

## Basic Food and Health Security: A Cross Country Look

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### Abstract

This paper uses cross country regression analysis to see whether the level of economic development and the extent of democracy are prime determinants of basic food, health, and general social security. It also considers whether the size of government and globalization matter, and, if so, whether positively or negatively, for the fundamental security needs of people. The findings of the paper indicate that both development and democracy are positive forces for the fulfillment of basic human security needs.

**Keywords:** Food security, Health security, Overall social security, Level of economic development, Democracy, Productivity growth.

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### 1. Introduction

For human beings, as well as other life forms, nothing is more important than survival. The physical bodies in which our souls dwell are very vulnerable and extremely demanding. They are readily subject to disease and illness, to life changing accidents and attacks from others, and constantly require food and water for operation and maintenance. Before higher level needs come into play, and individuals can differentiate themselves to live meaningful and productive lives and become truly human, they must have real security with regard to attainment of their basic and fundamental needs.

The purpose of this paper is to consider some of the reasons that may account for differences in food security, health security, and general social security across countries. It is hypothesized that the main drivers of basic security attainment in a country are the level of economic development and the amount of actual democracy.

The paper is divided into five sections. The first section reviews some of the recent articles on basic human needs security. The second section provides a little model of basic human needs security. The third section identifies the sources of the variables that are used in the regression analysis. The fourth section presents, discusses, and analyzes the results of cross country regressions that look at food security, health security, and overall social security. The final section wraps-up the article and provides a few policy suggestions.

#### 1.1. Some Recent Literature

Minkler and Sweeney maintain that human rights are essentially interdependent and indivisible (Minkler and Shawna, 2011). In their article, they provide a comprehensive literature review of the empirical studies of the determinants of human rights and develop a composite human rights index based on both subsistence and security rights. They use the index as a dependent variable in regressions on a sample of developing countries for cross section and pooled cross section data for the years 1997 to 2005. In the regressions, after adjusting for population size, and for internal and international conflict, they consider wealth, legal origins, democracy, globalization, and endorsement of international covenants as potential drivers of basic human rights. They find that GDP per capita is a strong predictor of human rights, that different measures of democracy are relevant, that trade openness matters, but not foreign direct investment, and that endorsement of international covenants may have some bearing.

Assuming, in line with the United Nations, that governments truly have food security as a goal, Adeyemi, Ijaiya, Ijaiya, and Ijaiya discuss various ways in which national governments can increase food security (Adeyemi *et al.*, 2009). Among others, they feel that these should include the creation of an environment in which individuals are able to provide for their own food needs, and for the provision of food in emergencies. The authors also consider potential determinants of food security by running a single regression for food security on a large number of regressors (fourteen) for forty eight countries in Sub-Saharan Africa for 2003. Surprisingly, their regression indicates that higher population leads to greater access to food, and, using a dummy variable for the presence of democratic values, that democratic values seem to have a negative effect on food access.

Misselhorn does a meta-analysis on forty-nine local household case studies for southern Africa (Misselhorn, 2004). Her study not only tries to identify food security drivers, but also the extent a driver's impact is on food access versus production, and whether a driver is short-term as opposed to long-term or chronic. She finds that environmental conditions and poverty are the two most frequently cited direct drivers of food insecurity in the case studies, that seventeen drivers account for the eighty percent of the total direct driver citations in the case studies, and that poverty, environmental conditions, and social conflict are important indirect drivers of food insecurity.

With regard to health security, Headey focuses on socioeconomic variables to explain changes in malnutrition in countries over time (Headey, 2012). Employing a cross section of countries that treats each Indian state as a country, and using the change in stunting over a five year period as the dependent variable in his regressions, his empirical analysis shows that economic growth, growth in food production, asset accumulation, greater female education, and reduced fertility appear to be statistically significant factors for reducing stunting.

De Muro and Burchi hypothesize a relationship between food security of rural people in poor countries, the category of people most vulnerable to food insecurity, and the extent of their education (De Muro and Francesco, 2007).

They create two indices of food security based on different weighting of survival, nutritional, and female malnutrition status, and use household survey data on forty eight developing countries, from surveys conducted for different years for different countries from 1995 to 2004, for their statistical analysis. In their regressions they find that primary education, school attendance of rural children aged six to ten, is a key determinant of rural food security for rural people in poor countries, and that, two of their control variables, assets and sanitation are also important.

Akramov, Yu, and Fan test the notions that mountain countries, mountainous environments, are more subject to food insecurity, and that food security in mountains countries is more sensitive to external shocks (Akramov et al., 2010). In their empirical analysis using an unbalance panel consisting of one hundred thirty two developing countries, they employ daily per capita calorie intake as a measure of food insecurity, and find support for both propositions. Their regressions show that a whole host of variables, road density, income per capita, population, arable land per capita, and percentage of trade to GDP have a positive and significant effect on food security, but that ethnic fractionalization has a negative effect. Their Chow tests on the parameters of the various explanatory variables indicate that, in general, mountainous countries food security is more responsive to individual determinants of food security than non-mountainous countries.

