipheral countries to long histories of ethnic or colonial divisions (Goldstein 2001).[8] Kick (1984; 1987) demonstrates how these conflicts have been influenced by the participation of external supporters and adversaries, especially during the Cold War. Even after the Cold War, global conflict remains pervasive today in conditioning national development and societal well-being.

Violent conflicts have also had especially enduring implications for women. According to feminist world-systems theorists, the establishment of the global division of labor emerged from the violent conquest of the periphery *and* women by Western European and North Atlantic colonists (Mies 1986; Dunaway 2001). When caught in the cross-hairs of war, women are commonly victimized, including horrific acts of systematic rape and other forms of physical and psychological abuse such as those reported in recent conflicts and wars

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[8] Research suggests that there is a link between conflict, refugees and famines, such as in the case of Sudan (e.g. Wallace 2007). However, preliminary analyses of the impact of refugees on the Global Hunger Index were not fruitful either due to unacceptable model-fit or an insignificant correlation between refugees and hunger.

in Bosnia, Chechnya, Sudan, and the Democratic Republic of Congo (Goldstein 2001). This conceivably has a harmful impact on hunger if indirectly.

Gender inequality and the impact of conflict and militarization are two of the four primary themes identified in the hunger literature and tested here. A third theme comprises the role of the global food system, something that has more recently garnered attention in the popular media (Brown 2011), policy reports (World Bank 2011), and academic studies (Heady and Fan 2011) as a leading cause of the most recent global food crisis.

The Global Food Regime and Hunger

Recent reflections on the 2008 global food crisis consistently identify rising food prices as central to the precipitating crisis and escalating hunger (Heady and Fan 2010). As a result, nations highly dependent on food imports experienced severe shortages (Brown 2011; International Food Policy and Research Institute 2010). At the same time, cash-strapped households throughout the periphery allocated unsustainable portions of their domestic budgets to procuring food (International Food Policy and Research Institute 2010). Soaring food prices have lead to an increase in uprising and riots worldwide (Berja 2011, Brown 2011), and according to Josset Sheehan, director of the World Food Programme, left unabated, these price shocks present a real threat to global security (Berja 2011). Why have skyrocketing food prices so severely undermined food security around the globe? What structures laid the foundation for such events and the associated fall-out? These questions are most clearly dealt with in the global food regime literature.

Distinct historical and contemporary food regimes have been identified within the sociological literature on global food systems (Friedmann and McMichael 1989; McMichael 2004, 2009; Pechlaner and Otero 2010). The past two food regimes, the first extending from the British colonial era to World War II and the second beginning after the war and lasting until the 1980's (Friedmann and McMichael 1989; McMichael 2010; Pechlaner and Otero 2010), were primarily organized around extensive accumulation strategies and nationally-led agricultural development policies (Friedmann 1993; McMichael 2004; Pechlaner and Otero 2010). During the second regime, domestic agricultural production was increased in core nations as an economic boost, and surpluses were either traded to peripheral nations as commodities or dumped via food aid—in the U.S. as the program PL 480 (Freidmann 1982; Freidmann and McMichael 1989; McMichael 2004). The food aid program waned by the 1970s, but commercial sales of U.S. farm commodities continued. Semi-periphery and periphery consumption of mass-produced grain commodities was bolstered by import substitution industrialization, and the growth of urban labor/consumers, as these were the primary development strategies during the second food regime era.

The agricultural development strategies implemented during the second food regime contributed to an emerging agricultural capitalist class and the increasing power of transnational agribusiness capital, primarily in the core but also semi-periphery and newly emerging agricultural economies (Heffernan 2000; McMichael 2009; Pechlaner and Otero 2010). As globalization of production and distribution of agri-food industrial projects continued, a third food regime is beginning to take shape (Burch and Lawrence 2009; McMichael 2009; Pritchard 2005; Pechlaner and Otero 2010). In this regime profit accumulation strategies are coordinated by transnational capital (Sklair 2000) rather than nationally based development efforts (Burch and Lawrence 2009; Pechlaner and Otero 2010). They are also coterminous with export oriented industrialization strategies proffered by multilateral organizations such as the World Bank, International Monetary Fund, and the World Trade Organization (Burch and Lawrence 2009; McMichael 2004, 2009; Pechlaner and Otero 2010). Thus, agri-food production has been restructured world-wide resulting in the production of fresh produce in the periphery for permanently in-season market in the core (Burch and Lawrence 2009; McMichael 2009). This restructuring has been heavily influenced by the globalized growth in large food retail chains and super-markets for the retail of these markets (Burch and Lawrence 2009; McMichael 2009). While the transition to a third corporate or neoliberal food regime remains to be fully articulated, a common theme throughout most global food regime theorizations remains the global integration of food production and trade as a major driving force behind the global capitalist system generally.

Most relevant to the present research, food import dependency among peripheral nations was a central component to the agricultural and domestic strategies of the North, beginning in the post WWII era and extending into modern times. During the cold war, grain imports and food aid were used as political leverage to combat socialists or capitalist regimes, depending on which side of the axis the benefactor fell (Cleaver 1977). The creation and execution of the Green Revolution, as both a set of agricultural technologies and as a development project, marked a move to rapidly industrialize agriculture increasing national incomes and supporting commodity prices through dumping surpluses in geo-politically strategic locations throughout the periphery (Cleaver 1977; Friedmann 1982).

More recently, authors have identified biologically engineered crop production as a contemporary technological advancement aimed at increasing agricultural profits in the North through production and trade with the South (Pechlaner and Otero 2010). Whether or not these technologies will alter the current global food regime remains to be seen.

Also important to consider is the biofuels boom promoted by President Bush in the late 2000s as a domestic agricultural development strategy and answer to an impending energy crisis (Pechlaner and Otero 2010). In fact, the precipitous increase in bio-fuel production was identified as an important contributing factor to the global food crisis by the World Bank (Chakrabortty 2008). The diversion of grains on the world market from consumption-based to fuel-based production contributed, at least in-part, to soaring food prices. More importantly in this chain of events, is the fact that the depletion of domestic grain stocks, caused by liberalized trade policies, alongside *an increasing reliance on food imports* were the primary causes of the most recent crisis (Heady and Fan 2010). Each of these processes, liberalization of agricultural trade and food import dependency, are central tenets of the global food regime perspective (Friedmann and McMichael 1989) and played an important role in the recent global food crises (Heady and Fan 2010).

As stated, a central component of global food regime theory is that food import dependency among peripheral nations emerged as the by-product of decades long trade liberalization strategies on behalf of core nations for their domestic development (Friedmann and McMichael 1989). Indeed, surplus agricultural production for international markets, used to reproduce cheap labor in the periphery, served to both boost agriculturally-based incomes in the core while subsidizing cheap manufacturing in the periphery (Freidmann

1982). The World Trade Organization, as lead by core nations (primarily consisting of the G8—United States, Germany, United Kingdom, France, Italy, Canada, Japan, and Russia), has advocated for the removal of agricultural trade barriers and the deregulation of global food markets (McMichael 2005). Yet, domestic agricultural subsidy programs such as the US Farm Bill or the European Union's Common Agricultural Policy, continue to create an un-even playing field in global food production and trade (Pechlaner and Otero 2010; Winders 2004).

These domestic programs, combined with liberalized international trade policies and regional agreements, have served to severely undermine domestic food production throughout the global periphery (Pechlaner and Otero 2010). As a result, food import dependency has become an increasing problem (Bello and Baviera 2009; McMichael 2009; Murphy 2009). This food import dependency was not an unfortunate accident of global development processes. Rather, as identified by global food regime theorists, food import dependency among semi-peripheral and peripheral nations was, and continues to be, a central development strategy of core nations in the post WWII era (McMichael 2009; Pechlaner and Otero 2010). Thus, peripheral nations are expected to experience higher levels of food import dependency, which in turn worsens hunger. I now turn to my fourth and final theme ecological context.

Ecological Context

In recent decades environmental sociologists have called upon their colleagues to account for the important role of ecological context in analyses of social processes (Hawley

1950; Dunlap and Catton 1979). As such, ecological context has increasingly been accounted for in macro-comparative research (e.g. Jorgenson and Clark 2009; Kick et al. 2011; McKinney et al 2010; York et al. 2003). Additionally, development geographers have indicated that trajectories in global development have been largely conditioned by environmental endowments (Diamond 1997; Easterly and Levine 2003; Sachs, Mellinger and Gallup 2000).

According to Diamond (1997; 2005) and Ponting (2007) environmental conditions can largely influence societal development or the lack thereof. Diamond (1997) indicates that the horizontal orientation, and temperate locale, of the Eurasian and North American continent laid the foundation for agrarian and later industrial societies. To summarize Diamond (1997), the favorable climate and local environmental conditions gave rise to the early centers of fertilization and the domestication of crops and animals. In particular however, it was the domestication of animals that gave societies in Eurasia an epidemiological advantage over others, as they developed disease immunities that would prove to be crucial to the conquest of other cultures such as the American Indians and the Maya, for example. Furthermore, the advent of agricultural and metal technologies that were coupled with the rise of an agrarian society provided another advantage to colonial powers. Each of these advantages was a consequence of fact that the horizontal orientation of land masses and temperate latitudes enabled more widespread transfer of agricultural technologies and species (Diamond 1997).

The early advantage gained by societies in these locales established a trajectory of global privilege that in conjunction with global conquest and violence set the stage for vast inequalities across nations (Diamond 1997). Of particular relevance to the current study is the global distribution of hunger—for instance tropical nations have higher rates of hunger when compared to those located along more temperate latitudes (Food and Agriculture Organization 2010). These nations are located not only in tropical climes, but the most extreme cases of hunger are located on the north-south oriented continent of Africa. Given the relevance and recent impact of this body of literature, the present research also controls for climate zone using approximate latitude.

In addition to the geographical dispersion of unequal global development, ecological and environmental contexts are particularly important to food production. The natural environment remains a factor of production not easily controlled by capital, and it largely conditions food production potential. While at first longer growing seasons and higher levels of rainfall would seem to favor tropical climates over more temperate climates, there is ample reason to argue the converse. Specifically, the social conditions under which the vast majority of agricultural technologies and practices were developed occurred within temperate climates of Northern nations (the United States in particular) under the auspices of the Green Revolution (Cleaver 1997). Tropical climates, diseases, drought/flood patterns were not accounted for in the development of the hybrid seeds and their related production practices, and as a result these technologies were not as effective in tropical zones. This, when taken in addition to economic and infrastructure constraints, contributed to much of the periphery being left behind by the Green Revolution (Cleaver 1977). Thus, more temperate climates are expected to experience lower rates of hunger through their accumulated ecological, technological, and geo-political advantage.

Another important factor of food production includes land. In particular, land area supports domestic agricultural production. Environmental sociological studies have shown that the bio-productivity of land is an important conditioning factor in social development (e.g. Jorgenson and Clark 2009). Having a greater land mass available yields both a larger quantity of naturally available recourses and materials, as well as more land mass for collecting refuse and the waste associated with industrial development. In societies around the globe the impact of industrial activities on natural landscapes has been profound and the sheer scale of these impacts is massive (Burtynsky 2005). Having more land area available to bear these impacts potentially off-sets the impacts of this scale of disruption and pollution—at least locally and only in the short-term—while providing a reserve portion of land that can be used for productive activities. However, the absorptive capacity of land will vary greatly depending on local ecosystems, and the degradation of any land marks a real sense a loss of a critical part of the bioshpere. Industrial waste and pollutants should certainly be reduced and minimized for long-term sustainability, as earlier identified in the report *Our Common Future* (United Nations 1987). Overall, land area could feasibly reduce hunger indirectly by increasing agricultural production and mitigating industrial environmental impacts. Given this it conceivably reduces food import dependency and indirectly impacts hunger.

