International Journal of Business and Social Research
Volume 07, Issue 01, 2017
ISSN 2164-2540(Print), ISSN 2164-2559(Online)

Cultural Changes and Food Production

Linghui Tang[1]

ABSTRACT

This paper explores the relationship between work-related values and food production modes. Following cultural materialism theory in anthropology, we hypothesize that the collective programming of mind began when humans adopted different methods to produce food. Using food production data in the 1970s and in the 1990s, we found that per capita production of milk was positively related to Hofstede's individualism and negatively related to power distance. Meanwhile, the production of fruits and vegetables in the 1970s was directly related to uncertainty avoidance. Similar results were found when applying the GLOBE cultural dimensions in the 1990s although technology development and globalization have weakened the relationship between food production and culture. The policy implications of the findings are discussed within the context of globalization of food industry.

Keywords: Culture changes, food production, work-related values.
JEL Codes: F00, O13, O33, Z13.
Available Online: 03-02-2017

1.0 INTRODUCTION

One of the most commonly made assumptions in cross cultural research is the stability of cultural measures and cultural distance between countries (Tung & Verbeke, 2010). However, many studies have found evidence regarding the dynamics of cultures in an increasingly integrated world. For instance, Heuer, Cummings, and Hutabaratt (1999) showed that the cultural difference between U.S. and Indonesian managers in terms of individualism and power distance had declined over time. With rapid economic development in China after the 1970s, Ralston, Egri, Stewart, Terpstra, and Yu (1999) found the new generation of Chinese managers is more individualistic and embraces less Confucian value than the old generation of Chinese managers does. Leung, Bhogat, Buchan, Erez, and Gibson (2005) attributed globalization and computer-mediated communications as driving forces for cultural convergence around the world. According to Tang and Koveos (2008), economic development, measured by GDP per capita, was the primary driver of cultural changes over time. Nonetheless, as pointed out by Hofstede (2015), limited research has been done to explain the processes that create

[1] Professor of Economics and International Business, School of Business, The College of New Jersey, Ewing, NJ 08628, USA, Email: tang@tcnj.edu, Phone: 609-771-2240

and maintain culture over time. We still know very little about how values and norms at individual or group level turn into societal patterns at national level. A more specific question for cross-cultural strategic management in multinational companies is whether company practices can eventually lead to cultural changes in foreign countries?

To answer this question, we examine an important human activity that has contributed to both cultural formation and cultural changes: food production. In fact, anthropologists and sociologists have long used food and its production to illuminate social-economic-political value creation process (see Mintz & Du Bois, 2002 for important reviews). In particular, food issues have been traditionally examined within the context of relatively closed local communities or ethnic groups until the 1980s when the global systems of food production, consumption, and sociality began to emerge (Phillips, 2006). Meanwhile, the seminal work conducted by (Hofstede, 1980 & 2001) is based on the assumption that work-related values in modern societies were inherited, learned, conserved, and passed from generation to generation. However, food production, the origin of societies and cultures in any human society has been largely ignored in international business research. Since almost all cultural dimensions such as those derived from the Hofstede and GLOBE study (House et al., 2004), are termed "work-related values", it is useful to understand the process and mechanism that food production has created, modified, and changed culture over time.

Indeed, some researchers have found evidence linking food production with societal values and norms. For instance, Alesina, Giuliano, and Nunn (2013) incorporated the methods of agriculture technology adopted by a country in ancient times to measure their impact on cultural differences. These researchers found that societies that were historically engaged in plough agriculture were more likely to be associated with attitudes of gender inequality and had lower female labor participation rates than countries that traditionally used hoes or digging sticks. This is because the plough requires a great deal of upper body strength and, hence, is a historically male-dominant agricultural method. More recently, Talhelm et al (2014) proposed the rice theory to explain value differences among societal groups. They argued that differences in values between farming rice and wheat were related to differences in production methods. The cultivation of rice requires large irrigation systems and more man-hours than the cultivation of wheat. Hence, rice-growing farmers are more interdependent and holistic in thinking than wheat-growing farmers. Similarly, ethnicity (Ketter & Arfsten, 2015), language (Kashima and Kashima, 1998), religion (Minkov & Hofstede, 2014), geography (Ronen & Shenkar, 1985) have been found correlated with Hofstede's cultural indices. However, the relationship between food production and work-related values has been ignored although food is commonly viewed as one of the most important elements to define cultural groups.

In this study, we will fill the gap by developing a food-production-based cultural model. We apply the cultural materialism theory in anthropology and posit that values were formed when humans worked together to obtain food for subsistence. More specifically, we used data in the 1970s and in the 1990s to test the change in relationship between work-related values and food production and compared the impact of food production with other social and ecological factors such as languages, religions, and climate.

The remainder of the paper is organized as follows. Section 2 presents the theoretical framework, which explains the relationship between food production modes and work-related values. Methodology of the research is explained in Section 3. The empirical test and results are offered in Section 4. Implications and the conclusion are provided in Section 4.

2.0 THEORY AND PROPOSITIONS

The most relevant theory that explains the relationship between food production and work-related values is cultural materialism. According to Morgan (1877), culture developed as humans extended and improved control over their environment, especially through the food supply. Similarly, Taylor (1916) declared that the first need of humans was to obtain daily food and this was the means by which

culture developed. White (1943) expanded this idea by specifying three factors in any cultural situation: (1) per capita energy put to work; (2) technological means used to work; and (3) the need-serving product after work. He argued further, "Other things being equal, the degree of cultural development varies directly as the efficiency of the technological means with which the harnessed energy is put to work." Later, Steward (1955) posited that behavioral patterns involved with the food-finding process had to be taken into account in order to understand cultural types. Gathering of wild vegetables was usually done by women who worked alone or in small groups, while fishing, especially marine fishing, was typically conducted by groups of men.

Following the cultural materialism theory, we hypothesize that different societal work-related values were developed under each unique food production system. After the food supply and the population increased, social, economic, and political systems to regulate and sustain the food production system were further developed. Although technological development has reduced the size of the labor force directly engaged in food production today, we posit that the deep culture of a society that has been passed from generation to generation originates from the traditional way to produce food through intensive agriculture, horticulture, pastoralism, and fishing. Meanwhile, national cultural characteristics are determined by the dominant food production mode in a country.