Sekhampu uses binary logistic regression on survey data for an individual township in South Africa from a survey he conducts in 2012, and finds that household size has a negative effect on food security, household income, age of head of household, and gender (female head of household) have positive effects, and that education does not seem to matter (Sekhampu, 2013).

Jeanty and Hitzhusen concentrate their efforts on estimating the potential effect of civil wars and conflicts on food security (Jeanty and Fred, 2006). Their regressions of battle deaths per thousand (their measure of conflict) on food security on a panel of seventy three countries from 1970 through 2002 show a negative and significant effect of conflict on food security when using instrumental variables to account for simultaneity bias.

## 2. A Model for Basic Security Satisfaction

The model consists of an individual equation with the same functional form for each basic security.

The equation is as follows.

$$s = f(E, D, C) \quad \delta S / \delta E > 0, \quad \delta S / \delta D > 0$$

In the equation, S designates a basic security such as food security, health security, or overall social security, E stands for the level of economic development, D is the amount of democracy, and C for a set of control variables. In words, the model simply states that the fulfillment of a basic security need depends on the level of economic development, the extent of democracy, and a set of control variables, and that security in a need is positively related to level of economic development and the extent of democracy.

Two things are likely to be vital for determining the extent that basic security needs are met in a country. The first is the ability of a country to provide for the needs of its citizens. The second is the will or desire of those having command over resources in a country (those who are in power) to provide these needs.

Countries with higher levels of economic development have a greater productive capacity, and therefore a greater ability to care for their peoples. Thus it is expected that higher levels of economic development, ceteris paribus, lead to greater food and health security.

The form of government, on the other hand, is what really matters with regard to country leaders making decisions that are in line with the needs of ordinary people in a country. The more democratic a country is, the greater the influence of the people on their leaders through democratic processes such as voting, criticism, and legitimate protest, and the more sensitive and responsive leaders will be (must be if they want to stay in office) to the desires of the people. Thus, it is anticipated that there is a positive relationship between the satisfaction of basic security needs and the extent of democracy in a country.

Three variables are considered as control variables. They are productivity growth, the size of government, and the extent of globalization.

Productivity growth is expected to be a positive force for satisfying security needs. Improvement in a country's ability to produce places a country in a better position to satisfy needs of its citizens. An increase in output due to productivity growth has multiple uses, one of which is greater basic need fulfillment.

The two other variables, the size of the government and the extent of globalization are added as control variables because their signs are of special interest and have major policy implications. Most everyone would like to know whether or not bigger government leads to greater fulfillment of basic human needs and whether or not globalization is or is not harmful to human need security.

### 3. Sources for Variables

The measure of food security is the food security index from the 2010 Human Security Index data set (Human Security Index, 2010). Similarly, health security is captured by using the health security index from the same source, and, a measure of overall social security, by using their social fabric index. For the 232 countries for which the data is available, the food security index ranges from 0 to .960, the health security index from .157 to .905, and the social fabric index from .172 to .793. The social fabric index is a fairly comprehensive measure of human security in the social arena as it based not just on the food security and the health security, but also on indexes for diversity, peacefulness, information empowerment, and quality of governance.

The variable employed to measure the level of economic development is real GDP per capita in 2000 U.S. dollars for the year 2005. The data source for the variable is the World Bank (World Bank, 2011).

Democracy is quantified with the Economist democracy index for 2008 of the Economist's intelligence unit (The Economist, 2008). The index has a potential value between zero and ten.

Productivity growth is the percentage change in real GDP per worker from the year 2000 to 2010 in which real GDP per worker is defined as purchasing power parity converted GDP chain per worker at 2005 constant prices. The data for real GDP per worker for each of the years comes from the Heston, Summers, and Aten's Penn World Data set (Heston *et al.*, 2012).

The percentage share of government consumption to GDP for 2005 is used to measure government size and the percentage of trade to GDP for 2005 to quantify globalization. The numbers for both variables are from the World Bank (World Bank, 2011).

### 4. Regressions for Food Security, Health Security, and Total Social Security

Table I shows the results of cross country regressions on the level of economic development, democracy, and other variables.