Other studies have indicated the importance of environment in conditioning global hunger. They indicate that the environment is an increasingly salient consideration when examining hunger given the ramifications of global warming on agricultural production (Gregory et al. 1999, 2005; Long et al. 2005), and how these are magnified in highly vulnerable peripheral societies (Roberts and Parks 2007). Interdisciplinary research indicates that global climate change, land use, crop productivity, and other social factors such as economic development are all important determinants of food security and hunger (Acevedo 2011). Many models estimating the productivity losses due to global warming among important food grains, such as corn or soybeans, show a predicted overall decline in global production of these crops (Nelson, Rosengrant, Koo, Robertson, Sulser, Zhu, Ringler, Msangi, Palazzo, Batka, Magalhaes, Valmonte-Santos, Ewing and Lee 2010). Additionally development geographers have indicated how social development has been influenced by natural endowments and biogeography (Diamond 1997, 2005; Sachs et al. 2001).

The literature reviewed thus far offers a theoretically complex set of relationships between the determinants of societal development and hunger. Based on this review, in the following section I outline the planned analyses, data, and methods employed in this study. I also highlight hypotheses in the variable descriptions. My approach to these analyses is to effectively test the theoretical relationships presented here in an integrated and hierarchical fashion. By presenting a final, trimmed model, I employ Popper’s falsification principle to the current research to identify relevant themes as they are related to one another in an integrated fashion. Currently, these themes are treated in the literature. I aim to extend this with the following analyzes.

CHAPTER THREE

DATA AND METHODS

The present study offers some analytic challenges common among macro-comparative, quantitative research. Namely, the variable of interest here, hunger, is primarily recorded for developing nations only. Certainly there is hunger in developed countries. However, relative to the global South, or developing world, hunger in the core of the world system is low. Thus, for reasons of global interest and technical examination (the low level of variation in the core make analyses of inter-country differences an unrewarding exercise), data sources such as the World Bank focus on data collection for the more disadvantaged countries.

I employ a theoretically nuanced and multidimensional measure in the present effort, the Global Hunger Index. These data are only collected for developing countries; thus, sample size is by definition limited in this case to the 70 nations for which Global Hunger Index data were available. Because of the small sample size it was necessary to strive for the greatest degree of parsimony in analytical models, employing the most theoretically relevant indicators for which data were available. The analytical design that follows is comprised of three deductive structural equation models based on a review of the literature, followed by a final, trimmed model derived from the three thematic analyses. This final model, presented last in the analysis chapter, extends the findings of the individually constructed themes by offering an original, synthetic analysis of global hunger. These analyses incorporate the impacts of gender inequality, conflict and militarization, and the global food system while also accounting for environmental context and global development processes.

Sample of Nations

As stated, all developing countries for which data were available are included in the study, resulting in a sample size of 70, a near population of the non-core. The seventy countries included in the sample, along with their score on the dependent variable, are listed in Appendix A. Developing country only samples are common in macro-comparative research, where processes are theorized to differ according to development level and geo-political context (e.g. Jorgenson 2006; Kentor and Boswell 2003). Additionally, as Kick et al. (2011) indicate there is variation within the semi-periphery and periphery on degree of global integration and density of networks. Statistical examination of the data for the other measures employed revealed the same conclusions can be drawn in the present study. Lastly, for this study I use a cross-sectional design as is common in much of the macro-comparative literature (e.g. Kick et al. 2011b; McKinney et al. 2010).

Analytical Technique

I follow the lead of Kick et al. (2011) and McKinney et al. (2010), in my use of a synthetic modeling approach. The relationships between positions of global power and dependency, nationally mediating factors, and hunger are theorized as being indirect and hierarchical. SEM analysis is a useful method for testing models that include multiple levels of hierarchically structured data (Byrne 2006; Curran and Hussong 2003; Tomarken and Waller 2005). The vast bulk of prior empirical studies examining hunger use direct effect estimators only. This is a less desirable technique for theory and embedded hypotheses testing as it potentially invokes a number of serious methodological complications such as multicollinearity. For instance, urbanization and gross domestic product per capita (GDPpc) are correlated at approximately .80 indicating a condition of multicollinearity for the equation generated by these two very important and often-used theoretical variables is likely.

SEM is generally a more powerful statistical modeling technique and an extension of the general linear model (Bollen 1989; Garson 2012; Tomarken and Waller 2005). The advantages of SEM, compared to multiple regression, are: 1) more flexible assumptions allowing for interpretation despite multicollinearity; 2) use of confirmatory rather than exploratory factor analysis utilizing multiple indicators for latent constructs; 3) the ability to test overall models rather than individual coefficients; 4) the ability to use results to re-specify the model and generate theory and 5) the capability to model mediating variables rather than additive models only (Bollen 1989; Byrne 2006; Garson 2012; Tomarken and Waller 2005). Although multiple regression is highly subject to interpretation error by misspecification, SEM allows the researcher to compare alternative models to test relative fit for more theoretically robust interpretations (Bollen 1989; Byrne 2006; Garson 2012; Tomarken and Waller 2005). Following the presentation of measures for each variable employed in the analysis, the results from my structural equation analysis are presented.

Variable Used in the Analyses

Global Hunger Index. According to the International Food Policy and Research Initiative (von Grebemer et al. 2010), the 2010 Global Hunger Index (Global Hunger Index)[9] offers a useful multidimensional overview of global hunger. The Global Hunger Index

[9] Analyses of this index reveal a Chronbach's alpha exceeding .70 (Chronbach's alpha=.72), a common threshold for establishing internal validity (Nunnaly 1978).

includes the following data: (1) the proportion of people who are undernourished, as estimated by the Food and Agriculture Organization of the United Nations; (2) the percentage of underweight in children under the age of five, as compiled by the World Health Organization (WHO); and (3) the under-five mortality rate, as reported by the United Nations Children's Fund (UNICEF) (International Food Policy and Research Institute 2010). This index captures "three dimensions of hunger: insufficient availability of calories, shortfalls in the nutritional status of children, and child mortality (von Grebemer et al. 2010:1)." Up to now nearly all sociological analyses of hunger only have examined the rate of child hunger, prevalence of undernourishment, or calories available separately, but not as an indexed outcome.

Composite measures are generally more desirable than single indicators for a number of reasons: they can capture multidimensional realities, are easier to interpret than a collection of single indicators analyzed separately, and they are conducive to parsimonious analyses of complex outcomes where a composite measure captures multiple dimensions of a process in one variable (Organization for Economic Cooperation and Development 2008; Saltelli 2007). The creation and use of composite indicators in cross-national research is commonly accepted, and these indicators have proven helpful in benchmarking countries' performance (Saltelli 2007). In fact, Scanlan (2003) calls for a multidimensional measure of hunger that accounts for deficits in calorie availability and distribution, while also capturing the related increases in mortality. Typically researchers have analyzed calorie deficits or prevalence of child hunger individually (e.g. Jenkins and Scanlan 2001; Jenkins et al 2007). The Global Hunger Index improves on these measures by accounting for prevalence of undernourishment, child hunger, and mortality rates all in one index. Thus, this index captures multiple dimensions of hunger, providing an indication of food distribution as well as vulnerability to the threat of hunger-related deaths (Wiesmann 2006).

The index using the following formula:

Global Hunger Index = (PUN + CUW + CM)/3
Global Hunger Index = Global Hunger Index
PUN = proportion of the population that is undernourished (in %)
CUW = proportion of children who are underweight (in %)
CM = proportion of children dying before age five (in %)

The 2010 data includes the most recent data available on global hunger from 2003-2008. Each of the indicators were examined as a dependent variable in itself, leading to the conclusion that theoretically, substantively, and technically the composite offered a superior alternative to the utilization of single indicators. Data were gathered from the International Food Policy and Research Institute (2010). Higher Global Hunger Index scores indicate more dire states of hunger.

World System Position. I use the measure of world-system position developed by Kick et al. (2011), for the period 1995-1999. This measure replicates Snyder and Kick's (1979) earlier study while updating it to the contemporary period. As explained by the creators of the index, the measure is based on a multiple-network analysis of transnational economic, political, cultural, and military linkages among 160 countries, of which 70 are included in this study. It is an ordinal rather than categorical measure of world-system position, and reflects the density of ties between each derived position (or "block") in the system. As such, it represents the degree to which nations are similar to other nations in terms of their networks established through economic and arms trade, shared memberships in international non-governmental organizations, and the presence of embassies. This measure is a multidimensional and more comprehensive interpretation of structural position in the world-system, accounting for both economic and non-economic dimensions of global power (Snyder & Kick 1979; Galtung 1971). Higher scores on this measure represent a nation's position of power, while lower scores represent a nation's relative dependency. *Positions of power across the world system are expected to reduce hunger through the specified indirect pathways, and the converse would hold true for positions of dependency*. For further explanation of this world-system measure, see Kick et al. (2011a) and the discussion of the major strands of measurement in the area (Mahutga and Smith 2011). It should be noted that the network analysis of Kick et a.l (2011) essentially replicates that of Snyder and Kick (1999) for the 1995-99 period instead of the 1960-65 period. Justifications for the utilization of this approach are offered by Lloyd, Mahutga, De Leeuw (2009).

Modernization. Some studies have theorized modernization as comprised of multiple dimensions, including human capital advances, democracy, capital investment and savings, infrastructural development, economic growth and development, urbanism and industrialization, among others (e.g. Jenkins and Scanlan 2001). However, in line with Kick et al. (2011b) and McKinney et al. (2010), I use a more parsimonious operationalization based on economic affluence and urbanization, two important latent indicators of modernization as defined by earlier modernization theorists (Durkheim 1893; Rostow 1955; Inkeles and Smith 1974). I use the conventional measure, gross domestic product per capita (GDPpc) for the year 2000. GDPpc is reported in constant US dollars. I operationalize urbanization as the percentage of the nation's population residing in urban areas. GDPpc is log-transformed to correct for distributional abnormalities, or violations of OLS assumptions about skewness and kurtosis. These data are gathered from the World Bank (2010). *Modernization is expected to improve hunger outcomes overall*.

Women in Parliament. Key independent variables in the present study seek to operationalize gender inequality across the world system. This includes access to political power and its impact on modernization and development directly and hunger indirectly. I take the percentage of parliamentary seats held by women to account for access to political power. Autonomy and participation in decision making have been identified as an important contributor to gender inequality and hunger, as reviewed earlier. *I predict that as more women gain access to political power modernization will improve, which promotes modernization and indirectly reduces hunger.* Previous macro-comparative research on gender inequality and environmental activism has employed this measure as a predictor of state environmentalism (Norgaard and York 2005). I extend its applicability to hunger here. This variable indicates the percentage of lower or single chamber of parliamentary seats held by women. Data are taken from the World Bank (2010) and are log transformed to correct for distributional abnormalities.

Female to Male Tertiary School Enrollment. Access to education, especially tertiary level or higher education (Assie-Lumumba 2006), has been shown to be an important determinant of hunger insofar as hunger is reduced as educational access improves. Denying educational access for women is a pathway through which, according to the literature reviewed, the oppression of women persists and broader development is impeded (Assie-Lumumba 2006; Klasen 2002; Scanlan 2004). As such, gendered disparities in educational access are an indicator of gender inequality within nations across the world-system. *It is hypothesized that as educational access for women improves hunger is abated*. I measure this as the ratio of girls to boys in tertiary school enrollments. Educational ratios as indicators of gender inequality have been used in prior studies (e.g. Klassen 2002), and women's access to higher education is especially important among developing nations (Assise-Lumumba 2006). Data for this measure are taken from 2000 and are gathered from the World Bank (2010).