2.1 INTENSIVE AGRICULTURE, COLLECTIVISM, AND POWER DISTANCE

The rise of agriculture or intensive cultivation is one of the most important breakthroughs in human history. Unlike traditional hunting-gathering lifestyle, agrarian societies favored permanent settlement and relied more on animal power and technology than human power alone in farming. Using more efficient tools such as metal axes, plows, and horse-drawn wagons and more advanced technology such as fertilization and irrigation, domestication of plants allowed people for the first time to build up surpluses of food. The commitment to a settled community also implied the availability of land was limited. Consequently, more man hours were required to prepare, fertilize, and irrigate land and more capital investment was needed to improve technology and support the growth of population. Meanwhile, the large scale of production increased communications and cooperation among agricultural workers, much more than that in hunting and gathering, horticulture, or pastoralism.

In addition, there are more than 50,000 edible plants on the earth, but only three of them (rice, maize, and wheat) provide 60 percent of world's energy intake[2]. This implies that the rise of intensive agriculture was accompanied by the sacrifice of individual preference to a selected few of crops in order to achieve economies of scale in production. Therefore, we expect intensive agriculture to be positively related to collectivism.

Furthermore, the surpluses of food made possible by intensive agriculture helped to free up labor to activities other than farming such as manufacturing, education, and administration. The division of labor became even more complex due to ownership of land, talents, and military power. Social stratification emerged with majority of population working as peasant farmers and supplying their crops to a smaller population in urban centers (Ferraro, 2008). Peasants often had less political power, lower level of education, and meager material wealth when compared to more powerful urbanities. In sum, we have

Hypothesis 1: *Intensive agriculture is positively related to collectivism and power distance.*

2.2 HORTICULTURE AND UNCERTAINTY AVOIDANCE

Horticulture includes three sectors: fruit growing, market gardening (vegetables and herbs), and ornamental cultivation (flowers, shrubs, and trees). In this paper, we focus on the first two types of horticulture because fruits and vegetables are important sources of energy and nutrition for humans.

[2] See http://www.fao.org/docrep/u8480e/u8480e07.htm

Meanwhile, the history of horticulture was closely linked to the development of agriculture, because fruit growing also involved long-term commitment to a piece of land (von Baeyer, 2014). In fact, a fruit orchard can remain productive over a century. In addition, farmers often planted fruits and vegetables around their houses or next to grain fields as supplementary income or additional food source. For instance, Olmstead and Rhode (2004) found that between 1890 and 1914, the California farm economy shifted from large-scale ranching and grain-growing operations to include smaller-scale but intensive fruit cultivation when demand for fruits increased, transportation improved, and the price for wheat dropped.

Since horticulture was used as a complement to crop production in order to diffuse the risk of planting only one or two crops in large-scale intensive agriculture, the values and norms associated with horticulture are also different from those in intensive agriculture. First, farmers in horticulture were more resistant to new technology since fruits and vegetables were used as the backup source of food in case of bad weather or pests destroyed grain crops. Meanwhile, large-scale grain farmers often used part of their fields (usually the less productive parts) to experiment new technology, while small-scale horticulturists did not have enough land to test new technology. Second, smaller land size for horticulture also made the adoption of lumpy machines less profitable (Feder, Just & Zilberman, 1985). In particular, it is very difficult to use machinery to substitute labor in grafting, pruning, pollination, and harvesting given potential damages to trees and fruit plants. This is why the capital-to-labor ratio in the production of fruits and vegetables remained largely unchanged (Huffman, 1999) although the adoption of mechanized techniques and the use of new chemical inputs had caused the intensity of labor in crop production to decline significantly after the 1950s (Gardner, 1992).

Finally, unlike grains, fruits and vegetables are perishable goods and have limited durability for storage, transportation, and trade. Hence, they were traditionally produced for local consumption only until the emergence of modern canning, packing, and transportation technology. In fact, Hofstede (2001, p. 170) found that consumers who liked purity and simplicity in food such as fresh fruits often scored high on uncertainty avoidance. As such, we posit that horticulture is directly related to low tolerance of risk and uncertainty, but high preference to stability. That is

Hypothesis 2: *Horticulture is positively related to uncertainty avoidance.*

2.3 PASTORALISM, INDIVIDUALISM, AND POWER DISTANCE

Pastoralism, also referred to as animal husbandry, involves the herding, breeding, and consumption of domesticated animals. A very distinct feature of this food production mode in human history was the requirement of mobility. In order to avoid over grazing and to find new pasture for animals, pastoralists had to move from one pasture to another one following seasonal changes. The term "nomadism" has generally been used to reflect the tradition of mobile pastoralists. Consistent with the theory of cultural materialism, a pastoral society is usually organized around kinship roles and has a small local community population. Even in today's sedentary pastoral systems with enclosed systems such as ranching, large tracts of land are usually fenced and managed by a single owner, which is the dominant livestock production system in North America, Australia, and parts of South America.[3] In fact, ranching in the US is associated with the cowboy culture, a symbol of individualism and self-dependence for those who work outdoor in isolated and sometimes hazardous conditions.

In addition, social units in pastoralism had to be flexible with membership in order to accommodate mobility that was so vital for survival (Dyson-Hudson & Dyson-Hudson, 1980). By examining the relationship between family and societal complexity, Blumberg and Winch (1972) found that herding societies were less gregarious than fishing and large agricultural societies. Since differences in gregariousness and family complexity were used by Hofstede (2001, p. 210) to define individualism and collectivism, we posit that pastoralism is directly linked to individualism.

[3] See Introduction: Pastoral Systems Worldwide from FAO Corporate Document Repository: http://www.fao.org/docrep/005/y2647e/y2647e02.htm

Furthermore, the political and economic institutions of pastoral societies were very primitive due to their small size (Nolan & Lenski, 2006). There was minimal inequality in power and privilege because land and natural resources were mostly public for pastoralists. In fact, pastoral societies have been found to be more egalitarian and less hierarchical than sedentary agricultural groups due to the love of freedom, dependence on household labor for herding, and the ecological advantage of herding dispersion (Dyson-Hudson, 1980). That is

Hypothesis 3: Pastoralism is positively related to individualism but negatively related to power distance.

2.4 FISHING AND GENDER INEQUALITY

Ample evidence indicates that fishing has been part of human life since the beginning of human history. Traditional fishing tools include spears, nets, lines with hooks, and baskets. For thousands of years, boats driven by human muscle and wind power have been the primary method for fishing. Mass harvesting of fish and seafood was not available until the introduction of steam-powered vessels by the end of the 19th century. Due to clear sexual division of labor: men fish while women stay at home (Andersen & Wadel, 1972), traditional fishing societies have been described as male dominant with the role of women being marginalized or excluded from decision making process. However, recent research (Danowski, 1980) found that fishermen's wives actually performed dual roles--- both as the mainstay of households and as the mainstay of fish processing, marketing, and distribution. Information from eighty-six countries provided to the FAO in 2012[4] also indicated that women worked both as fishers and fish farmers. They actually made up at least 50 percent of the workforce in inland fisheries.