**Table-1.** Cross Country Regressions of Food Security Index on the Level of Development and Other Variables

	(1)	(2)	(3)	(4)	(5)
CONSTANT	.3989	.2107	.1550	.0558	-.0005
	(22.93)	(4.94)			(-.01)
	*	*	*		
DEVELOPMENT	.0000104	.0000089	.0000102	.0000100	.0000090
	(8.03)	(5.26)	(6.16)	(6.18)	(5.36)
	*	*	*	*	*
DEMOCRACY		.0335	.0339	.0287	.0303
		(4.16)	(4.40)	(3.72)	(3.94)
		*	*	*	*
PRODUCTIVITY			.0015	.0021	.0020
GROWTH			(3.80)	(5.11)	(4.87)
			*	*	*
GOVTIOGDP				.0074	.0074
				(2.81)	(2.84)
				*	*
TRADETOGDP					.0006
					(2.36)
					**
RSO	.264	.381	.437	.482	.502
N	182	159	158	152	151

The table is set up with the first column listing the potential explanatory variables. The five remaining columns show the outcomes of an individual regression runs. These are numbered in the first row.

When a variable enters an equation, the top value in the row for the variable and the equation's column is the estimated coefficient value for the variable in that equation. The individual t-statistic is underneath the estimated coefficient. It is in parenthesis. Asterisks under the t-statistics are used to provide quick identification of the level of significance of variables in the equations. Fewer asterisks indicate greater level of significance. A single asterisk indicates significance at the one percent level of significance or better, two asterisks, significance at the five percent level of significance or more, and three asterisks, significance at the ten percent level of significance or greater. The r-squared values for the equations can be found in the second to last row of the table. Finally, the last row shows the number of countries entering the regressions.

Table I contains five equations. Starting with the first equation which only contains a single explanatory variable, the level of economic development, they each sequentially add, in a cumulative fashion, a single additional explanatory variable, democracy in equation two, productivity growth in equation three, government spending to GDP in equation four, and trade to GDP in equation five.

Therefore, the fifth equation contains all five of the explanatory variables.

The results are very consistent with the hypothesis that greater levels of economic development are favorable for food security, and the hypothesis that greater democracy is a boon to food security. The level of economic development is positive and significant at the one percent level of significance or better in all five equations, and democracy is positive and significant at the one percent level or greater in the four equations that it enters. Together, economic development and democracy when used in conjunction with no other explanatory variables explain over thirty eight percent of the cross country variation in the food security index (equation (2)).

The statistical evidence also indicates that productivity growth, government size, and globalization are positive for food security. Productivity growth is positive and significant at the at the one percent level of significance in the

three equations that it enters (equations (3), (4) & (5)). Government expenditure to GDP, the measure of government size, is positive and significant at the one percent level of significance or greater in the two equations that it appears (equations (4) & (5)). Lastly, trade to GDP, the measure of globalization, is positive and significant at the five percent level of significance or better in the fifth equation, the only equation that it enters.

Table II shows the same set of regressions as table I using the health security index as the dependent variable instead of the of the food security index. The table is set-up in analogous fashion to table I. The results for health security are similar to those for food security. Once again, just as for food security, development and democracy are favorable for health security. Once again, productivity growth, government size, and globalization are also positive for health security.

**Table-2.**Cross Country Regressions of Health Security Index on the Level of Development and Other Variables

	(1)	(2)	(3)	(4)	(5)
CONSTANT	.6287	.4661	.4522	.4047	.3604
	(52.28)	(16.13)	(14.75)	(10.30)	(8.56)
	*	*	*	*	*
DEVELOPMENT	.0000084	.0000060	.0000063	.0000059	.0000051
	(9.37)	(5.12)	(5.36)	(5.13)	(4.29)
	*	*	*	*	*
DEMOCRACY		.0314	.0313	.0289	.0303
		(5.78)	(5.77)	(5.28)	(5.57)
		*	*	*	*
PRODUCTIVITY			.0004	.0007	.0006
GROWTH			(1.37)	(2.29)	(2.01)
				**	**
GOVTIOGDP				.0039	.0038
				(2.06)	(2.07)
				**	**
TRADETOGDP					.0005
					(2.64)
					*
RSQ	.328	.452	.460	.478	.502
N	182	159	158	152	151

Next, the same set of regressions is run using the social fabric index, the overall measure of social security, as the dependent variable in the regressions. The results are presented in table III. Just as in the case when the food security index is employed as the dependent variable, and the case when the health security index is employed as the dependent variable, when the social fabric index is used as the dependent variable, the level of development, democracy, and the other variables are positive and statistically significant forces for overall social security.