Battle Deaths. I account for the impacts of long-term violent conflict by including a measure of battle deaths from 1946 to 1999. Thus, rather than only capturing the duration of conflict, this measure encapsulates both the duration and the magnitude of conflict among nations. The Uppsala Conflict Data program and International Peace Research Institute (UCDP/PRIO 2010), from which the data were gathered, define battle deaths as:

> Battle-related deaths refer to those deaths caused by the warring parties that can be directly related to combat over the contested incompatibility. This includes traditional battlefield fighting, guerrilla activities (e.g. hit-and-run attacks/ambushes) and all kinds of bombardments of military bases, cities and villages etc. Urban warfare (bombs, explosions, and assassinations) does not resemble what happens on a battlefield, but such deaths are considered to be battle-related. The target for the attacks is either the military forces or representatives for the parties, though there is often substantial collateral damage in the form of civilians being killed in the crossfire, indiscriminate bombings, etc. All fatalities – military as well as civilian – incurred in such situations are counted as battle-related deaths (UCDP 2010, definitions, "battle deaths").

To correct for distributional anomalies, I log transform this variable. *I predict that battle deaths will lower levels of modernization across all models based on recent findings by Kick et al. (2011).*

Military Expenditures. I use national military expenditures taken as a proportion of a country's GDP for the year 2000. Data are from the Stockholm International Peace Research

Institute (SIPRI) and include all expenditures on weaponry and armed forces. This includes monies spent on items from fighter jets and artillery to expenditures on peacekeeping forces, government agencies engaged in defense projects, paramilitary forces, and military space activities (World Bank 2010). These data were gathered from the World Bank (2010), which uses SIPRI (2010). As with other measures in the present research, these data were log-transformed to correct for distributional abnormalities. *Based on recent finding of Kick et al. (2011) I expect military expenditures to worsen hunger.*

Military Participation Ratio. One of the important causal patterns identified in the guns and/or butter literature is the impacts of military participation on development outcomes. *The guns* and *butter theorists posit that that military participation can drive development, thereby reducing hunger. However, the opposite may also be hypothesized. Modern military participation, as it is associated with "new" capital intensive military technologies and institutions (Kentor and Kick 2008), arguably drives capital intensive costs and worsens developmental outcomes, including hunger.* The military participation ratio data are measured as the total number of armed forces divided by the labor force population. Data are taken from the World Bank (2010) for the year 2000.

Arms Imports. Another important indicator in the guns and/or butter literature is the impact of arms imports, measured here in constant U.S. dollars. Similar to the military participation ratio, the impacts of arms imports are also modeled as operating through the militarization variable, military expenditures. *To the extent that arms imports drive military expenditures, a pernicious indirect impact on hunger is predicted.* These imports include military weapons through sales, aid, and gifts. These data also cover major conventional weapons such as fighter jets, artillery, ships, and missiles. Data are taken from the World Bank (2010) for the year 2000, which uses SIPRI (2010) as their source. This measure is log-transformed to correct for distributional abnormalities.

Food Import Dependency. A central tenet of global food regime theory is that food import dependency among peripheral nations emerged as part of a development strategy of core nations seeking to produce agricultural surpluses for consumption in peripheral markets (Friedman 1982; McMichael 2004). Therefore, the degree to which food imports dominate trade structures among peripheral nations indicates their integration into this regime as disadvantaged trade partners. I measure this as the percentage of food imports to merchandise imports for the year 2000. Food imports comprise commodities that include: food and live animals, beverages and tobacco, animal and vegetable oils and fats (World Bank 2010). *Food import dependency is expected to worsen hunger outcomes.* Data are taken from the World Bank (2010) which uses the COMTRADE database maintained by the United Nations Statistics Division.

Ecological Context. Recent macro-comparative studies have included a measure of approximate latitude as a control for environmental context, specifically climate (e.g. York, Rosa, and Deitz 2003; Jorgenson and Clark 2009; McKinney et al. 2010). Following suit, I also control for climate zone employing a measure of approximate latitude taken from Espenshade (1993). It is measured as the absolute value for the majority of the country. Higher scores indicate further distance from the equator. *Given the spatial distribution of hunger among countries in the sample (see Figure 1) latitude is predicted to be negatively correlated with hunger.*

An additional ecological indicator included in the present study is land area. Biogeography has been recently included in macro-comparative studies (e.g. Jorgenson and Clark 2009) and is an important natural endowment, especially in regards to potential agricultural productivity. Therefore, I account for the impact of *land area* on food imports by including this measure in the global food system model. *Greater land area is expected to lessen food import dependency.* Both variables are log-transformed address distributional abnormalities.

CHAPTER FOUR

ANALYSES

Table 2 presents the descriptive statistics and bivariate correlations for all variables included in the analysis. Upon observation of these measures, I conclude that multicollinearity among all *non-latent* indicators is not an issue. This conclusion is also confirmed by VIF and condition number diagnostics examined during my model estimations, using conventional thresholds for decision making (Garson 2012). Note however, that urban and GDPpc, my two latent indicators, are both highly, and significantly, correlated with one another. Their close association supports both the theoretical and methodological rational for including these as latent indicators of modernization. Not only does this enable the construction of a multi-dimensional measure for modernization, in contrast to the traditionally employed measure of GDPpc alone, but it also enables me to account for the high multicollinearity between these two indicators. This measure, with the two latent indicators employed here, has been used successfully in other studies as well (Kick et al. 2011; McKinney et al. 2010).

[Table 2 about here]

Gender Inequality Model

Figure 2 presents the findings from my SEM analysis of the Global Hunger Index across all nations in the sample using predictors derived from the women and development and hunger literature (e.g. Momsen 2010; Scanlan 2004, 2010). The chi-square for the model presented is 11.76 and is non-significant, with both fit indices and 1-RMSEA scores equaling one, indicating an excellent fit to the data especially when sample size is taken into consideration (Byrne 2006; Garson 2012; Hu and Bentler 1999). Caution must be taken when conducting SEM analyses with relatively small samples (Garson 2012), but there are measures that can confirm relative fit to the data even when this constraint is present. In the current study, I note that my indicator to sample size ratio is within the conventionally accepted threshold of ten observations per indicator (Garson 2012). Furthermore, an examination of the chi-square to degrees of freedom ratio, a test used to determine fit in small sample studies, indicates a good to excellent fit to the data, at a less than one ratio (Hooper, Coughlan, and Mullen 2008). Lastly, Barrett (2006) asserts that while large samples are generally desirable when conducting SEM analysis, small samples should be considered acceptable when the population from which they are drawn is limited in scope. The reader should note the current sample comprises the vast majority of all semi-peripheral and peripheral countries and well over half of the world's population. Furthermore, this reasoning applies to the acceptability of model-fit indices for all analyses included in the remainder of the report of the present research. The fact that a near-universe of the non-core constitutes the sample for this study raises the question, are tests for the statistical relations estimated applicable? They are according to Blalock (1979: 238-239) who argues that significance testing is indeed necessary when trying to ascertain causal relationships in our estimated models.

[Figure 2 about here]

One of the important themes identified in the hunger literature includes the role of gender inequality, measured here as women's access to political and educational resources, in conditioning hunger outcomes. I find strong support here that access to power for women improves societal modernization (.20). This and all other paths included in all models presented in the current research are statistically significant at the .05 probability level using a one-tailed t-test.[10] As women gain parity with men in higher education access hunger is directly reduced (-.17). Indirectly and directly, the role of women in society has important implications in the fight against hunger according to the results found here. These findings suggest that gender is crucially important in studies of global development and hunger and should be treated as such empirically.

As theorized above, world system position is also an important determinant of hunger through its impact on national development (modernization). It has a direct and positive effect on the latent construct, modernization (.42). This demonstrates that structures of power across the world system support modernization processes, including economic growth. Conversely, given that the variable captures both structures of power and dependency (Kick et al. 2011) this also means that countries that score lower on this measure have relatively lower levels of development. Structures of dependency within the world system, then, impede domestic modernization, thereby exacerbating hunger indirectly. This instance of an indirect but not a direct effect of an exogenous variable highlights the importance of models incorporating and testing more than direct relationships. This is especially true when indirect relationships are posited.

As stated earlier, the strongest direct impact on hunger in this model is modernization (-.69), indicated by GDPpc and percent urban population. This provides strong support for

[10] Where directional hypotheses are theorized, one-tail tests of significance are appropriate (Blalock 1979).

long held proposition that national modernization improves human well-being in the form of hunger. Again, this is unsurprising given that one of the strongest and most consistent predictors of hunger in macro-comparative research has been GDPpc (e.g. Jenkins et al. 2007; Jenkins and Scanlan 2001; Scanlan 2004). The present findings suggest that patterns of social organization, including urbanization and economic development as important indicators of modernization, reduce hunger. Because modernization is included here as an endogenous variable, the findings support the proposition that modernization, and domestic development processes generally, are best understood within their global context. Lastly, environmental context measured as latitude shows that hunger is concentrated in tropical zones (-.23). The present analysis also show that war directly impedes modernization (-.22) and indirectly worsens hunger. This supports previous research that identifies the pernicious impact war has on development outcomes (Imai and Weistein 2001; Kick et al. 2011), and in consequence perpetuates the hunger problem many non-core nations face.

Militarization and Conflict Models

Figures 3 and 4 present the structural equation models for the impacts of militarization and conflict on hunger derived from the literature. Figure 5 accounts for the impacts of military participation rates, while figure 6 accounts for the impact of arms imports. As with the gender inequality model, only pathways that resulted in acceptable model fit and were statistically significant were retained. Also, each of the military indicators, arms imports and military participation ratio, is included because of their impacts on hunger as derived from the literature. Model fit indices (IFI, CFI=1), RMSEA of 0 and a non-significant chi-square for both models indicates a good-to-excellent fit to the data. An examination of the chi-square to degrees of freedom ratio, a test used to determine fit in small sample studies, also indicates a good to excellent fit to the data at a ratio of approximately one (Hooper, Coughlan, and Mullen 2008).

[Figures 3 and 4 about here]

In figure 3 military expenditures (.23) worsen hunger, while societal modernization improves hunger (-.76). Military participation rates are found to drive military expenditures (.58), as expenditures on soldiers substantially increase defense budgets, thereby indirectly worsening hunger. Here I model these impacts as being indirectly related to hunger via their driving force on military expenditures, the primary causal mechanism that presents trade-off effects and is posited to worsen hunger. However, pathways found to be non-significant, were also examined to test if there were development benefits to military participation via its impact on modernization directly, as well as the indirect pathway from military expenditures to modernization. Neither was found to be statistically significant or yielded acceptable model fit. Conflict, in the form of battle deaths impedes societal modernization (-.22) also indirectly worsening hunger. Again, an impact of conflict on militarization expenditures was tested but not found to be significant. This is arguably due to the negative association between battle deaths and military expenditures in much of sub-Saharan Africa, such as Eritrea and the Democratic Republic of Congo, were violent conflict and mass battle deaths transpired, but national economies could not support large expenditures on technologically sophisticated weaponry. Similar to the gender inequality model, hunger is shown here to be concentrated in tropical zones (-.24). Lastly, world-system position also has a direct and positive impact on modernization (.44) supporting the claim that positions of international power across the world system promote development, which in turn reduces hunger.

