

# Food Production or Food Distribution: The Key to Global Food Security?

*Edward L. Kick*

Department of Agriculture and Natural Resource Economics, North Carolina State University  
*elkick@ncsu.edu*

*Francesco Tiezzi*

Department of Animal Science, North Carolina State University  
*f\_tiezzi@ncsu.edu*

*Diego Castedo Pena*

Department of Mathematics, North Carolina State University  
*dcasted@ncsu.edu*

## Abstract

Major world agencies have identified a serious contemporary food insecurity problem, and sound even louder alarms that by the year 2050 around one billion people will be “food insecure.” The solution proposed by the World Bank in a 2012 Report is that the world grow significantly more food. Eyes certainly are on the US to remediate this problem by growing more livestock. Is “more food” the answer? This study uses World Bank data and path/structural equation modeling to determine the veracity of this position versus another. It is counter argued that food distribution and waste prevent food from reaching substantial segments of the world’s population. That is, the poor and dependent are unable to gain access to food that is privateered by governance systems that permit rulers and the wealthy to access food, and set food prices at unreachable levels for the poorest of the poor and, sometimes, even the middle class. Further, wages are set below the level needed to purchase basic food stuffs. The reaction has been food riots in countries ranging from Venezuela to the Middle East countries such as Lebanon, Jordan, Libya, and Egypt, among others.

## Keywords

food production – food distribution – food security – modernization theory – world systems theory – dependency theory

### 1 Introduction

The United Nations observes 795 million people of the 7.3 billion people in the world were suffering from food insecurity in 2014-2016. By “food insecurity” we mean the state of not having reliable access to a sufficient quantity of affordable, nutritious food. Almost all the food insecure people, 780 million, live in developing countries. By comparison there are 11 million people in this condition in developed countries (FAO 2015).

It has been argued that there will be a global food insecurity cataclysm if the way we produce and distribute food is not changed. What is the solution? The World Bank (2013) and the FAO (2012) argue what is needed are agriculture systems that produce 50 percent up to 70 percent more food to feed the world's 9 billion people by the year 2050.

We examine the mechanisms that are said to cause food insecurity in the remainder of this article. We use World Bank data coupled with data from related sources to identify the direct and indirect causal factors that lead to food insecurity using a structural equation analysis to estimate linked causal forces.

### 2 General Theories

It is noteworthy that World Bank analysts suggest that in addition to the threats addressed above, climate change could further attenuate crop yields by more than 25 percent in upcoming years. The world's natural capital, in the form of land, biodiversity, oceans, and forests, is being depleted at unprecedented rates. Thus, food insecurity may be substantially greater, particularly for the poorer sectors of the world. The World Bank argues that without appropriate action regarding global warming, levels of hazard will be greatly augmented for water resources, and in all ecosystems, affecting food insecurity and human health. While every world sector will be affected, there will be a particularly strong impact for countries least able to engage in what functionalists refer to as “adaptation,” i.e. the poor, who have least control over world-system processes. Causality is a major question. This includes the Green Revolution and the way

political economic forces affect national capitals. Building on path analyses and SEM, our overall conclusion is that achieving global food security involves global and national alternations in many complex and interdependent ties between the global and national production and distribution systems, and particularly often conditioned by the domestic political system.

### 2.1 *Modernization Theory*

Modernization theory in the social sciences views development as the progression of a society's human values, culture, and technology. This interpretation is consistent with a host of sociologists who have written about modernization theory and its counterpart, world system/dependency theory. Modernization theory had its foundations in the works of Spencer and Rostow. The Westernization of developing nations creates a foundation for policy formation in the form of the Green Revolution. Advanced economies have the modern values, work ethics, superior technologies, and evolved capital institutions that are essential for development (Parsons 1951). Multilateral agencies controlled by these core countries advocated a policy for the modernization of agriculture during the Green Revolution era. These agricultural/developmental approaches are reflected in the transition to a globalization project emphasizing agricultural free-trade production strategies, and more recently, Bio-Revolution genetic technologies.