It is worth noting that the most significant change to fishing industry since the 1970s has been the introduction of aquaculture, which increased by almost 12 times according to the report published by the FAO in 2012. Instead of harvesting natural living resources in marine or freshwater, aquaculture cultivates fish, crustaceans, molluscs, and aquatic plants in controlled conditions. While the global growth of capture fishery production became stable after the 1980s, aquaculture production continues to grow at an annual rate of 8.8 percent. China has been responsible for most of the world's per capita fish production and consumption, especially in aquaculture.

The rise of aquaculture production has helped to elevate the social status of women in fishing societies because both the physical requirement and working conditions in aquaculture are less demanding and less dangerous than capture fishery. In particular, the development of transportation technology and global trade have increased the importance of processing and marketing in fishing production value chain, the two areas where women have traditionally played significant role in a fishing society. Therefore, it is reasonable to infer that gender inequality problem is less severe in aquaculture than in capture fishery. Nonetheless, given that the production of capture fishery is still much higher than aquaculture production, we hypothesize that

Hypothesis 4: Fishing is positively correlated with masculinity.

3.0 METHODOLOGY

3.1 INSTRUMENTATION AND DATA

In this study, we use Hofstede's (1980 &2001) four cultural dimensions—power distance, individualism, uncertainty avoidance, and masculinity as instruments to work-related values in the 1970s. The seminal work by Hofstede has arguably had far greater impact than other competing cultural dimensions and it stands out in cross-cultural research because of its "clarity, parsimony, and resonance with managers" (Kirkman, Lowe & Gibson, 2006: 286). Meanwhile, the recently published GLOBE study, *Culture, Leadership, and Organizations* (House et. al, 2004), provides the closest replication and updates of the

[4]Available at: http://www.fao.org/docrep/016/i2727e/i2727e00.htm.

Hofstede work-related values in the 1990s. Therefore, we use the GLOBE cultural measures to represent work-related values in the 1990s and compare the results with those in the 1970s. As such, the sample of countries in this study is limited to those with either Hofstede's or GLOBE's cultural scores: 62 and 67 respectively. Nonetheless, all major economies especially the largest agricultural producers in the world were included. The list of countries is provided in Appendix I. For food production modes, we use per capita output of cereals, milk, fish, fruits and vegetables (combined) in a country to measure the level of intensive agriculture, pastoralism, fishing, and horticulture respectively. These four food categories represent the largest items in world diet by proportion according to the data published by the Food and Agricultural Organization (FAO) at the United Nations[5]: cereals 51%, oil, fats and sugar 19%, meat, fish, milk, and eggs 14%, and fruits, nuts, vegetables 8% between 1988 and 1990.

Another reason we focus on the production of these four food items is due to differing level of globalized production and technology progress have taken place in these sectors from the 1970s to the 1990s. For instance, cereals are now the largest category of internationally traded foodstuffs and over three-quarters of world trade in cereals are controlled by large corporate giants (Watkins, 1996). Meanwhile, the adoption of mechanized techniques and the use of new chemical inputs have caused the intensity of labor in crop production to decline significantly since the 1950s (Gardner, 1992). In contrast, the capital-to-labor ratio in the production of fruits and vegetables remains largely unchanged because the new technology in this sector has not been intended for labor saving (Huffman, 1999). Meanwhile, Huang (2004) reported that global trade of fruits and vegetables has grown more rapidly than trade in other commodities after the 1980s even though the trade flows remained intraregional and concentrated within three areas: EU, NAFTA, and Asia. As to Fisheries, the progress in transportation and preservation technology has led world seafood trade value to triple from 1976 to 2006 (Asche & Smith, 2009). As mentioned previously, another important change in fishery production is the rapid growth of aquaculture: from about 5% in 1970 to 42% of total seafood supply in 2006. Finally, the sector that has affected the least by technology and global trade is probably dairy industry. In fact, only 5% of the total cow's milk produced globally was traded on international market (Hadjigoeorgalis, 2005). Since the dairy industry in most countries receives significant amount of financial assistance from government, it is still dominated by small and family-owned operatives, which gather members' milk production and transport it to processors and manufactures of dairy products.

Table 1: Summary statistics of food production per capita (in 1,000 metric tons per person)

	1970-1974					1994-1998				
Variable	#Obs.	Mean	Std. Dev.	Min	Max	#Obs.	Mean	Std. Dev.	Min	Max
Cereals	**62**	**0.342**	**0.344**	**0.000**	**1.527**	**67**	**0.389**	**0.394**	**0.001**	**1.724**
Starchy Roots	62	0.143	0.199	0.000	1.448	67	0.118	0.116	0.005	0.635
Sugar crops	61	0.383	0.453	0.000	2.342	67	0.362	0.419	0.000	2.018
Sugar & Sweeteners	62	0.041	0.044	0.000	0.214	67	0.045	0.046	0.000	0.278
Pulses	62	0.007	0.007	0.000	0.029	67	0.011	0.020	0.000	0.125
Tree nuts	62	0.001	0.002	0.000	0.011	67	0.001	0.002	0.000	0.012
Oil crops	62	0.036	0.043	0.000	0.192	67	0.056	0.093	0.000	0.554
Vege oils	62	0.011	0.012	0.000	0.076	67	0.024	0.056	0.000	0.445
Vegetables	**62**	**0.088**	**0.069**	**0.006**	**0.320**	**67**	**0.108**	**0.088**	**0.007**	**0.397**
Fruits	**62**	**0.136**	**0.163**	**0.001**	**0.739**	**67**	**0.127**	**0.147**	**0.004**	**0.918**
Stimulants	62	0.004	0.009	0.000	0.046	67	0.003	0.007	0.000	0.042
Spices	62	0.000	0.001	0.000	0.005	67	0.001	0.001	0.000	0.005
Alcoholic Beverages	62	0.063	0.058	0.000	0.215	67	0.071	0.061	0.000	0.309
Meat	62	0.054	0.059	0.003	0.350	67	0.071	0.071	0.003	0.360
Offal	62	0.005	0.008	0.000	0.055	67	0.006	0.008	0.000	0.056
Animal Fats	62	0.014	0.022	0.000	0.138	67	0.016	0.023	0.000	0.139
Eggs	62	0.009	0.007	0.000	0.026	67	0.011	0.006	0.001	0.040