Figure 4 presents the findings from the arms import model and provides support for the proposition that arms imports drive military expenditures (.33) and indirectly worsen hunger. As with the military participation ratio, the impacts of battle deaths (.-22), approximate latitude (-.24), and world system position (.44) on modernization work in the same directions with only modest changes in magnitude of effects. Temperate latitudes are associated with improved hunger outcomes, while modernization and positions of power within the world system substantially improve hunger levels directly and indirectly, respectively. Also, modernization remains one of the largest predictors of hunger have a favorable reducing effect (-.74). An additional pathway was found to be significant here that does not come through when controlling for military participation, and that is a negative impact on world system position on military expenditures (-.31). This indicates that positions of dependency are associated with higher rates of military expenditures and thereby indirectly worsen hunger through this pathway. Conversely, positions of power depress military expenditures thereby improving hunger indirectly. As with the military participation model, an impact of conflict on militarization expenditures was tested but not found to be significant.

Global Food System Model

Figure 5 presents the findings from the SEM analysis of the Global Hunger Index across all nations in the sample. This model tests the impact of variables derived from global food regime theory, namely food import dependency and land area, on hunger. The chi-square for the model presented is 10.6 and non-significant, and both fit indices and 1-RMSEA scores equal approximately one. This indicates a good to excellent fit to the data especially when sample size is taken into consideration (Byrne 2006; Garson 2012; Hu and Bentler 1999). An examination of the chi-square to degrees of freedom ratio, a test used to determine fit in small sample studies, indicates a good-to-excellent fit to the data at a ratio of approximately one (Hooper, Coughlan, and Mullen 2008).

[Figure 5 about here]

The model indicates that world system position impacts development (.31) and food import dependency (-.41) directly and hunger indirectly. Positions of power across the world system serve to promote both domestic modernization and economic development, as well as prevent food import dependency. Conversely, positions of dependency in the world system serve to promote food import dependency and impede development relative to more powerful nations. The dependent structural positions of more peripheral nations worsens hunger as a result. Development, as represented by modernization, reduces hunger (-.76). A pernicious impact of food import dependency (.17) on hunger is shown by the present model. Structural positions of dependency increase food import dependency among peripheral nations, which in-turn worsens hunger. Nations located in more tropical latitudes are more likely to experience higher levels of hunger (-.22), while those endowed with greater natural resources specifically land, have lower levels of food import dependency (-.26) and indirectly lower less hunger. These, and previously presented findings, have important implications for comparative sociological research on hunger that are discussed in the concluding section.

Synthetic, Trimmed Model

A final trimmed model is presented based on pathways that were validated or falsified during earlier examinations. This provides an extension of current empirical examinations of hunger globally, as each theme identified within the literature is tested synthetically in this model. Figure 6 presents these findings. As with all other models discussed thus far, the model fit statistics (non-sig Chi-square; IFI,CFI=1; RMSEA=.03) all indicate a good-to-excellent model fit. Also the Chi-square to degrees of freedom ratio falls within acceptable limits approximating one. It should be noted that the ratio of estimates to sample size slightly exceeds conventionally recognized limits of 1:10. Therefore, these results are exploratory and should be further examined in future studies. As such, I judge this final model to be a good fit to the data. All significant pathways identified in previous models were tested in this model and only those that yielded significant impacts and acceptable model fit were retained.

[Figure 6 about here]

World-system context (world-system position = .40), political access for women (women in parliament = .20), and entrenched violent conflict (battle deaths = -.21) all have a direct impact on modernization. While structures of power among nations, and access to political power for women both improve development outcomes, entrenched violent conflict impedes modernization. Modernization (-.62) also had a direct favorable impact on hunger across non-core nations. World-system position (-.48) has a negative impact on food import dependency, demonstrating power in the world system structure lowers food import dependency, while, conversely, the structure of dependency (lack of power) fosters it. Food import dependency (.11) harms hunger rates directly, while temperate latitudes (-.23) and access to higher education for women (-.19) improves it. Also, military expenditures worsen hunger (.22).

This final, trimmed model provides evidence that supports a number of hypotheses from the three identified pathways, where a number of relationships and direction of correlations remained consistent. Indeed there are important impacts across multiple social dimensions that impact the hunger problem. Gender inequality, military expenditures, violent conflict, and the emergence of a global food system that fosters food import dependency among nations are all important determinants of hunger across nations. Also important in these findings is the impact of ecological context, suggesting that the "guns, germs, and steel" hypotheses proposed by Diamond (1997) as derived from development geographers (e.g. Sachs et al. 2001), is an important consideration for global development and hunger analyses. Lastly, the interplay between global structures of power and dependency and national modernization, and their relation to hunger, are illuminated here in ways they have not been in other studies. The meaning and implications of these findings for sociology broadly as well as for hunger policy are discussed in the following conclusions.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

The present research has demonstrated the value in synthetic analyses of global development processes and their inter-related impacts on hunger. As well, it has enhanced the sociological literature by testing the direct and indirect effects of determinants of hunger commonly examined separately, and offers a heuristic integrated model. A number of conclusions can be drawn from the analyses presented earlier that relate to the sociological literature and move knowledge in this particular substantive area forward. I outline these contributions as the findings are discussed further, and the conclusions are presented. I begin with general observations across all analyses, then proceed to the implications for each theme analyzed. Importantly, I also discuss the contributions of the trimmed model. The study raises issues that relate to the conduct of social science research, which I discuss. This is important insofar as the strides I wish to make through the present research are largely informed by my foundational beliefs and philosophy of science that I have adopted.

General Methodological and Substantive Contributions

This study has made a number of methodological and theoretical contributions. By employing SEM analysis, it was possible to model synthetically the two primary debates on global social change and development, and demonstrate how these two predominant research traditions are related to one another. In accordance with previous efforts (Kick et al. 2011; McKinney et al. 2010) my findings suggest that rather than treating world-systems/dependency and modernization hypotheses as oppositional, accumulated knowledge is served by treating them in an integrated fashion. This is important because a number of recent empirical studies continue to stress the incompatibilities among world-systems and modernization theories (e.g. Michale-O'keef and Li 2011; Jenkins and Scanlan 2001). Integrative efforts such as these provide the foundation for advancements in science and theory construction (Tittle 1995). Indeed, analyzing the way in which national modernization, when situated within its global context of power and dependency, reduces hunger provides valuable information not only for sociological scholarship and scientific advance but also for the implementation of effective hunger policy.

The present research indicates that sociological studies of global problems such as hunger would be well-served by modeling the direct and indirect impacts of global structures and processes on outcomes of interest. World-systems theory is a complex theorization dependent upon a number of directly and indirectly related dynamics that contextualizes national development (GDPpc, urbanization) within global positions of power and dependency (world system position). Thus, nation to nation exchanges create a global hierarchy within which internal national modernization unfolds. On an applied note, present findings suggest that nationally-based approaches which identify domestic characteristics that reduce hunger will not be fully effective unless the focus extends to the global processes that affect those characteristics.

National modernization has the largest impact on hunger of any other predictor. Yet, discovering the role modernization has in reducing hunger is only part of the picture. The domestic payoffs of modernization, increased incomes from economic development levels or infrastructure effectiveness from more highly differentiated forms of social organization, are inextricably tied to nations' positions within the broader global system. So, just as positions of power serve to support national modernization and indirectly reduce hunger, positions of dependency serve to undermine national modernization and indirectly worsen hunger. Also, returning to political economic theorizations, it is important to recall that power within the global system affords nations the ability to modernize, often at the expense of less-powerful nations. Thus, the positive impacts here very much represent a trade-off among nations, where the more-developed nations unequally benefit from global linkages, and the non-core is largely excluded from the distribution benefits. It should be pointed out that as levels of national incomes increase so do consumption of resources with the attendant environmental impacts. Higher incomes alone are not the answer to sustainably lowering hunger rates. In sum, the relationship between modernization and hunger, as it is situated within the global context, is theoretically and practically enriching for sociological studies of hunger. Studies that do not adequately account for both are quite possibly testing mis-specified models and prematurely rejecting relevant and important hypotheses, or validating invalid hypotheses, as a result. I will return to this later in the conclusions.

The present findings provide further evidence of the negative and enduring impact of war on modernization and hunger. The more years nations are entrenched in violent conflict, the less likely they are to develop the levels of modernization needed to raise human well-being levels, including the level of hunger. War costs nations not only in terms of lives lost, but the causalities of war extend beyond these deaths to include the loss of infrastructure, social cohesiveness, and societal stability. Some studies have found that conflict significantly depresses modernization impeding economic growth and potential for investment in nations (Kick et al. 2010). On the whole, social conflict undermines sustainability across all dimensions—social, economic, and environmental (United Nations 1987). Furthermore, the costs and economic trade-offs that are spent caring for the sick and injured as a result of the conflict has a negative impact on the modernization levels of society. The current findings provide support for this claim and suggest that researchers examining the development and sustainability of nations and global problems such as hunger would be remiss to exclude the impacts of war on national modernization.

Another contribution of this study is that, unlike prior efforts, the outcome analyzed, measured by the Global Hunger Index, is a multidimensional measure of hunger. This means that while prior studies (i.e. Scanlan 2004; Jenkins et al. 2007; Wimberley and Bello 1992) have analyzed food availability and hunger separately, by employing the Global Hunger Index measure this study captures the vulnerability to hunger in a more robust fashion (Weismann 2006). As stated earlier, composite measures are preferable when modeling multi-dimensional outcomes, in that they maximize parsimony without sacrificing complexity. Furthermore, as Weismann (2006: 2) states "Indices can be powerful tools for international advocacy and monitoring…." By capturing multifaceted phenomena, indices "facilitate the use and interpretation of statistics by policymakers by condensing information (Weismann 2006; 2-3)." In the present analyses, the Global Hunger Index accounts for food availability and undernourishment, child hunger, and child mortality thus capturing the major dimensions of hunger—distribution, utilization, and access (Food and Agriculture Organization 2011). It is also a current hunger indicator across non-core nations (Weismann

2006). The present research therefore provides a comprehensive and contemporary analysis of hunger globally in its examination of this outcome.

Further substantive contributions should also be derived from each pathway/theme examined in my structural models analyzed here. In the following pages I turn to a discussion of these in the order that they have been presented thus far, gender inequality, conflict and militarization, the global food system, and ecological context. I elaborate further on the contributions of each theme in an in-depth discussion of the final trimmed model, and draw out the broader implications for the sociology of hunger and development sociology. I also situate this study within sociology as a social science identifying both my philosophy of science and the progression of knowledge that results from this study. In conclusion, I connect the impacts of my findings to hunger policy and areas for potential action.

Insights on Gender Inequality and Hunger

The results here have several important implications for both hunger research and sociology more broadly. First, these findings demonstrate the theoretical, methodological, and substantive benefits of using a synthetic approach to analyzing hunger. Second, the results of my analysis confirm the importance of global context as well as gendered inequalities. Also, the present findings provide further support for the pernicious effects of war and conflict on national development and hunger. In addition to the substantive advances of this analysis, there are important and related methodological and theoretical advances gained through this study. Finally, my findings here support the claim that hunger research needs to be more central to the sociological discipline as it is intimately related to central sociological concerns, including both global development and gender inequality.

Prior to discussion of the contributions of the present research in regards to gender and hunger, I will address some potential areas of future exploration. The current study does not address how gender inequality and hunger are related to environmental degradation. This however, is a promising area of future research. Although this exploration was outside the bounds of the current study, feminist ecologists have a great deal to offer such future endeavors (Sachs 1996; Shiva 1989). Given the current climate crisis, and the attendant implications for the global hunger crisis, it would be fruitful to examine how gender intersects each of these global social problems (Tandon 2009). Women are central to the production of food throughout most of the world and they comprise the majority of the agricultural labor force in most developing countries. As such, the potentially devastating impacts that climate change may have on food production through many developing regions, especially sub-Saharan Africa, has important implications for women. To the degree that women are involved in addressing efforts to mitigate the impacts of climate change, entire nations, their potential for development, and the attendant impacts on hunger lie in the balance.