Herbert Spencer generally is conceded the role as the foundational sociologist in modernization theory with his evolutionary paradigm of societies, relying upon the "survival of the fittest" as a key dynamic in his approach. For societies those at the top of the development hierarchy demonstrated their fitness relative to others in the sorting of least to most developed in all the aspects of modern development (mechanization, technology, education, both rural agricultural and urban advancement, and so on). Around a century and one-half later Walter W. Rostow articulated a more concrete approach to the "linearity" in the evolution of development in comparative societies. His evolutionary stages of economic growth include at the starting point "traditional society" with limited technology and no centralized political system, followed by "pre-conditions to take off" where external forces initiate trade with the society, domestic infrastructure is advanced by more concerted technological development, and a national identity begins to take on a discernable form. In the subsequent "take off" stage urbanization moves at a faster pace, and primary goods move to secondary goods as industrialization takes on a more central place in the productive system. Then a "drive to maturity" with diversified industrialization follows along with a visible switch to advances in the social infrastructure (e.g., schooling). Finally, there is the age of "mass consumption,"

the ultimate phase, with expanded industrialization, consumerism, and accompanying urbanism.

## 2.2 *Dependency and World-Systems Theories*

Political economy proponents arose as a counter to many of the claims of modernization scholars. Dependency and world-systems theorists focus on the inequitable power relationships among nations across the globe that result from exploitative production, trading, investment, and the overall structural positions of power and dependency of nations in the world division of labor. These power/dependency processes are crucial to the political, economic, and food security concerns of all world sectors. Wallerstein (1974) identifies a three-tiered world system of core, semi-peripheral, and peripheral countries in which the core extracts surplus value from the cheap labor and exported raw materials of the periphery, and to a lesser extent the semi-periphery. This fosters nearly across-the-board advance for core countries. While it is also less true for the semi-periphery or “transitional” societies (e.g., India, China), the periphery is destined to under-development. The capitals that the core may take for granted—political, economic, infrastructural, military, and human capitals, for example—are poorly developed and disarticulated from one another in the Global South. In turn, uneven trade between the world-system tiers leads to limited domestic capital formation, and low levels and misalignment of the capitals in the periphery. Taken together these and domestic upheavals limit the amount of investment that can go into social welfare and development promotion. In turn, this results in severe social problems such as hunger and the transfer of waste to the periphery, and to a lesser degree, the semi-periphery. The global agricultural production in the periphery in trade with the core’s high-tech commodities undermines the developmental outcomes in the periphery, jeopardizes universal food security, while simultaneously enabling luxury and excessive food consumption in the core.

## 3 Method of Analysis

### 3.1 *Sample*

To adjudicate the many complementary as well as contradictory themes above, we drew a sample of 162 nations from the over 218 countries that comprise the world. Excluded from our sample were small countries with populations of just a few thousand. Excluded also were countries that are not politically independent from another nation, and those that do not report conventional indicators to international organizations (e.g., North Korea). Our sample is

larger than is typical in part because our effort took relevant data from known sources that lead the world in breadth of data coverage (e.g., World Bank vd; FAO vd; SIPRI vd). We list the countries analyzed in Table 1 (see Appendix). We do not detect any easily discernible sample bias (except for the above), and believe our sample broadly represents all geographical areas in the world.

### 3.2 *Model*

We use structural equation modeling. The models represent a web of variables with paths of origin, or independent variables, drawn to dependent variables; causation is shown in a variable's position as recipient of a path with an arrowhead pointing to it. In some cases, we employed indexes comprised of variables represented by several latent measures of the construct of concern. In the latter case we gleaned from the literature the major variables that represented the construct of interest. Tests were performed to ensure our constructs met the conditions prescribed by the ordinary least squares technique as described in Blalock (1979) and in statistical analysis programs such as SAS, SPSS, R, and others. In other cases no representative proxy variables were necessary and the variable itself could be used (e.g., gross domestic product, representing financial capital). Path analysis, a closely associated technique, was used in these cases. The software of choice is R.

Variables were causally connected by the theoretical expectations or hypotheses described above. No single researcher hypothesized the models tested, but each contributed hypotheses that we linked in order to create a "big picture" of the food security process. In so doing we were able to address related questions that formed a portion of the overall model. We could address the question of increasing food production as the best solution to the serious problem of food security now and especially by the year 2050. We also address probable sustainability consequences for the world as a whole of current solution sets. We do not directly test proposed differences in core, semi-periphery, and periphery relationships. However, in many cases we can indirectly infer these differences from the known descriptive statistics of each variable.