[5] Source: http://www.fao.org/docrep/u8480e/u8480e07.htm

Milk	**62**	**0.235**	**0.327**	**0.000**	**2.046**	**67**	**0.255**	**0.392**	**0.0002**	**2.777**
Fish & Seafood	**62**	**0.042**	**0.116**	**0.000**	**0.741**	**67**	**0.053**	**0.117**	**0.0004**	**0.677**
Aquatic Products	62	0.001	0.003	0.000	0.021	67	0.002	0.006	0.000	0.042

Table 1 provides the descriptive statistics for the per capita production of cereals, milk, fish, fruits and vegetables along with other major food items in the 1970s and the 1990s. As we can see, the production (in 1,000 metric tons per capita) of cereals, fruits and vegetables (combined), and milk were among the highest (except for sugar crops) in both the 1970s and the 1990s. Meanwhile, there were countries with zero production in cereals, milk, fruits, fish and seafood during the period of 1970 and 1974. By the 1990s, all countries reported positive production in these four food items. It is worth mentioning that the country sample in Hofstede's study is not the same as the sample in the GLOBE study although there is significant overlap. Therefore, our statistical tests in the next section were based on the sub-sample of Table 1 when using different cultural measures in the 1970s and the 1990s.

4.0 ANALYSIS AND RESULTS

In this section, we use regression analysis to examine the impact of per capita output of cereals, fruits and vegetables, milk, and fish on national cultural scores of individualism, power distance, uncertainty avoidance, and masculinity, respectively. In addition, we compare the food-production-based model with those based on religion, language, and climate. In fact, Tang and Koveos (2008) found that language, religion, GDP per capita, and climate were the most important determinants to societal differences in values and norms. The question we want to address in this study is whether food production adds anything over and above these known cultural determinants.

Four dummy variables were created to represent the most spoken language in our sample: *Arabic*, *English, German*, and *Spanish*. The language dummies were chosen when more than one country belongs to the language group in our sample. In addition, three indicator variables, *Catholic*, *Muslim, Protestant,* were used to represent the largest religion in a country. Following Ronen and Shenkar (1985), we included dummy variables to represent the main climate type of a country, *continental*, *tropical*, or *marine*. The logarithm of GDP per capita in constant 2005 dollar, denoted by *logGDP*, was the average of GDP per capita from 1970 to 1974 in the regressions for Hofstede's cultural scores, while the averages of 1994-1998 GDP per capita were used for the GLOBE cultural scores. Data for all control variables were gathered from Parker (1997), Stulz and Williamson (2003), Guiso, Sapienza, and Zingales (2003), the World Development Indicators from the World Bank, and CIA's *the World Fact Book*.

Table 2: Correlation matrix for independent variables

	Cereal	Fruit	Milk	Fish	Log GDP	English	Spanish	Arabic	German	Catholic	Protestant	Muslim
Cereal		1.000										
Fruit	-0.09	1.000										
Milk	0.566	-0.107	1.000									
Fish	0.062	-0.124	0.200	1.000								
LogGDP	0.465	0.183	0.662	0.203	1.000							
English	0.100	-0.181	0.213	-0.084	0.239	1.000						
Spanish	-0.222	0.266	-0.257	0.035	-0.125	-0.259	1.000					
Arabic	-0.056	-0.054	-0.139	-0.061	-0.263	-0.085	-0.121	1.000				
German	0.055	-0.082	0.166	-0.068	0.209	-0.085	-0.121	-0.040	1.000			
Catholic	-0.094	0.265	-0.014	-0.066	0.131	-0.197	0.631	-0.193	0.008	1.000		
Protestant	0.407	-0.257	0.321	0.291	0.393	0.468	-0.296	-0.098	-0.098	-0.470	1.000	
Muslim	-0.141	-0.175	-0.253	-0.127	-0.489	-0.181	-0.259	0.469	-0.085	-0.410	-0.208	1.000

The correlation matrix of all independent variables is shown in Table 2. Per capita output in cereals, fruits plus vegetables, milk, and fish in the 1970s in general had low correlations with each other. In

other words, they were good proxies to represent four production modes in intensive agriculture, horticulture, pastoralism, and fishing, respectively. In addition, only per capita output of milk had relatively high correlation with *logGDP*, with a correlation coefficient equal to 0.662. This implies that income level, although related to food production, cannot fully explain the dominant production mode in a country. Another two independent variables with relatively high correlation were Spanish and Catholic (0.631). This suggests that societies sharing same language are likely to have same religion.

Tables 3 reports the Ordinary Least Square (OLS) regression results using Hofstede's power distance, individualism, uncertainty avoidance, and masculinity scores as dependent variable respectively. There are three panels in the table: results on the top of the table were based on fthe ood-production model, the middle panel is based on languages while the bottom one was based on religion. All three panels included the logarithm of GDP per capita in the 1970s, *logGDP*, as independent variable in order to control for the economic impact on work-related values.

Table 3: Comparing the impact of food production in 1970s, language, religion on hofstede's cultural indices

	Power Distance		Individualism		Uncertainty Avoidance		Masculinity	
Cereal - H1	-0.76	(-0.09)	9.94	(1.12)	-6.61	(-0.72)	-5.52	(-0.62)
Fruit - H2	-2.04	(-0.17)	-17.66	(-1.35)	**38.01*** **	**(2.78)**	-11.37	(-0.87)
Milk - H3	**-38.09*** **	**(-2.74)**	**33.66** **	**(2.21)**	**-45.18*** **	**(-2.85)**	-16.30	(-1.08)
Fish – H4	-6.89	(-0.38)	-16.60	(-0.83)	-8.51	(-0.41)	**-53.59*** **	**(-2.68)**
logGDP	**-5.17** **	**(-2.33)**	**7.44*** **	**(3.07)**	**6.10** **	**(2.41)**	2.00	(0.83)
Adjusted R^2	*0.47*		*0.53*		*0.33*		*0.10*	
# of obs.	*51*		*51*		*51*		*51*	
F statistics	*9.70*		*12.29*		*5.99*		*2.08*	
English	-3.49	(-0.52)	4.17	(0.57)	**-15.57** **	**(-1.82)**	**15.27** **	**(2.13)**
Spanish	7.79	(1.40)	**-17.76*** **	**(-2.94)**	**16.09** **	**(2.29)**	4.18	(.71)
Arabic	-3.79	(-0.31)	10.18	(0.75)	13.90	(0.89)	-1.72	(-0.13)
German	**-21.33** **	**(-1.74)**	-2.05	(-0.15)	-3.88	(-0.25)	**33.09*** **	**(2.55)**
logGDP	**-8.65*** **	**(-5.00)**	**11.08*** **	**(5.87)**	3.31	(1.51)	**-3.32** **	**(-1.81)**
Adjusted R^2	*0.43*		*0.50*		*0.13*		*0.10*	
# of obs.	*51*		*51*		*51*		*51*	
F statistics	*8.58*		*11.19*		*2.48*		*2.08*	
Catholic	10.78	(1.65)	-11.21	(-1.47)	10.13	(1.24)	-2.69	(-0.38)
Protestant	-1.27	(-0.16)	-4.29	(-0.45)	-16.16	(-1.59)	**-17.24** **	**(-1.96)**
Muslim	4.85	(0.58)	-0.52	(-0.05)	0.85	(0.08)	-7.27	(-0.80)
logGDP	**-9.36*** **	**(-4.72)**	**12.41*** **	**(5.35)**	2.61	(1.05)	-0.50	(-0.23)
Adjusted R^2	*0.43*		*0.42*		*0.13*		*0.04*	
# of obs.	*51*		*51*		*51*		*51*	
F statistics	*10.36*		*10.23*		*2.92*		*1.58*	