Another area for future research lies in examining the impacts of agrarian transitions on women and hunger globally. As stated earlier, women world-wide are predominantly involved in agriculture and food production. It would be interesting to analyze whether and to what degree the structure of agricultural production attenuates the relationship between gender inequality and hunger. Given the role that biofuel production and large agricultural corporations have played in the latest global food and climate crises this is a particularly salient concern. Thus, as agriculture production becomes more industrialized, are women better or worse off generally, and how does this impact society more broadly, including the level of hunger? I expect this relationship would be heavily conditioned by a nation's structural position of power within the world system, where nations that have more global power and economic privilege are more capable of accommodating these agrarian transitions as urban centers and industrial sectors grow. However, where urban and industrial growth are lacking a rural redundancy of labor emerges (Bryceson 2000) or reserve army of labor (Marx 1847), the intersection between these rural labor redundancies, gender inequality, and hunger should be further examined.

To summarize, as women gain more access to political power national development outcomes improve. Achieving greater levels of gender equality promotes modernization levels, one of the most consistent and important determinants shown to reduce hunger. Also, increasing access to higher education for women has a directly reduces hunger. This translates into benefits for entire nations, not just the female demographic. Generally then, as the political power of women and gender equality increases hunger is abated for *everyone*.

Insights on Conflict, Militarization, and Hunger

Both models presented in this study confirm that militarization and conflict among developing nations has an unfavorable impact on hunger. Confirming findings previously in the literature, conflict, here measured as the intensity of conflict (number of deaths) impedes societal modernization, one of the largest factors in all thematic models shown to reduce hunger. In addition to this both militarization measures, arms imports and military participation ratios ramp up military expenditures. Contrary to the predictions of defense economists, military expenditures do not have developmental benefits among developing countries, a finding also confirmed by Kick et al. (2011), and these expenditures indeed represent a trade-off on expenditures that could have potentially alleviated hunger. Thus, in line with political economic interpretations, military expenditures have a direct and destructive impact on hunger.

Although the present effort did not find a direct and negative impact of war on hunger similar to other studies employing a direct effects analytic technique only (Jenkins et al. 2007; Jenkins and Scanlan 2001; Scanlan and Jenkins 2001; Scanlan 2001), it does so indirectly by reducing development and modernization. The findings here demonstrate a nuanced and theoretically distinct relationship between war and hunger which are consistent with Kick et al. (2011), who found support for this indirect pathway using a different hunger outcome—the intensity of food deprivation or hunger deficit.

Defense economists and political economists have engaged in the guns and/or butter debate about the potential benefits or trade-offs of societal militarization. The findings here clearly support the position of political economists that developmental tradeoffs from increased militarization are not realized among less developed countries. Furthermore, these trade-offs represent a real threat to broader human well-being in the form of heightened hunger. This is also surely connected to patterns of warfare and global structures of dependency, as is shown in the arms imports model. Positions of dependency across the world-system further foster the proportion of domestic economies that are allocated to military spending. Thus, peripheral world zones are both more vulnerable to conflict, originating both internally and externally (Kick 1980; 1987), and according to the findings here are more likely to misdirect funds towards the military sector at the expense of the nations' citizens in the form of increased hunger. Some have argued that a transition towards a newer, technologically dependent military has emerged where the waging of war depends not on foot soldiers but the complex coordination and operation of technologies such as unmanned drones (Kentor and Kick 2008). Expenditures on high-technologies such as these undoubtedly amplify defense budgets. Also, as others have observed, military expenditures are intimately connected to neoliberalization of economic strategies and are driven largely by political corruption and subsidized military industries (Kentor and Kick 2008).

Furthermore, the development benefits that some scholars have noted for the core resulting from military-industrial complexes are also better understood within their global context. Although core nations were not included in this sample, similar to previous studies (Kick et al. 2011), the absence of these payoffs for the developing regions of the world indicates that along political economic interpretations, benefits are realized primarily for those nations that occupy the top of the economic and political hierarchy across the world system. Therefore, the extent to which there are payoffs for the development of a military-industrial complex within nations via the Keynesian approach, these are only realized in more developed countries (Kick et al 2011).

Lastly, violent conflict, operationalized here as the cumulative intensity of warfare during the post-WWII era, has resounding impacts on modernization directly and hunger indirectly. Warfare is one of the most consistent predictors of hunger across the quantitative macro-comparative literature, and the present study confirms its impact. However, the analyses presented here show an indirect effect of warfare operating through the obstruction of societal modernization. Many development scholars writing about hunger have proposed the concept of a hunger/poverty trap. Here I suggest we extend the concept to include the conflict/poverty/hunger trap. Reviewing the global distribution of hunger shows that this problem is particularly acute in sub-Saharan Africa. Not coincidentally, these nations have also been embroiled in inter- and intra-state wars for decades now (e.g. Somalia; Democratic Republic of Congo; Eritrea), resulting in broad societal upheaval, depressing development outcomes, and exacerbating hunger. In fact, the connections between conflict, poverty, and hunger in this region of the world are an area ripe for future study. An examination of the impact on domestic conflict and the progression of hunger and hunger-related social ills, such as disease, could be examined. Additionally, where the trap between conflict/poverty/hunger persists the differential impacts on women and agricultural systems could also be examined.

Insights on the Global Food Regime and Hunger

The results of my analysis confirm the importance of the global context with respect to structures of food trade, specifically imports. As such, this line of sociological inquiry has merit, both in the present study and in future studies of global hunger. This confirms Buttel's (1996) call that the sociology of development and sociology of agriculture literatures be further integrated. Before explaining the contributions of the present research in regards to the connections between the global food system and hunger, let me address some potential areas of future exploration.

The findings of the present research broadly support political economic and global food regime analyses of hunger. This evidence shores up global food regime and world-system/dependency interpretations of hunger and its causes. When modeled synthetically, domestic modernization is shown to be an important factor in reducing hunger. Thus, when taken together support is garnered for both modernization and world-system/dependency hypotheses regarding hunger. However, as the global food regime and world-system/dependency theorists analyses indicate, the impact of domestic modernization levels on hunger must be understood within the broader global political economic and environmental context. It should also be noted that the present research indicates the importance of accounting for geographical and ecological context in macro-comparative examinations of hunger.

While preliminary analyses yielded unacceptable model fit or non-significant effects, a further exploration of food exports among peripheral nations would be a logical next step. The global food regime articulates that the export of luxury fruits and vegetables to Northern markets places peripheral nations as a structural disadvantage. This arguably undermines economic development as more profits are garnered upstream in value added chains and as subsistence strategies are replaced by efforts to produce food for global markets (McMichael 2005). In addition to examining the role of food exports on the Global Hunger Index, it would also be interesting to use an unequal exchange approach (Jorgenson 2006) to test if specifically exports to Northern countries heighten the negative effects theorized by the global food regime. Lastly, given the era of environmental degradation and ecological rifts (Foster, Clark and York 2010) that we are currently experiencing, the impact of ecological context on societal development, food production, and hunger should be further analyzed. Because of the role that biofuel production and large agricultural corporations have played in the latest global food and climate crises this is a particularly salient concern (Tandon 2009).

One of the primary aims of this research was to analyze how global structures of food import dependency, as theorized by the global food regime (Friedmann and McMichael 1989; McMichael 2009), impacted hunger. As stated earlier, the convergence of neo-liberal regulation in global agricultural trade and domestic development strategies in the North predicated on exporting agricultural surpluses have led to growing food import dependency among peripheral world zones. Preliminary analyses of the global food crisis, spurred by soaring food commodity prices world-wide in 2008 and 2011, indicate that food import dependency was a major contributing factor (Heady and Fan 2010). The present study confirms these impacts. Importantly, current analyses also indicate that food import dependency must be understood within the global context of unequal power and development across the world-system.

These findings suggest that the causes of hunger can no longer be claimed to be limited to the nation-state in scope. Clearly, global positions of power and dependency condition human well-being in the form of hunger (Kick et al. 2010). Countries that occupy global positions of power as indicated by world-system position enjoy higher levels of national development and modernization (Kick et al. 2011). National modernization has the largest impact on hunger compared to all other predictors. Yet, discovering the role modernization has in reducing hunger is only part of the picture. The domestic payoffs of modernization, increased incomes from economic development levels or infrastructure effectiveness from more highly differentiated forms of social organization, are inextricably tied to nations' position within the broader global system. So, just as positions of power serve to support modernization and reduce hunger, positions of dependency serve to undermine modernization and worsen hunger. The relationship between modernization and hunger, as it is situated within the global context, is both theoretically and empirically enriching for sociological studies of hunger.

Insights on Ecological Context and Hunger

Additionally, this study finds that ecological context, as identified by structural human ecologists (Dunlap and Catton 1979; Duncan 1950; Hawley 1950), is important when examining the causes of hunger macro-comparatively. While earlier human ecologists examined the impact of the environment on society, it wasn't until the late 1970s that more wide-spread support for study of the environment emerged. The "new ecological paradigm" proposed by Dunlap and Catton (1979), asserts that social science inquiry cannot effectively exclude the environment within which societies are contained as human societies are equally subject to the laws of nature, a concept well known by classical theorists such as Marx (1863).

Modern studies examining the role of the natural environment on social processes are becoming more common. Davis (2002) has astutely demonstrated that climatological anomalies associated with El Nino in conjunction with colonial exploitation contributed to the horrific Bengali famine in colonial India. In a similar vein, development geographers and structural human ecologists have linked societal development and change to environmental context, generally asserting that bio-capacity and productivity is necessary for growth (Diamond 1997; Dunlap and Catton 1979; Hawley 1950; Jorgenson and Clark 2009; York et al. 2003). Findings here suggest that tropical climates and limited land area both undermine food security. Further refinement and examination of ecological context and measures is needed, but these analyses do suggest that sociologists are remiss to omit the environment as in important contextual factor in macro-comparative examinations of hunger.

Insights from the Trimmed Model

I included a final model in this study to examine the impact of variables from each of the identified themes on hunger across nations. In fact, each theme reviewed and analyzed separately, is represented in the final model. Generally, improving structural position within the world system, enhancing societal modernization and higher educational access for women, as well as occupying more temperate latitudes reduces national hunger vulnerability. Also, food import dependency and military expenditures worsen hunger across nations. Thus, each identified theme holds true in the final model, and this represents a more comprehensive depiction of the determinants of hunger among developing nations. Previous cross-national research has not accounted for the impacts of these processes in one synthetic, comparative, and quantitative model.

Furthermore, in offering a trimmed model, I aim to progress the sociology of hunger through the accumulation of tests and potential falsifications of theories presently dominating the debate. Although more often than not sociologists aim to test one theory against another, it is possible, and I argue here likely, that this methodological emphasis is contributing to errors in analyses resulting in the unnecessary falsification of important causal determinants and development outcomes, including hunger. Popper (1963) suggests that the accumulation of knowledge is achieved through the scientific testing, based on deductive reasoning, of theories derived from problem-solving attempts. He suggests that researchers should try hardest to disconfirm or falsify their own theories, and that theories are valuable only to the extent that they are refutable (1963). This provides the foundational reasoning for my multiple models and final trimmed models. As such, I test, deductively, the theorized causes of global development and hunger, using multiple iterations and an integrated approach. In order to reduce the degree of error contained in my examination of hunger, I have chosen the most appropriate analytic method currently available that can test both the direct and indirect impacts of the theories specified. As pathways within the models were refuted, I expunged them. Given that the analyses presented here verify the theories enumerated, further support is garnered for both political economic and modernization interpretations of development and human well-being in the form of hunger.