Readers are invited to contact us if they are interested in bivariate associations and descriptive statistics.

### 3.3 *Dependent Variables*

We report results for the central food security dependent variable coded by the World Bank as the average daily intake of protein. The equal treatment of all meats in the variable is warranted since an ounce of cooked meat of virtually any species produces near equal protein value. Other alternative measures were rejected because they often were confined to a marginal number of cases,

and subject to issues of recording and reporting difficulties. Moreover, they did not capture the central feature of our food security conceptualization, that consumption, rather than production, is the key to understanding food security in the world today. Thus by including an ecological indicator driven by consumption processes, we are able to judge the impact of agricultural production and consumption in our model.

### 3.4 *Independent Variables*

#### 3.4.1 Geographical Variables

Sachs (2001), Sachs and Warner (1995), and others in the economic literature have initiated significant discussion of the role of geography and natural resources in augmenting food security. For instance, the geographic latitude of societies, reflected in locales such as tropical and desert spaces, are associated with a range of other domestic natural and human resources that adversely impact societal development and food security. Africa's geographical position hinders virtually all forms of development due to the absence of fertile soils and abundance of diseases, pests and parasites, hindrances to photosynthesis, and widely spread infectious diseases.

Diamond (1997) contends that the lead established in the Global North (e.g., Western and Eastern Europe, Eurasia) that grew grain species with a resistance to pathogens created an advantage over regions in the Global South (e.g., Latin America, Africa). The latter had comparatively little chance to compete. Moreover, the number of animal species that could be domesticated was significantly regionalized in Eurasia over the longer run, which established a widespread immunity to diseases and long-distance land and ocean trade from China to far distant points in Western Europe. In Diamond's words (Pg. 185) "Eurasia's west-east axis allowed Fertile Crescent crops quickly to launch agriculture over the band of **temperate latitudes** from Ireland to the Indus Valley ..." Conversely, "Eurasian crops that were first domesticated far from the Fertile Crescent but at the same **latitude** were able to diffuse back to the Fertile Crescent." Thus we code Diamond's latitude variable as "1" for those countries within Diamond's Eurasian latitudinal arena and assigned "0" to societies outside of it.

We also include an eco-system variable different from Diamond's latitude-based variable. The eco-system scores are assigned on the basis of the map of biomes or ecosystems as defined by the Museum of the University of California, Berkeley. Descriptions provided by that source and other comparable sources such as the University of Michigan, University of Missouri, and the National Geographic Society classification of biomes were used to rank order on an ordinal scale those eco-systems most conducive to the production of plant and

animal life. Our scores range from “1” assigned to the least productive (e.g., desert), “2” for the next-to-least productive (e.g., tropical rainforest and savannah), and “3” for the most productive biomes (e.g., temperate forest, grasslands, and taiga). Many countries are homogeneous as to ecosystem, but some are heterogeneous (e.g., the US). For such cases a panel of five judges estimated the proportion of each ecosystem in each case. The degree of continuity in judges’ scores was very high (over 80 percent) and when scores were not identified the judges convened and reached a consensual judgment after examining initial classification differences. Ratings are available upon request.

#### 3.4.2 Global Power

We use a variable measuring the centrality of a nation in the international arena, or its world system position. The data involve matrices of nation-to-nation multiple networks—economic trade, military exports, the existence of embassies from foreign countries on host soils, and political treaties (a symmetric matrix) for the years 1995-1999—which identify the degree of centrality of each nation vis-à-vis all others in the global political economy (Galtung 1971). Their centrality and power/dependency is demonstrated through the application of a “multiple-network analysis” (“blockmodel”) program that simultaneously analyzes the structural positionality across the four networks for each nation. The results show which nations cluster into similar structural positions insofar as they are similarly related to all other nations across all four dimensions of connectivity (Kick et al. 2011). The software to produce the final results is from UCINET from the University of California. This technique used by Kick et al. is fully reproduced and justified in Snyder and Kick (1979).