Note: numbers in parentheses are t ratios. ***,**, and * significant at 1%, 5%, and 10% level

As we can see in Table 3, economic development played a significant role in explaining power distance and individualism in the 1970s. In contrast, *logGDP* was not significantly related to uncertainty avoidance and masculinity. As predicted by Hypothesis 2, the production of fruits and vegetables was positively related to uncertainty avoidance scores. Meanwhile, per capita milk production was negatively related to power distance but positively related to individualism. In other words, Hypothesis 3 was confirmed.

However, contrary to Hypothesis 1, the coefficients on the production of cereals were not significant for both individualism and power distance. This implies that globalization and technology had changed the traditional culture and its connection to intensive agriculture. Similarly, Table 3 reports a negative correlation between the production of fish and masculinity. Therefore, Hypothesis 4 was not confirmed. There are two possible explanations for this outcome. First, as mentioned previously, fishing societies

have experienced significant technological transformation due to the development of aquaculture. More women were able to participate in labor force. Second, we have to note that masculinity in Hofstede's study does not directly measure gender equality. Instead, it is an indicator of societal attitudes towards competitiveness, materialism, and assertiveness. For instance, Hofstede (2001: 308) reported a positive correlation between the ratio for women as a percentage of all professionals and technicians and masculinity scores in 47 countries. In other words, women can be as competitive and assertive as men and masculinity is not equivalent to gender inequality.

Comparing three models within the same culture framework, results in Table 3 suggest that the food-production-based model provides a better fit to cultural scores in terms of adjusted R-square. This is especially true for uncertainty avoidance, where the adjusted R-square from the food-production-based model is almost two times higher than those based on language and religion. This again confirms our hypothesis that food production played a significant role in societal values and norms, at least in the 1970s.

Since GDP per capita data were not available for some developing countries in the 1970s, the number of observations in Table 3 was only 51. To correct the problem, we replaced *logGDP* with a dummy variable *developed* to represent the economic development level of a country in regression analysis in Table 4. The variable is equal to one when a country's GDP per capita was above $13,000, the definition provided by the World Bank. In addition, we put all independent variables together and conducted a full-model analysis for each cultural dimension. To check whether the effect of food production is different from climatic factors, we also ran a separate regression for each cultural dimension by replacing food production variables with the climate dummies in Table 4.

Table 4: Full models for food production in the 1970s, language, religion, and hofstede's cultural indices

	Power Distance		Individualism		Uncertainty Avoidance		Masculinity	
Cereal - H1	-2.29		**16.38****		5.84		-6.30	
	(-0.35)		**(2.28)**		(0.72)		(-0.96)	
Fruit - H2	-17.02		-8.39		**35.26****		-0.76	
	(-1.37)		(-0.62)		**(2.31)**		(-0.06)	
Milk - H3	**-17.58****		**20.32****		-6.50		-3.96	
	(-2.24)		**(2.39)**		(-0.67)		(-0.51)	
Fish – H4	-15.00		-0.34		-6.72		-29.65	
	(-0.77)		(-0.02)		(-0.28)		(-1.54)	
Continent		3.52		4.48		1.73		1.64
		(0.45)		(0.59)		(0.19)		(0.21)
Tropical		**13.51***		**-20.55*****		-11.58		-0.18
		(1.85)		**(-2.88)**		(-1.36)		(-0.02)
Marine		-2.98		**17.03****		-7.99		-5.22
		(-0.35)		**(2.02)**		(-0.79)		(-0.59)
Desert		-2.82		-4.00		3.77		4.15
		(-0.33)		(-0.48)		(0.38)		(0.48)
Developed	**-12.06****	**-15.28*****	**15.32****	**9.72***	-1.23	2.82	-4.97	-8.23
	(-2.06)	**(-2.59)**	**(2.41)**	**(1.69)**	(-0.17)	(0.41)	(-0.86)	(-1.36)
English	-1.96	-5.24	-0.02	9.35	-13.20	-8.81	**21.48*****	**23.24*****
	(-0.28)	(-0.71)	(-0.00)	(1.31)	(-1.53)	(-1.03)	**(3.11)**	**(3.10)**
Spanish	2.04	-6.06	**-16.23****	-9.80	1.50	11.05	-7.72	-12.95
	(0.28)	(-0.75)	**(-2.06)**	(-1.24)	(0.17)	(1.17)	(-1.08)	(-1.56)
Arabic	6.11	13.23	3.16	-2.76	17.24	10.90	-1.09	-0.17
	(0.53)	(1.07)	(0.25)	(-0.23)	(1.22)	(0.76)	(-0.10)	(-0.01)
German	**-28.35*****	**-22.93****	3.12	-1.62	-3.78	-8.35	**24.93****	**29.12*****
	(-2.64)	**(-2.04)**	(0.27)	(-0.15)	(-0.29)	(-0.64)	**(2.36)**	**(2.54)**
Catholic	-5.15	2.22	9.54	6.40	5.52	2.75	8.22	**13.43****

	(-0.79)	(0.34)	(1.35)	(1.00)	(0.69)	(0.36)	(1.28)	**(1.99)**
Protestant	**-16.95****	**-13.14***	1.53	2.61	-9.96	**-19.20****	-12.04	**-14.98***
	(-2.18)	**(-1.72)**	(0.18)	(0.35)	(-1.01)	**(-2.16)**	(-1.57)	**(-1.92)**
Muslim	-2.16	5.45	-7.19	-6.07	-9.11	-12.06	-2.75	-3.08
	(-0.26)	(0.58)	(-0.79)	(-0.66)	(-0.88)	(-1.09)	(-0.33)	(-0.32)
Adjusted R^2	*0.47*	0.42	*0.50*	0.53	*0.25*	0.21	*0.24*	0.18
# of obs.	*61*	64	*61*	64	*61*	64	*61*	64
F statistics	*5.49*	4.80	*6.06*	6.85	*2.65*	2.35	*2.55*	2.21

Note: numbers in parentheses are t ratios. ***,**, and * significant at 1%, 5%, and 10% level

Compared to Table 3, the results in Table 4 remained similar for milk, fruit and vegetable production: Hypotheses 2 and 3 were confirmed again. Meanwhile, the production of cereals was positively correlated to individualism and fishing was insignificantly correlated with masculinity. In other words, Hypotheses 1 and 4 were still not confirmed. Nonetheless, in terms of adjusted R-squares, the food-based models in general provide better explanation for variations in cultural indices except for individualism. In sum, results from Table 4 confirm that our food-production-based theory does add additional explanation to cultural formation over and above climatic, linguistic, and religious factors.