Broader Implications for the Study of Hunger

Given that 2011 marked second global food crisis within three years, the significance of hunger and its indelible impacts on people across the world are undeniable. Much as Josset Sheehan (World Food Programme director) claims (Bjerga 2011), we are in an era where not only the world and nations ignore the food issue at their peril, but sociology also tends to ignore it to the discipline's detriment. The global hunger problem is a pervasive current social problem, and its impacts travel across many of the most important variables identified in macro-comparative sociology and carries grave consequences, including disease and death.

Social scientists and policy makers need to understand more thoroughly the processes and global context that impact hunger if future efforts to ameliorate it are going to have any promise of succeeding. The Millennium Development Goals would like to halve hunger by 2025. At current trajectories this is not likely to occur without a concerted global effort.

The present research provides strong support for the claim that achieving gender equality is central to abating hunger globally. Structures of political power and women's access to them condition hunger outcomes indirectly. Women's occupation of positions of power improves national modernization levels. Within nations, as women gain more representation within political societal development is enhanced. Granting women access to higher education reduces hunger, indicating the importance of achieving gender equality in education. Furthermore, the role of higher education in today's global economy is becoming more important. This is especially important as research shows that women who are more educated will likely have higher income levels, and women's income is more important in improving nutritional statuses within households than men's incomes (Safilios-Rothschild 1985).

In light of prior research, my findings suggest that in addition to granting women educational access, also granting them political power is an important step in reducing hunger globally. Societies where women are denied a political voice are under-utilizing, and indeed oppressing, roughly *half* of their population. Thus, there is significant reduction in the chances of producing productive members of the labor force, training and employing the next scientists and technological inventors, or nurturing and developing the next social activist or policy maker who can address a society's ills. By denying women the same opportunities as men, these societies deny their populations each of these potential contributions that could as equally be made by women as by men. Societies that oppress women deny their nations societal development as a result. As indicated by the present research, achieving gender equality is key to preventing and/or abating a downward spiral in the hunger/poverty trap. Addressing the current global food crisis is not possible without thoughtfully examining and attending to processes that contribute to global *and* gender inequality.

Also central to reducing global hunger is ceasing violent conflict. Although previous studies have found a direct impact between violent conflict and child hunger (Jenkins et al. 2007), current analyses suggest that without ending conflict, societal development is impeded and consequently hunger is worsened. As discussed, conflict disrupts the effective operation and maintenance of social institutions that can foster national development and modernization. Given that societal modernization is one of the most consistent and strongest predictor of hunger vulnerability across nations, this is an important indirect pathway contributing to global hunger. Here warfare is shown to leave an indelible mark on societal modernization, and the ensuing conflict creates social upheavals and disruptions that impede the broader functioning of society.

Clearly, one of most important feats that international development agencies could accomplish is to cease, or even better, prevent the outbreaks of violence and war. Some social scientific researchers have linked spiraling environmental degradation to the outbreaks of war (e.g. Homer-Dixon 1999; Klare 2010). Some theorists suggest that internal conflicts originate when power and resources are scarce and inter-group competition, often fueled by ethnic and racial discrimination, is heightened (e.g. Homer-Dixon 1999; Klare 2010). While others maintain that ethnic conflict is at least heighted, and at most perpetrated, by external originators of violence and fueled by the importation of arms (e.g. Sislin and Pearson 2001). Research here, and elsewhere, suggests that promoting environmental, social and economic sustainability and promoting human rights would be an integral part of these efforts.

Relatedly, redirecting funds currently spent on militarization within developing countries could also alleviate hunger. Analyses here show that military expenditures do indeed take away from funds that could be allocated to the overall betterment of society, including reducing hunger. The developing countries included in this sample only experience the negative impacts of military spending on hunger, with no societal development payoffs as theorized by defense economists (Kick et al. 2011). One huge step towards reducing hunger globally would certainly include the reduction of military power, including the stock pile of weaponry and soldiers at arms in the developing and developed world. Yet, among the world's leading arms producer, the United States, military expenditures comprise nearly half the national budget and show no signs of abating soon (Boot 2006).

Addressing the current global food crisis is not possible without thoughtfully examining and attending to food production and trade across the globe. Rather than disproportionately focusing on agricultural production for global export, the focus needs to shift to food production for local consumption. Under current economic, social, political and environmental conditions enumerated here concrete efforts to address hunger globally must look beyond the usual model of increased agricultural production and global trade prescribed by neo-liberal or "free-trade" economic frameworks. The integration of global trade and production advocated by free-trade theorists, as well as the privatization of publically available good and services, are each central to a neo-liberal development strategy or what has been called the "Washington Consensus (Gore 2000)." As Pelancher and Otero (2011) demonstrate, and is supported here, these types of development strategies harm hunger among developing nations in an effort to support industrial agricultural sectors and multinational corporations in developed nations. Thus, forcing free trade policies and further economic integration likely exacerbates food import dependency and perpetuates hunger. Clearly, this is not a socially sustainable development principle.

Locally-integrated food systems and sustainable agricultural systems are promising alternatives to our current model of industrial agriculture production for global trade. Community food security and food sovereignty movements, along-side peasant-based movements such as la Via Campensina or anti-globalization movements such as the World Social Forum, hold a great deal of potential for future change and locally-based development strategies to address hunger (McMichael 2004; Schanbacher 2010). As rural movements emerge, and agrarian transitions continue to occur throughout much of the developing world, the potential for such movements to make vast and lasting differences grows. Many global chains of food production and consumption depend on the integration of peasant producers and rural agricultural laborers in developing countries. Increasing resistance among each of these social groups represents a potential for widespread change throughout the global food system. The extent to which such changes can achieve sustainability will depend in large part on the ability of future alternatives to reduce hunger globally. Furthermore, emerging studies on food sovereignty argue that the present global food system and its organizing principles represent a massive violation of the basic human right to food (Schanbacher 2010). Operationalizing and empirically examining this issue further in macrocomparative studies offers an exciting and fruitful avenue for future research on hunger.

This study presents a comprehensive analysis of hunger across developing nations, while accounting for the impacts of gender inequality, militarization and conflict, and the emergence of a global food system. Although each of these have been examined within the quantitative, macro-comparative literature separately and using differing analytical methods, they have not been examined synthetically in one study. Furthermore, the analytic approach employed here enables a test of derived theoretical propositions as they are related to one another and hunger, both directly and indirectly. Given that the structure of the theories presented specify the impacts of national processes within a global context of power and dependency, this type of modeling technique is critical in order to accurately test the presented theories on development and hunger. This does not suggest that alternative techniques, such as a longitudinal design, do not have their merits. Indeed, analyzing change over time provides valuable insights. However, the magnitude of changes for the processes currently examined require longer periods of time that extend beyond the scope of presently available data that currently capture the international hierarchy of power and dependency across the world-system and its impacts on national development and ultimately hunger. Understanding these causes and addressing them through the empowerment of local communities and peoples, as they are embedded within natural contexts, will be crucial if the Millennium Development Goal of cutting hunger in half by 2015 is to be achieved (World Food Programme 2010).

Hunger, as demonstrated here, has several interdependent causes. These determinants coalesce to create "global spatial inequality" of hunger (Kick et al. 2011). Most vulnerable to hunger are nations occupying positions of dependency within the world system, tropical climes, a deep history of conflict, depressed national modernization, heightened gender inequality, and increased food import dependency. Each of these causes is related directly and indirectly to global hunger. In fact, it is their relation to one another as well as to hunger that marks one of the greatest contributions of this study. It is often purported that global hunger is a complex issue. The analyses contained herein take a vital step in illuminating these complexities.

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TABLES

Table 1. A Typology of Theoretical Perspectives on Hunger in Developing Countries

Assumptions regarding the role of increased food production in alleviating hunger	Assumptions regarding the role of population growth	
	Non-Malthusian	Neo-Malthusian
"Productionist" Increased food production is central in reducing hunger.	Modernizationism: Hunger is caused by a lack of modernization and technology. Hunger is reduced through progressive economic development and global integration.	Productionist Neo-Malthusian: Hunger is caused by food production falling behind population growth. Hunger is reduced through agriculture R&D and increased agricultural productivity.
"Non-productionists" Nonproduction factors such as inequality and population growth are most central in reducing hunger.	Political Economy: Hunger is caused by social inequality and poverty produced both locally and globally. Hunger is reduced by lessening inequality and increasing citizenship rights and reframing global institutions and trade.	Ecological Neo-Malthusian: Hunger is caused by population growth and environmental degradation. Hunger is reduced through redesigning policy, technology and institutions to reduce population and consumption in line with resource limitations.

(Reproduced from Buttel 2000: 17)

Table 2. Descriptive Statistics and Bivariate Correlations for all Variables

	Mean	StDev	1	2	3	4	5	6	7	8	9	70	11	12	13
Global Hunger Index 2009 (1)	17.25	8.84	1												
World System Position 1995-1999 (ln) (2)	1.03	0.55	-.438*	1											
Gross Domestic Product per capita 2000 (ln) (3)	6.27	0.96	-.770*	.396*	1										
Urban population (% of total) 2000 (4)	39.13	17.77	-.648*	.234*	.767**	1									
Women in Parliament 2000 (ln) (5)	2.64	0.55	-.030	.053	-.031	-.111	1								
Female/Male Tert. Enrollment 2000 (ln) (6)	87.77	18.52	-.645*	.358*	.645*	.464*	.132								
Food imports (% of merch. imports) 2000 (7)	16.12	7.95	.364*	-.475*	-.270*	-.088	-.279*	-.344*	1						

Table 2. Continued

Battle Deaths, 1945-1999 (ln) (8)	8.43	4.12	.199*	.216*	-.104	-.134	.165	-.170	-.116	1					
Military Expenditures (% GDP) 2000 (ln) (9)	1.10	0.54	-.002	-.062	-.013	.021	.266*	-.083	-.096	.026	1				
Arms Imports 2000 (ln) (10)	8.84	8.75	-.054	.203*	.149	.052	.076	-.061	-.213	.386*	.027	1			
Military Participation Ratio 2000 (11)	0.57	0.81	.084	-.186	-.014	-.070	.087	-.092	.275*	.184	.202	.203*	1		
Approximate Latitude 1993 (12)	18.00	12.01	-.290*	.208*	.074	.049	-.068	.214*	-.078	-.245*	-.014	.026	.088	1	
Land Area (Hectares) 2000 (ln) (13)	12.69	1.33	-.020	.157	.111	.048	-.020	-.126	-.354*	.230*	.190	.342*	-.144	.010	1

*p< .05 or better using a one-tailed t-test.