#### 3.4.3 Capital and its Forms

To examine earlier reported arguments, we used measures of internal capital variables. Some researchers had principal interest in economic capital while others reported interest in causal relationships involving a wide variety of capitals. Capital as used in this article refers to resources or assets. Often they are invested in their many forms to create new resources, frequently of a variety of new types, creating new capitals. We follow Flora and Flora (2013) in identifying seven capitals or sets of resources, and emphasizing six of them in our analyses. Our treatment “natural capital” includes air, water, soil, biodiversity, weather, plant life, and other related items, including those of high value such as oil. Focuses on some forms of capital are treated as assets and others as “curses” in prior research. Our initial set of resources, natural capital in the form of ecosystems, are conducive to plant life and animals supported will aid

all forms of sustainability. In other words, optimal ecosystems are hypothesized to improve forms of national capital.

Political capital permits nations to translate its mores and norms into rules and regulations that enforce what has been referred to as the “social contract,” while distributing the pool of collective resources (gleaned e.g., from taxation) into many components that serve the collective good (highways, individual health, education, and welfare). It serves to sway the “collective will” on the distribution of resources, and it subsequently enacts that will. Political capital enhances democracy, and stands as a central variable in subsequent advantage. In other words it determines the others, including economic capital. We follow many who posit political capital leads to economic capital, and indirectly through other capitals affects food security and the environment. Note then, that we are really emphasizing the distributive role in food insecurity. This contrasts with the position that increased production of food will solve anticipated desires in food security by 2050. We argue instead for the importance of food distribution. Our political capital variable is taken from the Worldwide Governance (WGI) projects, which report country-level data for 1996 to the present on six dimensions of government: Voice and Accountability; Political Stability and Absence of Violence; Government Effectiveness; Regulatory Quality; the Rule of Law; and Control of Corruption (World Governance Indicators 2014).

Human capital is the human power of a nation, its skills, knowledge, and experience or legacy continued can be used to create some of the most valued “outputs” of society. There is disagreement over what “human capital” is, exactly, including those who emphasize economic output and others, such as us, who also treat other measures of “development,” including human welfare.

Financial capital, in the words of Flora and Flora (2013), includes “savings, income generation, fees, loans and credit, gifts and philanthropy, taxes and tax exemptions.” We discovered empirically that the many proposed measures of financial capital do not load together in a confirmatory factor analysis. Given this we use the one generally accepted measure of financial capital, the gross domestic product per capita. The GDP/c is skewed so we log transformed our rational measures of it. The wealth per capita variable used is taken from the World Bank.

Infrastructural capital is built capital. It is instrumental for the purpose of individual and collective living and the reaching of goal attainment by individuals, families, communities, and nations. Roadways, bridges, trains, planes, and other conveyances are well-known forms of infrastructure. In contemporary times it has increasingly become the preferred means of communication (such



as cell phones). The infrastructure variable included an index of the number of fixed broadband internet subscribers per 1000 people and passenger cars per 1000 people. The data were compiled by the World Bank, and accessed through their data portal; data used were circa 2000. These two variables loaded highly as a single factor.

We add national military capital to the Floras' (2013) inventory of capitals. Military capital has been the critical mechanism used by states to achieve their national will using the real or the prospects for real coercive force across most of human history. These may in the most crisis-filled times be employed to enforce the will of the state on segments of the nations' population, or alternatively, the state. Military capital has become institutionalized as a means to achieve national goals that either oppose the goals of other nations, or work in tandem with them. President Eisenhower identified a "military-industrial complex" in the US that had come to define and pursue their views of the goals of the nation, and impose them on the wills of citizens and opposing nations. However, the military serves multiple purposes that are different in the core-type nations versus the non-core. Military expenditures are tied to national improvements in employment and wages. For example, for developed societies they introduce technological improvements that have domestic applications, such as drones in agricultural surveillance, the production of which boosts salaries for engineers and line-workers jointly. Among developing countries militaries employ equipment and soldiers to aid farmers in boosting agricultural production. We employ a measure of national expenditure per soldier taken from the World Bank (Military expenditures/armed forces personnel) for circa-2000 military capital.

Agricultural capital should be one of the central dependent variable of this study. World Bank arguments underscore the importance of food production for food security. Societies with the greatest human capital and machine productivity would rank most highly in their agricultural production. Of course modernization hypotheses, consistent with the World Bank approach, argue for the importance of food production for food security, while world systems' theory (dependency theory) counter argue that distribution dynamics are of greatest importance.