In Table 5, we replaced Hofstede's culture scores with GLOBE's dimensions. The purpose is to investigate the dynamic relationship between food production modes and work-related values within the context of globalization and technological changes from the 1970s to the 1990s. Due to conceptual and methodological differences between the GLOBE and Hofstede frameworks (Hofstede, 2006), we only used the cultural dimensions from the GLOBE study that were reported to have positive correlations with Hofstede's cultural scores (House, et. al., 2004), which include practice-based power distance, group collectivism, assertiveness, and value-based uncertainty avoidance scores.

Table 5: Comparing the impact of food production in the 1990s, language, religion and globe's cultural indices

	Power Distance Practices		Group Collectivism Practices		Uncertainty Avoidance Values		Assertiveness Practices	
Cereal - H1	-0.13	(-0.99)	-0.20	(-1.19)	-0.18	(-1.38)	**0.24***	**(1.85)**
Fruit - H2	0.17	(0.63)	**0.60***	**(1.88)**	**0.50****	**(2.01)**	0.20	(0.81)
Milk - H3	-0.15	(-1.04)	**-0.37****	**(-2.21)**	**-0.34****	**(-2.53)**	-0.18	(-1.36)
Fish – H4	-1.03	(-1.24)	-1.57	(-1.56)	1.26	(1.60)	**-1.35***	**(-1.72)**
LogGDP	-0.07	(-1.55)	**-0.32*****	**(-5.85)**	**-0.29*****	**(-6.88)**	0.00	(0.07)
Adjusted R^2	*0.18*		*0.66*		*0.68*		*0.10*	
# of obs.	*50*		*50*		*50*		*50*	
F statistics	*3.20*		*19.80*		*21.77*		*2.11*	
English	-0.11	(-0.71)	**-0.39***	**(-1.96)**	-0.13	(-0.94)	0.20	(1.37)
Spanish	0.09	(0.60)	0.21	(1.18)	0.15	(1.13)	0.14	(1.00)
Arabic	0.02	(0.06)	0.42	(1.42)	0.33	(1.55)	-0.02	(-0.10)
German	0.05	(0.22)	-0.21	(-0.68)	**-0.55****	**(-2.47)**	**0.44***	**(1.92)**
LogGDP	**-0.10****	**(-2.40)**	**-0.35*****	**(-6.36)**	**-0.29*****	**(-7.45)**	-0.03	(-0.73)
Adjusted R^2	*0.09*		*0.59*		*0.67*		*0.00*	
# of obs.	*50*		*50*		*50*		*50*	
F statistics	*1.93*		*15.23*		*21.26*		*1.05*	
Catholic	0.09	(0.67)	**0.31****	**(2.05)**	0.11	(0.82)	0.07	(0.49)
Protestant	-0.24	(-1.46)	**-0.48*****	**(-2.61)**	-0.04	(-0.23)	-0.09	(-0.51)
Muslim	0.03	(0.19)	**0.40****	**(2.14)**	0.16	(0.90)	0.01	(0.08)
LogGDP	**-0.09****	**(-2.12)**	**-0.32*****	**(-6.97)**	**-0.33*****	**(-7.82)**	0.01	(0.19)
Adjusted R^2	*0.17*		*0.70*		*0.62*		*-0.06*	
# of obs.	*50*		*50*		*50*		*50*	
F statistics	*3.59*		*29.58*		*20.68*		*0.27*	

Note: numbers in parentheses are t ratios. ***,**, and * significant at 1%, 5%, and 10% level

Overall, the results in Table 5 were similar to those in Table 3 except that the per capita production of milk in the 1990s was not significantly correlated with power distance practices. Nonetheless, milk production was negatively related to group collectivism practices, while fruit and vegetable production was positively related to uncertainty avoidance values. Therefore, hypotheses 2 and 3 still held in the 1990s. However, we cannot find evidence to support hypotheses 1 and 4 for the production of cereals and fishing even with the GLOBE cultural scores. Meanwhile, the food-based model did not seem to have clear advantage over language-based or religion-based models according to adjusted R-squares.

In Table 6, we put all independent variables together for GLOBE's cultural scores. Per capita production in Milk remained negatively related to practice-based group collectivism. The sign on the production of fruits and vegetables was still positive in uncertainty avoidance equation but not statistically significant anymore. Since GDP per capita was not significantly related to power distance practices either, we suspect the results may be driven by measurement difference between the GLOBE and Hofstede study. Nonetheless, food-based models were only marginally better in explaining variations in uncertainty avoidance and assertiveness when compared to the regressions based on climatic variables in Table 6. In other words, the explanation power of the food-production- based model has declined by the 1990s. This is consistent with our expectation that globalization and technological advancement has weakened the link between traditional cultural values and food production.