FIGURES

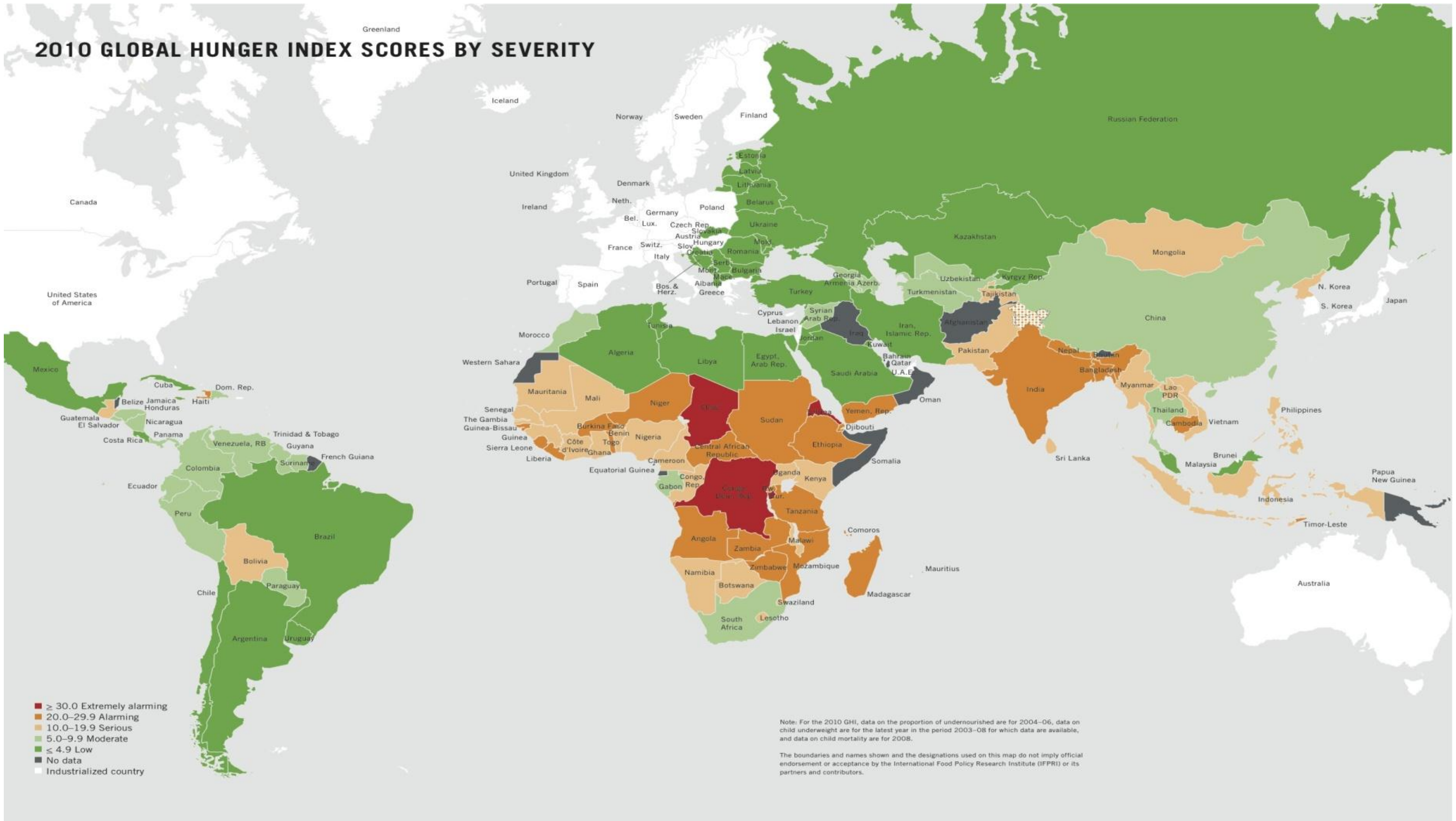

Figure1. Map of the Global Hunger Index across Developing Countries (source: International Food Policy and Research Institute 2010)

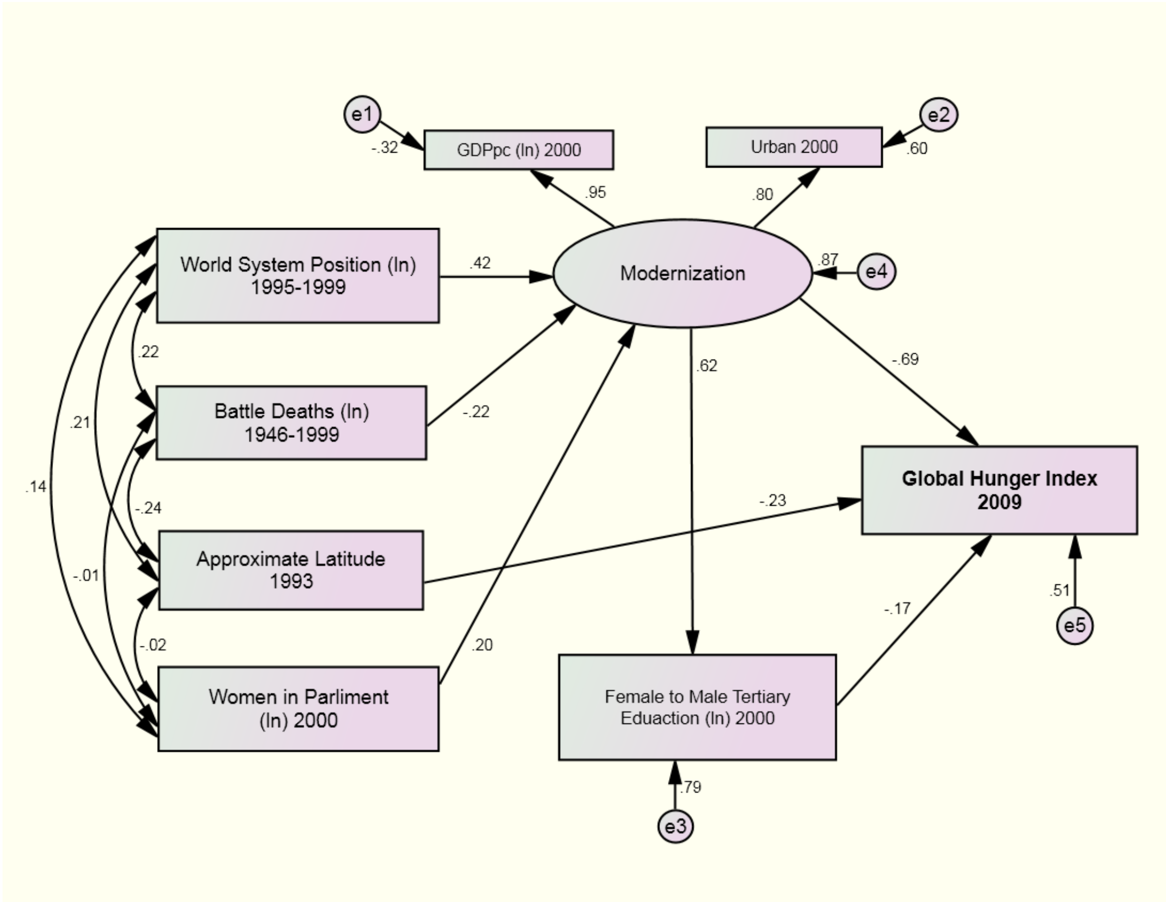

Figure 2. Gender Inequality Structural Equation Model Predicting the 2010 Global Hunger Index*
*N=70, Chi-square=11.76 (non-sig.); IFI, CFI=1; RMSEA=0; all pathways statistically significant at the .05 level or better using a one-tailed t-test.

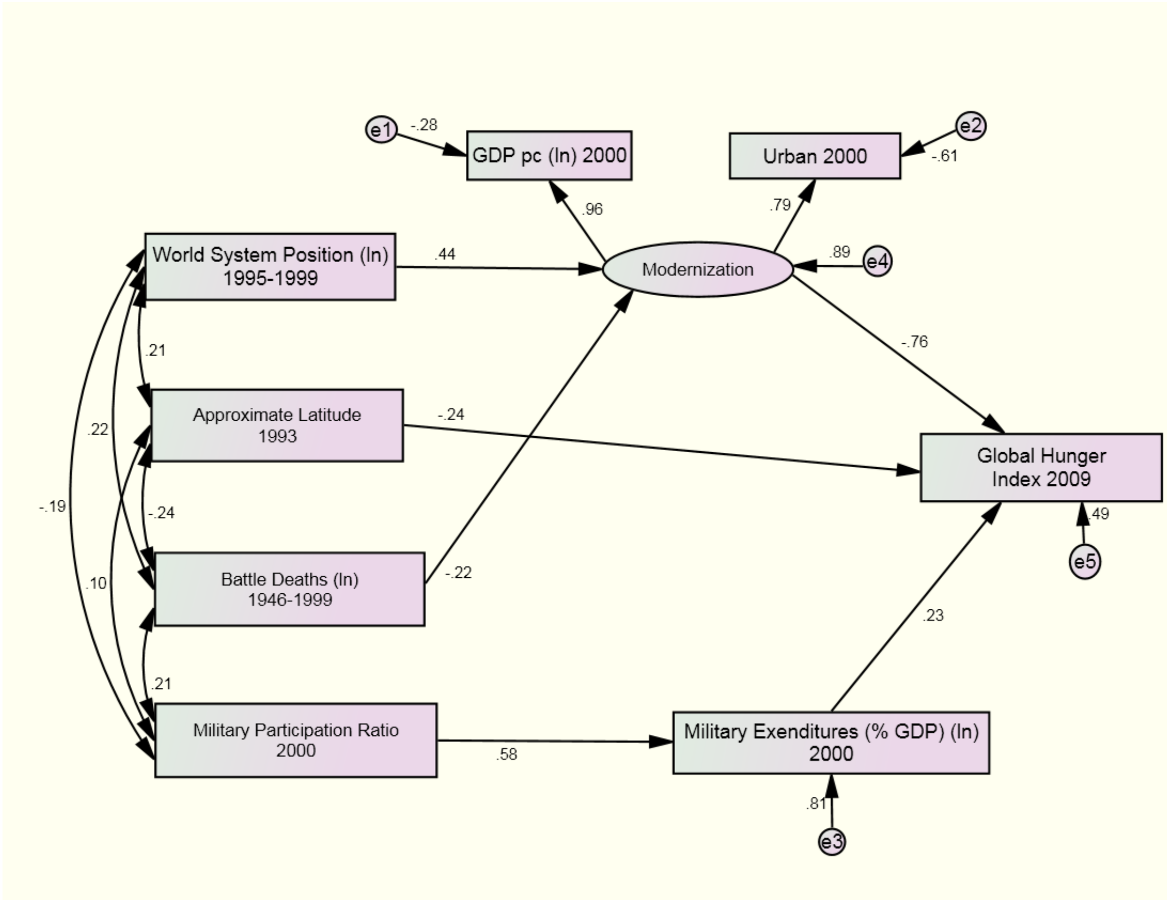

Figure 3. Conflict and Militarization (Military Participation Ratio) Structural Equation Model Predicting the Global Hunger Index across Developing Nations*

*N = 70, Chi-square=9.28 (non-sig.); IFI, CFI=1; RMSEA=0; all pathways statistically significant at the .05 level or better using a one-tailed t-test.