## 4 Results and Discussion

### 4.1 *Notable Findings of Analysis*

Results reported in Figure 1 show there is a statistically significant link between national ecosystem and global power, and global power extends a moderately

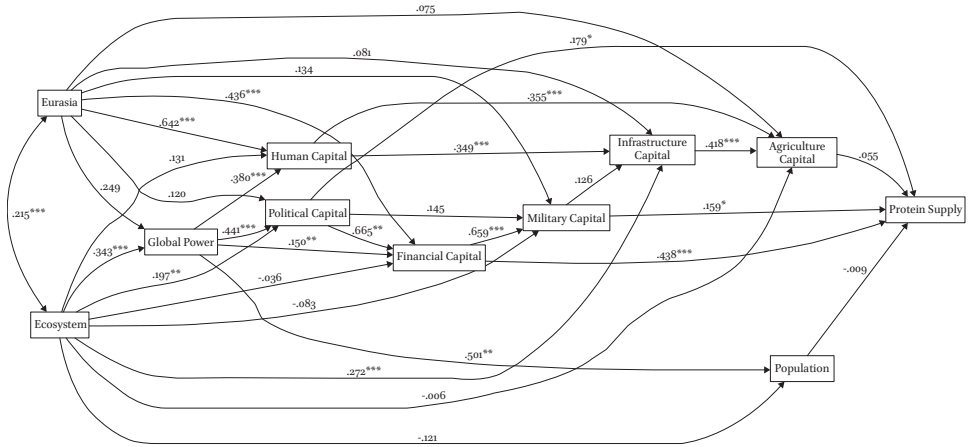
strong impact on political capital. Further there is a favorable economic return (financial capital) to greater political capital. Inconsistent with the East-West axes themes developed by Diamond (1997), Eurasia has no effect on global power. Many countries in the European block identified by Diamond are internationally weak, and many countries outside Eurasia, such as the US, Australia, Canada, and others are strong. A few of the more nuanced arguments of Diamond are suggestive of the importance of local environmental conditions. Further we embrace an eco-system argument because the effects of ecosystems are quite interpretable. When considered historically, this helps interpret the experiences of Europe especially. Western European countries, in particular, enjoyed the advantages of natural resources that are part of their well-endowed ecosystems. As argued earlier other world-system and dependency theorists detail how historically this was true to a lesser degree in Central and Eastern Europe. These included the availability of food and housing resources, and advantages in the construction of the machinery and weaponry of conquest. Further, local eco-systems' importance is seen in a visual inspection of the raw data on the world's biomes, e.g., the many advantages of "forests" or "temperate forests" versus grasslands, savannah, rainforests, and deserts. It is rather clear how an abundance of natural resources has payoffs for the essentials of life. For example, wood and water are in a variety of other ways a capital mainstay of primitive life, the ascendancy of Europe beginning in the 1400s, and the rapid hegemonic climb of many Western European powers from then (Portugal and Spain) through the more contemporary power of Great Britain and the US, and to a somewhat lesser degree, the power of countries such as Canada, portions of Australia, and so on.

Notable as well are the consequences of geography for political capital and for the global centrality or power of nations. There is little question this feeds back into the domestic system as global prominence enhances domestic well-being.

National wealth, as modeled by financial capital, would seem likely to improve the national power to produce high-protein foods, however it does not improve protein-related food security through the route of agricultural capital. This finding is discussed at some length subsequently. Food production certainly requires a certain degree of infrastructural development, and this is confirmed in the coefficient between infrastructural capital and agricultural capital.

#### 4.2 *Discussion*

A main theme of this study is the veracity of the statement by the World Bank that nations must produce substantially more food to feed the nine billion



NOTE: The numbers on each path if starred are statistically significant standardized coefficients representing the impact of the causal variables on the caused variables.