	Power Distance Practices		Group Collectivism Practices		Uncertainty Avoidance Values		Assertiveness Practices	
Cereal - H1	-0.18		-0.24		-0.23		0.21	
	(-1.11)		(-1.48)		(-1.66)		(1.45)	
Fruit - H2	0.10		0.37		0.35		0.37	
	(0.34)		(1.16)		(1.33)		(1.36)	
Milk - H3	-0.16		**-0.32***		**-0.36****		**-0.31****	
	(-0.97)		**(-1.87)**		**(-2.48)**		**(-2.07)**	
Fish – H4	-0.53		-0.50		**1.63***		-0.53	
	(-0.50)		(-0.46)		**(1.76)**		(-0.56)	
Continent		-0.24		-0.01		-0.23		-0.11
		(-1.21)		(-0.03)		(-1.32)		(-0.55)
Tropical		0.03		0.02		0.07		-0.20
		(0.16)		(0.11)		(0.38)		(-1.07)
Marine		**-0.48****		**-0.53****		**-0.44****		-0.27
		(-2.03)		**(-2.07)**		**(-2.04)**		(-1.13)
Desert		-0.17		0.03		0.07		0.03
		(-0.81)		(0.14)		(0.35)		(0.15)
logGDP	-0.06	-0.03	**-0.26*****	**-0.24*****	**-0.24*****	**-0.22*****	-0.02	-0.02
	(-1.05)	(-0.53)	**(-4.58)**	**(-3.96)**	**(-5.01)**	**(-4.31)**	(-0.36)	(-0.31)
English	0.06	0.04	0.00	-0.05	0.19	-0.03	**0.31***	**0.32***
	(0.28)	(0.23)	(0.02)	(-0.28)	(1.06)	(-0.20)	**(1.74)**	**(1.89)**
Spanish	-0.09	-0.11	-0.14	-0.02	0.04	0.01	0.09	0.13
	(-0.47)	(-0.55)	(-0.71)	(-0.09)	(0.27)	(0.05)	(0.55)	(0.65)
Arabic	-0.08	-0.02	0.12	0.18	0.27	0.33	-0.10	-0.21
	(-0.27)	(-0.07)	(0.42)	(0.61)	(1.10)	(1.29)	(-0.39)	(-0.76)
German	-0.02	0.11	-0.29	-0.18	**-0.48****	**-0.47***	**0.53****	**0.52****
	(-0.08)	(0.43)	(-1.04)	(-0.65)	**(-2.03)**	**(-1.96)**	**(2.17)**	**(2.01)**
Catholic	0.16	0.03	**0.36***	0.20	0.04	-0.07	0.02	0.03
	(0.89)	(0.18)	**(1.97)**	(1.08)	(0.28)	(-0.46)	(0.15)	(0.19)
Protestant	-0.11	-0.21	-0.32	**-0.56*****	-0.19	-0.17	-0.01	-0.13
	(-0.51)	(-1.09)	(-1.40)	**(-2.70)**	(-1.00)	(-0.92)	(-0.03)	(-0.66)
Muslim	0.07	-0.01	0.33	0.20	0.02	-0.21	0.11	0.07
	(0.31)	(-0.05)	(1.49)	(0.84)	(0.13)	(-1.00)	(0.60)	(0.32)

Adjusted R^2	*0.08*	0.11	*0.72*	0.72	*0.70*	0.68	*0.10*	-0.05
# of obs.	*50*	50	*50*	50	*50*	50	*50*	50
F statistics	*1.35*	1.53	*11.57*	11.24	*10.37*	9.61	*1.46*	0.80

Note: numbers in parentheses are t ratios. ***,**, and * significant at 1%, 5%, and 10% level

5.0 DISCUSSION AND POLICY IMPLICATIONS

In an effort to understand how culture, especially work-related values, developed and evolved over time, we apply cultural materialism theory in anthropology to examine the relationship between food production modes and national cultural differences. More specifically, we examined how intensive agriculture, herding, horticulture, and fishing were related to individualism, power distance, uncertainty avoidance, and masculinity cultural scores in the 1970s and the 1990s respectively. We found that individualism and power distance were closely linked to per capita output in milk while uncertainty avoidance was related to the production of fruits and vegetables in a country. The food-production-based model outperformed other cultural models based on language, religion, and climate in the 1970s although the connection between food production and work-related values was much weaker when using the GLOBE cultural scores in the 1990s.

Our findings have several policy implications to the debate on globalization of food production and consumption. First, the food-production-based model emphasizes how methods of production can shapes the values and norms of a society. As technology continue to increase the size and power of large corporate farms and fishery, the cultural link to the production of food has been weakened overtime. For instance, Parker (2013) found that farmers who were more open to new technologies, markets and farming practices often expressed less environmental values but more general utilitarian values. In other words, our findings provide support to the concern that globalization for the production of food imposes threats to environmental conservation and agricultural sustainability. Therefore, regulations to protect environment should be on the agenda for discussion of trade liberation in agricultural sector.

Second, this study also confirms that societal values, especially power distance and individualism are highly correlated with income level or GDP per capita. As income increases and poverty rate drops, consumer demand for food become more diverse and individualized. More importantly, consumer movements concerned with food safety, fair trade, and organic production have pushed large biotech and food companies to adopt more environmental friendly practices. In other words, the claim that global food production regime will destroy cultural and bio diversity is unsubstantiated. Nonetheless, policy makers can take a proactive approach to educate and protect consumers with regard to food safety and food innovation. For instance, the Food Safety Modernization Act enacted by the US Food and Drug Administration (FDA) includes a provision on Foreign Supplier Verification Programs. The rule requires US food importers to provide verification that the food imported to the US has met the US safety standards.

Third, the findings of this research support the importance of government policies in assisting small-scale family-owned food business and their role in sustaining local values. Due to limited impact of globalization and significant amount of government subsidies, per capita production of milk has the most consistent correlation with individualism and power distance, as predicted by the food-production-based model. Today, the role of government policies in agriculture is not limited to the protection of small farmers but include regulations on agrochemical and transgenic technology. Since government policies are virtually the collective outcome of a nation's or a region's decision, mainstream values of a country can now determine food production methods. In other words, corporations alone cannot change the scale and technology in agricultural production. The equilibrium of global network and community-level food organizations is determined by the interaction of small farmers, large food and biotech companies, consumers, and government.

Finally, we want to note that this research is only the first step to test the relationship between food production and national value differences. Our sample is limited by the countries with Hofstede or GLOBE work-related cultural scores. In addition, we did not directly test differences in values and opinions regarding the impact of globalization on food production and consumption because globalization is relatively new in food industry. Future study can explore how food, as a way of life, continues to manifest itself through the value system of modern societies.

REFERENCES

Alesina, A., Giuliano, P., and Nunn, N. 2013.On the origins of gender roles: Women and the plough. *Quarterly Journal of Economics*128: 469-530

Andersen, R. and Wadel, C. 1972. *North Atlantic Fishermen: Anthropological Essays on Modern Fishing*. Institute of Social and Economic Research, Memorial University of Newfoundland.