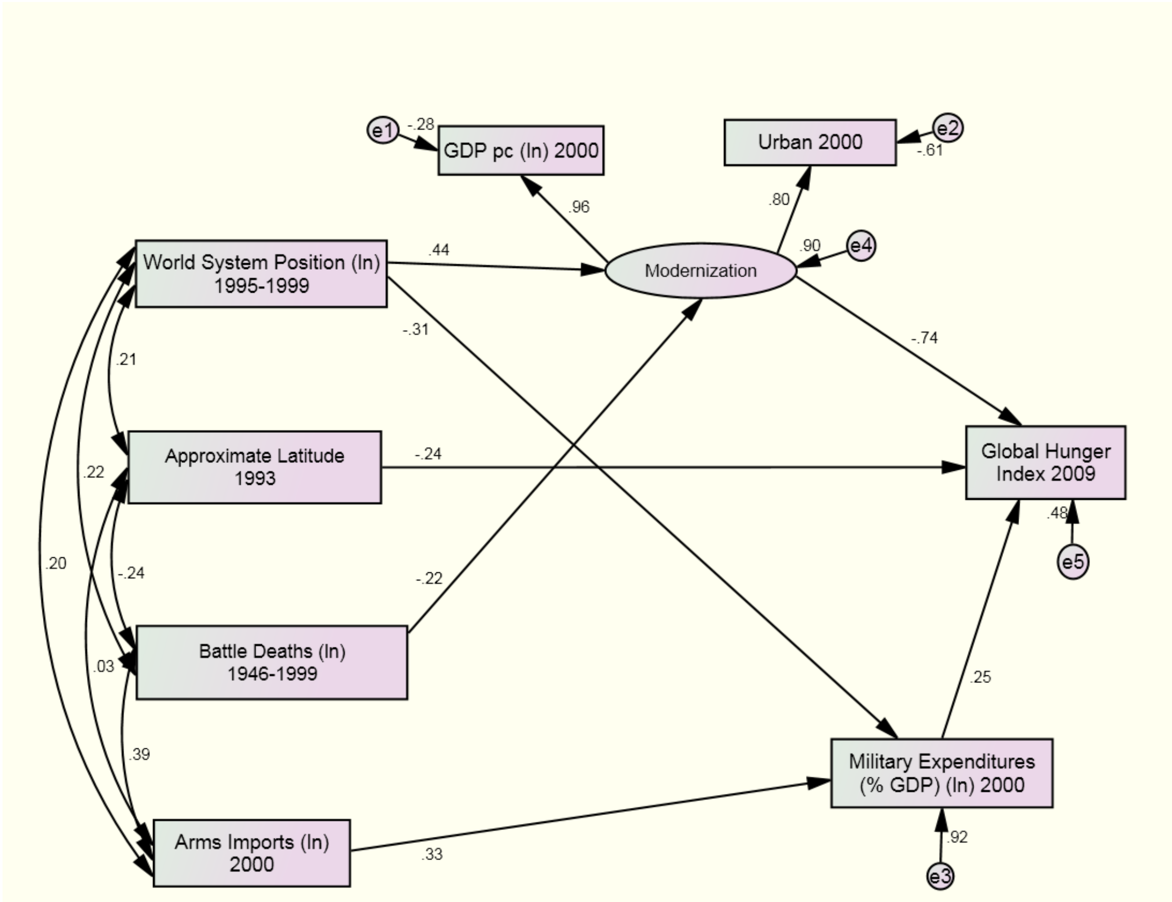

Figure 4. Militarization and Conflict (Arms Imports) Structural Equation Model of the Global Hunger Index across Developing Countries*

*N = 70, Chi-square=8.05 (non-sig.); IFI, CFI=1; RMSEA=0; all pathways statistically significant at the .05 level or better using a one-tailed t-test.

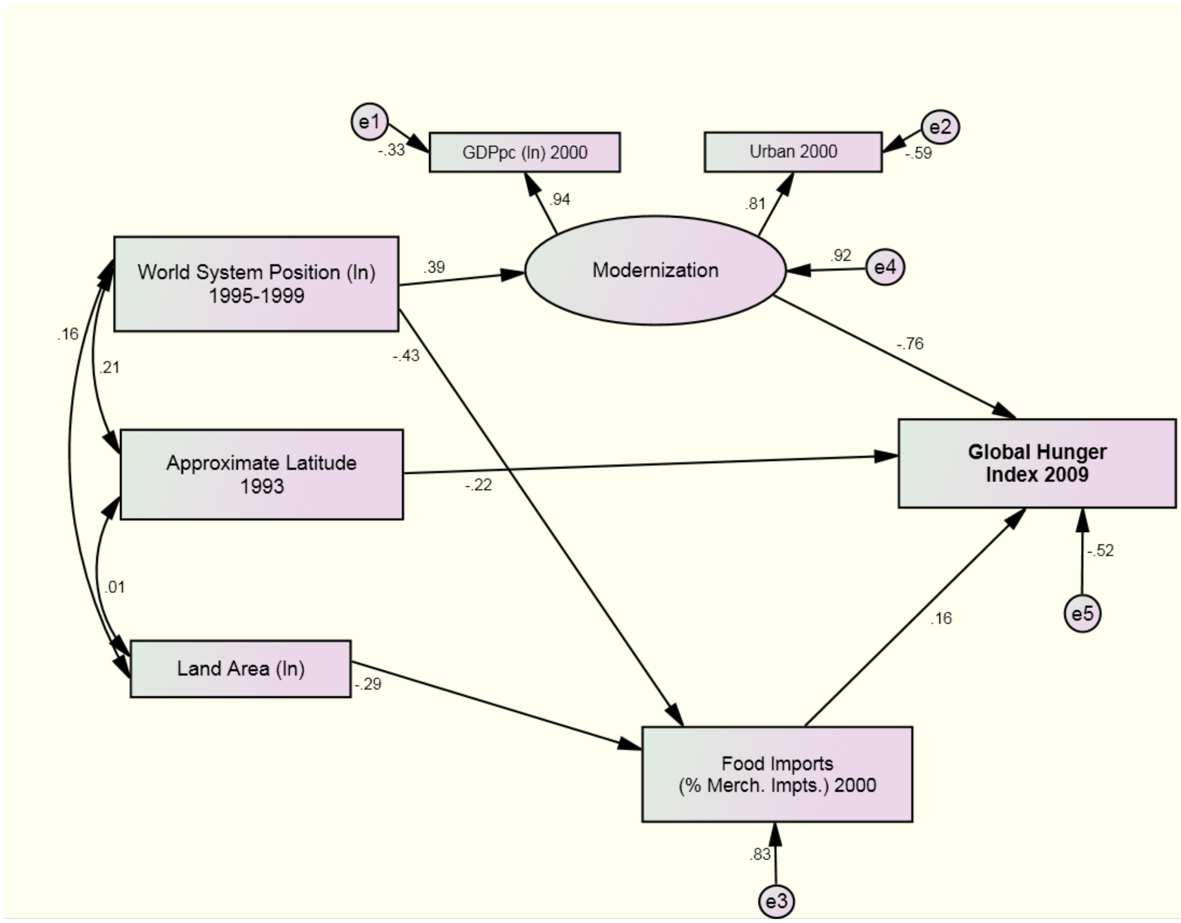

Figure 5. Global Food System Structural Equation Model across Developing Nations*
*N = 70, Chi-square=11.36 (non-sig.); IFI, CFI=1; RMSEA=0; all pathways statistically significant at the .05 level or better using a one-tailed t-test.

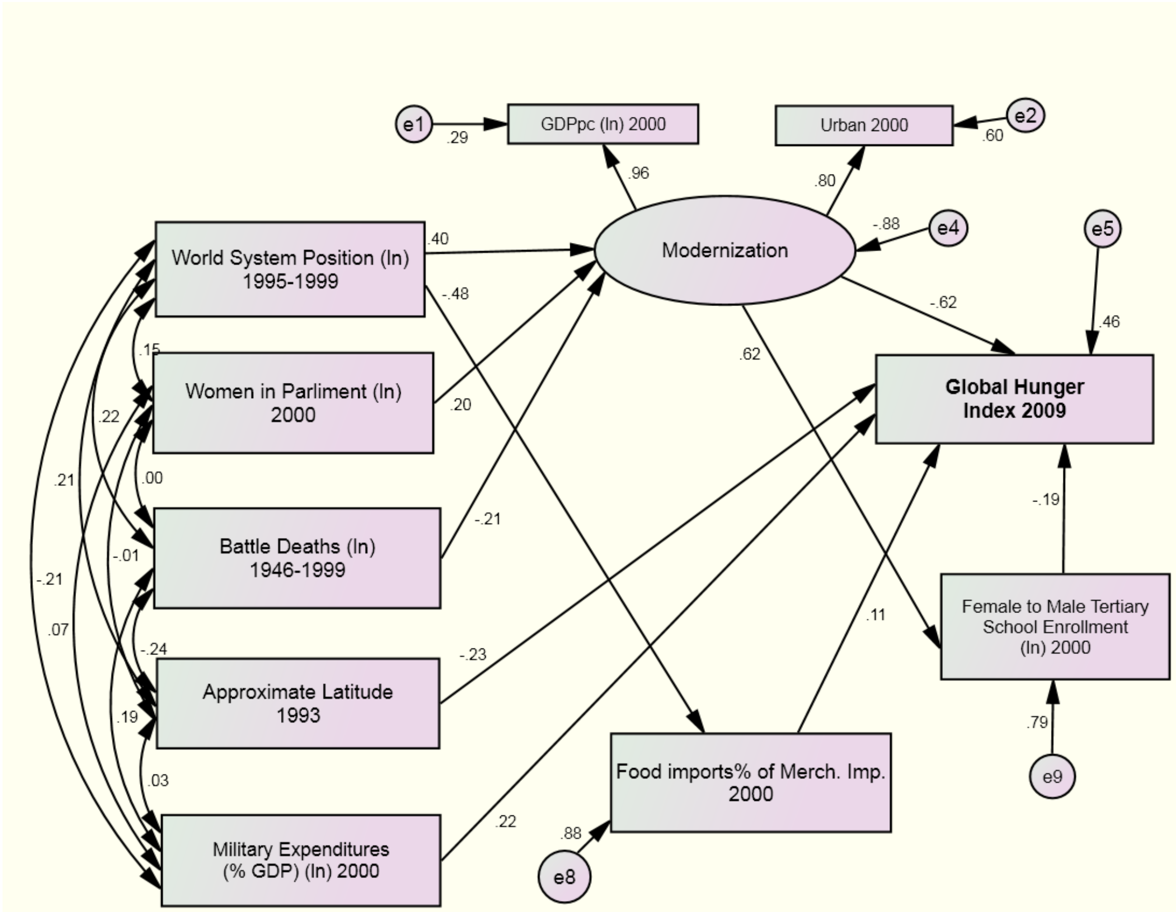

Figure 6. Trimmed Structural Equation Model for Theory Construction
*N = 70, Chi-square=21.88 (non-sig.); IFI, CFI=1; RMSEA=0; all pathways statistically significant at the .05 level or better using a one-tailed t-test.

APPENDIX

Appendix A. Countries in Sample and Global Hunger Index Scores

Burundi	39
Congo, Dem. Rep.	39
Eritrea	37
Sierra Leone	34
Chad	31
Ethiopia	31
Niger	29
Cent. African Rep.	28
Haiti	28
Madagascar	28
Yemen, Rep.	27
Zambia	26
Angola	25
Bangladesh	25
Liberia	25
Mozambique	25
Rwanda	25
India	24
Cambodia	21
Pakistan	21
Tanzania	21
Zimbabwe	21
Burkina Faso	20
Kenya	20
Mali	20
Myanmar	20
Nepal	20
Sudan	20
Gambia, The	19
Lao PDR	19
Malawi	19
Tajikistan	19
Cameroon	18
Guinea	18
Nigeria	18
Benin	17
Senegal	17
Cote d’Ivoire	15
Indonesia	15
Mauritania	15

Uganda	15
Namibia	14
Guatemala	13
Mongolia	13
Philippines	13
Botswana	12
Ghana	12
Lesotho	12
Vietnam	12
Bolivia	11
Nicaragua	11
Armenia	9
Dominican Rep.	9
Azerbaijan	8
Ecuador	8
Honduras	8
Panama	8
Thailand	8
Uzbekistan	8
Gabon	7
Peru	7
South Africa	7
China	6
Colombia	6
Georgia	6
Morocco	6
Paraguay	6
Turkmenistan	6
Venezuela, RB	6
Syrian Arab Rep.	5