FIGURE 1 Model of the causal antecedents of food security (daily protein consumption per capita).

people expected by the year 2050. Changes in rainfall patterns, soil quality, available arable land, crop yield, plant diseases, dietary choices, and important resources such as petroleum and coal are likely to exacerbate the problem. Some optimistically posit that technological trends will improve food production and environmental protection. Others more pessimistically question if the nature of the global structure, both geographically and socio-economically, can contribute to universal food security. Based on our analyses, we offer a discussion of perspectives on global food security.

Our path/structural equation analysis of 162 countries shows biomes' direct impact on national wealth is trivial, but its influence is substantial when considered indirectly through the international strength of states, which is seen in power and political capital. Superior geographical positions permit accumulation of substantial surplus that is manifested by political capital's function of resource distribution. For example, the non-homogeneous countries of Eurasia share approximately the same latitude, though not biomes, and these countries differ substantially in their economic strength, state viability, and environmental circumstances. Diamond's (1997) early treatment of such issues appears to emphasize the near sole importance of east-west versus north-south axes, and ultimately latitudes. Yet, his argument is a great deal more nuanced and includes some eco-system considerations as well. Perhaps due to his own emphases, the many other geographical precursors to economic well-being in

Diamond's work commonly are secondary in treatment of his work to east-west geographic positioning. It is common for studies in sociology to report strong, direct linkages between the structural positions of the power of nations and consequent national economic development and growth, as well as inequality. For the contemporary period tapped by our data, however, we found world power vis-à-vis other nations predicted to national state strength or political capital, which in turn determined economic development. This finding is different from emphases adopted in a number of prior treatments in that we had never before seen an estimation that employed state strength as a mediating variable translating the effect of global power on a range of domestic outcomes, including economic capital.

It is common to report direct effects between world-system position and economic development. Wallerstein's (1974) pioneering approach to the world system was a Marxian- inspired approach, which established a legacy that has seemingly ignored the possibility of a nation state translating its multiple forms of international power to significant economic advantage indirectly. Possible mechanisms include the state's often-significant collection of taxes, and determination of domestic division and usage of those revenues, to the setting of land ownership rules and regulations, to the state's coalitional powers with giant multinationals, and in the modern era, its power to bail out a sizeable proportion of the corporate world on a selective basis to keep them afloat during the most challenging of times. By so doing, the wealthiest of states may have avoided or postponed cataclysmic national economic consequences. This is consistent with the themes of world-system/dependency theory, which emphasize the linkages between the government, the military, and big business, rather than the "survival of fittest" approach of modernization theory. Do geographic effects operate through domestic capitals to impact economic development? Our results suggest geographic effects do, indeed, operate through domestic capitals. Domestic capitals are important in their own right, but they often translate geographic factors into a range of outcomes, including those that are economic in nature. Examination of interaction of the two domains and their consequences is an absolute necessity for future empirical examination.

Results support the modernization arguments that technological advances seen in infrastructural capital improve food production. Infrastructural improvements are commonly accompanied by wealth enhancements. Empirical linkages also demonstrated in earlier studies show the military helps poor farmers in case-study settings across the world (e.g., Nigeria, China) are shown here empirically as increases in average protein supply. These indirect ties indicate that the military helps ensure the population is fed in both the Global

North and South, at least over the time covered in our analysis. In the Global North, the usage of military technology in agriculture also explains this relation. For instance, the drones used extensively in the military are now used to view the health of corn rows in real-world farming, and in experimentation in agriculture.

We find an insignificant relationship between the production of agricultural capital and the average daily intake of protein. The production of food does not bear a one-to-one relationship with the consumption of food. Food waste and mal-distribution by the state will impair the average protein intake of the masses. Domestic production in the non-core may increasingly be destined for export by agribusinesses. World-system and dependency authors argued as early as 1948 that the Global South's production of food was "distorted" bringing profits to local elites in alliance with foreign powers, much to the detriment of farm workers or peasants (Prebisch 1948). Modernization programs for the infrastructural development of poorly developed countries may foster the production or import of food, but are based on the planting, fertilizing, pest management, and water management techniques and preferences of the Global North more so than the practices and cultural legacy of developing nations.