Asche, F. and Smith, M. 2010. Trade and fisheries: Key issues for the World Trade Organization. *WTO Staff Working Paper ERSD-2010-03*

Blumberg, R. L. and Winch, R. F. 1972.Soceital complexity and familial complexity: Evidence for the curvilinear hypothesis. *American Journal of Sociology* 77: 898-920

Danowski, F. 1980. Fishermen's wives: Coping with an extraordinary occupation. *Marine Bulletin* 37: 78

Dyson-Hudson, R. 1980.Toward a general theory of pastoralism and social stratification. In *Newsletter of the Commission on Nomadic Peoples*, No.7: 1-7

Dyson-Hudson, R. and Dyson-Hudson, N. 1980. Nomadic pastoralism. *Annual Review of Anthropology* 9: 15-61

Feder, G., Just, R. and Zilberman, D. 1985. Adoption of agricultural innovations in developing countries: a survey. *Economic Development and Cultural Change* 33(2): 255-298

Ferraro, G. 2008. *Cultural Anthropology: An Applied Perspective*, 7th edition, Thomson Higher Education, Belmont, CA

Gardner, B. 1992. Changing economic perspectives on the farm problem. *Journal of Economic Literature* 30 (1): 62-101

Guiso, L., Sapienza, P. and Zingales, L. 2003. People's opium? Religion and economic attitudes, *Journal of Monetary Economics* 50: 225-282

Hadjigeorgalis, E. 2005. The U.S. dairy industry and international trade in dairy products. Technical Report #42. New Mexico State University

Heuer, M, Cummings, JL. and Hutabaratt, W. 1999. Cultural stability or change among managers in Indonesia? *Journal of International Business Studies* 30(3): 599-610

Hofstede, G. 1980. *Culture's Consequences: International Differences in Work-related Values*. Beverly Hills, CA: Sage Publications

_____ 2001. *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations across Nations* (2nded.). Thousand Oaks, CA: Sage Publications

_____ 2006. What did GLOBE really measure? Researcher's minds versus respondents' minds. *Journal of International Business Studies* 37(6): 882-896

Hofstede, GJ. 2015. Culture's causes: The next challenge. *Cross Cultural Management: An International Journal* 22(4): 545-569

House, R., Hanges, P., Javidan, M., Dorfman, P., & Gupta, V. 2004. *Culture, Leadership, and Organizations: The GLOBE Study of 62 Societies*. Thousand Oaks, CA: Sage Publications

Huang, S. 2004. Global trade patterns in fruits and vegetables. Agriculture and Trade Report #WRS-04-06, US Department of Agriculture

Huffman, W. 1999. The labor intensity and technology of agriculture: California versus other states, 1960-96. *Changing Face* vol.5 number 4

Kashima, E.S. and Kashima, Y. 1998. Culture and language: the case of cultural dimensions and personal pronoun use. *Journal of Cross-Cultural Psychology* 29:461-486

Ketter, C. and Arfsten, M. Cultural value dimensions and ethnicity within Kenya. *International Business Research* 8(12): 69-79

Kirkman, B., Lowe, K. and Gibson, C. 2006. A quarter century of *Culture's Consequences*: a review of empirical research incorporating Hofstede's cultural values framework, *Journal of International Business Studies*, *37(3)*: 285-320

Leung, K., Bhogat, R., Buchan, N., Erez, M. and Gibson, C. (2005) Culture and international business: recent advances and their implications for future research. *Journal of International Business Studies* 36(4): 357-378

Minkov, M. and Hofstede, G. 2014. Nations versus religions: which has a stronger effect on cultural values at the group level? *Management International Review* 54: 801-824

Mintz, S. and Du Bois, C. 2002. The anthropology of food and eating. *Annual Review of Anthropology* 31: 99-119

Morgan, L. 1877. *Ancient Society*. Holt, New York

Nolan, P. and Lenski, G. 2006. *From Human Societies: An Introduction to Macrosociology*, Paradigm Publisher, Boulder, Colorado

Olmstead, A. and Rhode, P. The evolution of California agriculture, 1850-2000, in Jerome B. Siebert (ed.), *California Agriculture: Dimensions and Issues* (University of California Press, 2004), pp.1-28.

Parker, J. 2013. Integrating culture and community into environmental policy: Community tradition and farm size in conservation decision making. *Agriculture and Human Values* 30: 159-178

Parker, P. 1997. *National Culture of the World: A Statistical Reference*. Greenwood Press

Phillips, L. 2006. Food and globalization. *Annual Review of Anthropology* 35: 37-57

Ralston, D.A., Egri, C. P., Stewart, S., Terpstra, R.H. and Yu, K. (1999) 'Doing business in the 21st century with the new generation of Chinese managers: A study of generational shifts in work values in China', *Journal of International Business Studies* 30(2): 415-428

Ronen, S. and Shenkar, O. 1985.Clustering countries on attitudinal dimensions: a review and synthesis. *Academy of Management Review* 10(3): 435-454

Steward, Julian. 1955. *Theory of Culture Change: The Methodology of Multilinear Evolution*, University of Illinois Press, Urbana- Champaign, IL

Stulz, R. M. and Williamson, R. 2003. Culture, openness, and finance, *Journal of Financial Economics* 70: 313-349

Talhelm, T., Zhang, X., Oishi, S., Shimin, C., Duan, D., Lan, X., and Kitayama, S. 2014. Large –scale psychological differences within China explained by rice versus wheat agriculture. *Science* 344 (9): 603-608

Tang, L. and Koveos, P. 2008. A framework to update Hofstede's cultural value indices: Economic dynamics and institutional stability. *Journal of International Business Studies* 39(6): 1045-1063

Taylor, E.B. 1916. *Anthropology: An Introduction to the Study of Man and Civilization*. Appleton & Co. New York

Tung, R. and Verbeke, A. 2010. Beyond Hofstede and GLOBE: Improving the quality of cross-cultural research. *Journal of International Business Studies* 41 (8): 1259-1274

Von Baeyer, E. 2014. The development and history of horticulture, in *World Environmental History* edited by Agnoletti, M., Johann, E., and Serneri, S., EOLSS Publisher

Watkins, K. 1996. Free trade and farm fallacies: From the Uruguay round to the World Food Summit. *The Ecologist* 26(6):244-255

White, L. 1943. Energy and the evolution of culture. *American Anthropologist* 45(3): 335-356

Appendix I: List of countries in the sample

Argentina	Ecuador	Italy	Norway	Trinidad
Australia	Egypt	Jamaica	Panama	Turkey
Austria	Salvador	Japan	Pakistan	UK
Bangladesh	Finland	Korea	Peru	USA
Belgium	France	Kuwait	Philippines	Uruguay
Bolivia	Germany	Luxembourg	Poland	Venezuela
Brazil	Greece	Malaysia	Portugal	
Bulgaria	Guatemala	Malta	Romania	
Canada	Hungary	Mexico	Russia	
Chile	India	Morocco	South Africa	
China	Indonesia	Namibia	Spain	
Colombia	Iran	Netherlands	Sweden	
Costa Rica	Ireland	New Zealand	Switzerland	
Denmark	Israel	Nigeria	Thailand	