As we affirm the growing concentration of wealth within a sizeable number of developing and increasingly developed countries and in the US, we raise the possibility that this will be true between northern and southern nations as well. It is not clear that the associated discrepancy in food security can be offset by technological innovations and increased production of food, as suggested by the World Bank. The insignificant effect of agricultural capital on protein supply suggests that increases in food production will continue to be mal-distributed in the developing world. Without increased wages and broader wealth distribution true food security may be out of reach for some significant segment of the world's population. On the basis of our analyses, the food security gap cannot be reduced by 2050, not because of insufficient technology and global food production, but because of inadequate wealth distribution within countries and the concomitant inability of a portion of countries' population to purchase sufficient food locally.

## 5 Conclusions

Portions of Diamond's East-West hypothesis set appear accurate; but, others are contradicted by this research—Diamond's variable (Eurasia) has no effect on global power (0.249), while ecosystem does (0.343\*\*\*). Both (ecosystem and global power) together explain a great deal of the food security model (see Figure 1).

The World Bank says: "The future needs an agricultural system that produces about 50 percent more food to feed the world's 9 billion people by 2050 (Alexandratos and Bruinsma 2012)." However, agricultural capital (total food production) has no effect on protein supply (0.055) at all, as calculated in our quantitative model. Thus, increasing food production likely will not achieve global food security. Is it surprising "more food" will not solve global food insecurity problems? While they are not in conformity with some World Bank and FAO "more food production" programs, distribution issues clearly are salient to the solution of global food security.

Apart from governmental actions that mitigate food security (through, e.g., high levels of natural corruption, food hoarding for profit, and widespread food theft), food waste accounts for 30-40 percent of food loss, equivalent to about 33 grams of protein. This should be compared with the world average daily consumption of 77 grams of protein. The UN agrees with us that we need to eliminate food waste, and push governments to guarantee that foodstuffs are equitably distributed. Governments might fine retailers for throwing away edible food. This strategy is usually seen in developed countries, as suggested by the law passed by France. Post-harvesting problems are more common in developing countries. Food is wasted due to poor harvesting techniques, lack of technology, limited storage facilities for food, and inefficient transportation infrastructure. Discussion of aid to the third world might well consider improvement related to these dynamics, which also will decrease their dependency.

Food distribution is a significant limitation to food security. International organizations may be needed to convince some governments to guarantee equitable food distribution, and to hold governments accountable for corruption. Feasibly, military capital can be used by international organizations and governments to safeguard the equity of food distribution. These actions hopefully will spur the policy changes necessary to ensure food security globally.

Finally, food security may be part and parcel of other closely distributional issues that have received scant attention in this article. For example, if we consider food distribution alone will this be a successful cure for contemporary food riots? The current food riot in Venezuela is directed against the government and their perceived mismanagement of oil revenues. Rioters reason that had proper attention been given to the management and distribution of these revenues, this could have substantially improved the availability of foodstuffs to the population, including those living at the starvation level.

Similarly, food riots across the Middle East have been widespread, and revolve on issues of food subsidies, inflation, and economic stagnation. However, they have emerged in modern times as well as dating back decades in key countries, including Lebanon, Morocco, Jordan, Libya, and Egypt. It is difficult to separate the "food riot" from other forms of Middle Eastern discontent

stemming from the disparity between the wealth of a small proportion of the elite and the selective poverty of the masses. Ultimately the form of governance adopted by the state has impacted a range of domestic ills in addition to food itself. That form of governance manifests itself in the distribution of a range of resources—all those related to the forms of inequality in society.

### Acknowledgement

We wish to thank Dr. John Classen for his helpful comments on this article. We also wish to thank the editor for his extensive and useful critiques and suggested resolutions to a number of substantive and editorial difficulties. Any ultimate errors are of course our own.

### References

- Alexandratos, Nikos and Jelle Bruinsma. 2012. "World agriculture towards 2030/2050: The 2012 Revision." ESA Working paper No. 12-03. Rome, FAO.
- Blalock Hubert M. 1979. *Social Statistics, Revised 2nd Edition*. New York: McGraw-Hill.
- Diamond, Jared. 1997. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: W.W. Norton.
- FAO, IFAD, WFP. 2014. *The State of Food Insecurity in the World 2014: Strengthening the Enabling Environment for Food Security and Nutrition*. Rome: FAO.
- Flora, Cornelia Butler and Jan L. Flora. 2013. *Rural Communities: Legacy and Change, 4th Edition*. Boulder, Colorado: Westview Press.
- Galtung, Johan. 1971. "A Structural Theory of Imperialism." *Journal of Peace Research* 8(2):81-117.
- Kick, Edward L., Laura A. McKinney, Steve McDonald, and Andrew Jorgenson. 2011. "A Multiple-Network Analysis of the World-System of Nations." Pp. 311-328 in *The Sage Handbook of Social Network Analysis*. Edited by John Scott and Peter J. Carrington. London: Sage.
- Parsons, Talcott. 1951. *The Social System*. Glencoe, IL: Free Press.
- Prebisch, Raúl. 1948. Acerca de los anteproyectos sobre Banco Central y bancos. *Revista de hacienda* 13:146-178.
- Rostow, Walter W. 1960. *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge: Cambridge University Press.
- Sachs, Jeffrey D. 2001. "Tropical Underdevelopment." Working Paper 8119. Cambridge, MA: National Bureau of Economic Research.

- Sachs, Jeffrey D. and Andrew M. Warner. 1995. "Natural Resource Abundance and Economic Growth." NBER Working Paper No. 5398.
- Snyder, David and Edward L. Kick. 1979. "Structural Position in the World System and Economic Growth, 1955-1970: A Multiple-Network Analysis of Transnational Interactions." *American Journal of Sociology* 84(5):1096-1126.
- Spencer, Herbert. 1851. *Social Statics*. London: Chapman.
- Wallerstein, Immanuel. 1974. *The Modern World-System: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*. New York: Academic Press.
- Worldwide Governance Indicators. 2014. (<http://info.worldbank.org/governance/wgi/index.aspx#home>).

## Appendix

TABLE 1 *List of countries used in the analysis*

Albania	Dominican Republic	Latvia	Rwanda
Algeria	Ecuador	Lebanon	Saudi Arabia
Angola	Egypt, Arab Rep.	Lesotho	Senegal
Argentina	El Salvador	Liberia	Serbia
Armenia	Equatorial Guinea	Libya	Sierra Leone
Australia	Eritrea	Lithuania	Singapore
Austria	Estonia	Luxembourg	Slovak Republic
Azerbaijan	Ethiopia	Macedonia	Slovenia
Bahamas, The	Fiji	Madagascar	Somalia
Bahrain	Finland	Malawi	South Africa
Bangladesh	France	Malaysia	Spain
Barbados	Gabon	Mali	Sri Lanka
Belarus	Gambia, The	Malta	Sudan
Belgium	Georgia	Mauritania	Suriname
Benin	Germany	Mauritius	Swaziland
Bolivia	Ghana	Mexico	Sweden
Bosnia and Herzegovina	Greece	Moldova	Switzerland
Botswana	Guatemala	Mongolia	Syria
Brazil	Guinea	Morocco	Tajikistan
Brunei Darussalam	Guinea-Bissau	Mozambique	Tanzania
Bulgaria	Guyana	Myanmar	Thailand



TABLE 1 *List of countries used in the analysis (cont.)*

Albania	Dominican Republic	Latvia	Rwanda
Burkina Faso	Haiti	Namibia	Togo
Burundi	Honduras	Nepal	Trinidad and Tobago
Cambodia	Hungary	Netherlands	Tunisia
Cameroon	Iceland	New Zealand	Turkey
Canada	India	Nicaragua	Turkmenistan
Central African Republic	Indonesia	Niger	Tuvalu
Chad	Iran	Nigeria	Uganda
Chile	Iraq	Norway	Ukraine
China	Ireland	Oman	United Arab Emirates
Colombia	Israel	Pakistan	United Kingdom
Congo, Dem. Rep.	Italy	Panama	United States
Congo, Rep.	Jamaica	Papua New Guinea	Uruguay
Costa Rica	Japan	Paraguay	Uzbekistan
Cote d'Ivoire	Jordan	Peru	Venezuela
Croatia	Kazakhstan	Philippines	Vietnam
Cuba	Kenya	Poland	Yemen
Cyprus	Korea, Rep.	Portugal	Zambia
Czech Republic	Kuwait	Qatar	Zimbabwe
Denmark	Kyrgyz Republic	Romania	
Djibouti	Lao	Russian Federation	