**Table-3.**Cross Country Regressions of Social Fabric Index on the Level of Development and Other Variables

	(1)	(2)	(3)	(4)	(5)
CONSTANT	.5439	.3818	.3616	.3151	.2740
	(60.90)	(20.70)	(18.98)	(13.11)	(11.00)
	*	*	*	*	*
DEVELOPMENT	.0000086	.0000065	.0000070	.0000067	.0000060
	(12.92)	(8.89)	(9.65)	(9.57)	(8.48)
	*	*	*	*	*
DEMOCRACY		.0303	.0304	.0278	.0291
		(8.73)	(9.02)	(8.29)	(9.00)
		*	*	*	*
PRODUCTIVITY			.0006	.0007	.0007
GROWTH			(3.15)	(4.23)	(3.91)
			*	*	*
GOVTIOGDP				.0039	.0039
				(3.41)	(3.52)
				*	**
TRADETOGDP					.0004
					(4.01)
					*
RSQ	.481	.682	.704	.728	.755
N	182	159	158	152	151

Strictly speaking, the index for food security, health security, and overall security, are limited dependent variables, so that the assumption of normality in the error term is violated and there is a problem with the test statistics using ordinary least squares (the errors also tend to be subject to heteroskedasticity). To address these concerns, interpreting each of the three securities indexes as probabilities, regressions of the log of the odds ratio, instead of the indexes themselves, were re-run on the independent variables. The results for the regressions (not shown) of the log of the odds ratio on each of the security indexes in terms of the signs and statistical importance of the various independent variables is similar to the results of the regressions in tables I, II, and III.

## 5. Conclusion

Based on the findings of the paper, it appears that a primary way to improve the basic security needs of people in a country is to promote economic growth and development and to take measures to insure that government is responsive to the needs of its people. It also appears, with regard to satisfying people's fundamental needs, that bigger government is generally better, and that there is little reason to fear globalization, as it seems to be favorable for basic security needs.

Humans are creatures of hope. As human beings we have the capacity to endure almost any situation as long as there is hope that it will be alleviated. There appears to be hope for higher basic security achievement from greater economic development. The paper shows that higher levels of development are associated with greater satisfaction of fundamental security needs. And, any cursory look at the evidence certainly indicates that it is possible for countries to move from being poorer to being richer. Countries that were at low levels of economic development in the recent past such as the Asian tigers, China, and India, have already either achieved a high level of development or are well along the path of making a transition to higher levels of economic development.

There is also hope with regard to government. Human beings ultimately decide the form of government. It may be very difficult, it may even take a revolution, but human beings can change a government to make it more responsive to the basic security needs of the people.

## References

- Adyemi, S.I., G.T. Ijaiya, M.A. Ijaiya and B.L. Ijaiya, 2009. Determinants of the right of access to food in Sub-Saharan Africa. African Journal of Food, Agriculture, Nutrition and Development, 9(5): 1146-1160. Available from: <http://www.bioline.org.br/abstract?id=nd09052>. [Accessed July 12, 2013].
- Akramov, K.T., Y. Bingxin and F. Shenggen, 2010. Mountains, global food prices, and food security in the developing world. International Food Policy Research Institute, Discussion Paper No. 00989. Available from: <http://www.ifpri.org/sites/default/files/publications/ifpridp00989.pdf>. [Accessed July 23, 2013].
- De Muro, P. and B. Francesco, 2007. Education for rural people and food security : A cross country analysis. Food and Agriculture Organization of the United Nations. Available from <ftp://ftp.fao.org/docrep/fao/010/a1434e/a1434e.pdf> [Accessed July 10, 2013].
- Headey, D.D., 2012. Developmental drivers of nutritional change: A cross-country analysis. World Development, 42: 76-88.
- Heston, A., S. Robert and A. Bettina, 2012. Penn world table version 7.1, center for international comparisons of production. Income and Prices at the University of Pennsylvania. Available from: [https://pwt.sas.upenn.edu/php\\_site/pwt71/pwt71\\_form.php](https://pwt.sas.upenn.edu/php_site/pwt71/pwt71_form.php). [Accessed May 20, 2013].
- Human Security Index, 2010. Human security index version 2.0. Available from: [http://www.humansecurityindex.org/?page\\_id=28](http://www.humansecurityindex.org/?page_id=28). [Accessed June 10, 2013].
- Jeanty, P.W. and H. Fred, 2006. Analyzing the effects of conflicts on food security in developing countries. An Instrumental Variable Panel Data Approach. Available from: <http://ageconsearch.umn.edu/bitstream/21483/1/sp06je04.pdf>. [Accessed July 23, 2013].
- Minkler, L. and S. Shawna, 2011. On the indivisibility and interdependence of basic rights in developing countries. Human Rights Quarterly, 33(2): 351-396.
- Misselhorn, A.A., 2004. What drives food insecurity in Southern Africa? A meta-analysis of household economy studies. Global Environmental Change, 15: 33-43. Available from: [http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.researchgate.net%2Fpublication%2F222814543\\_What\\_drives\\_food\\_insecurity\\_in\\_southern\\_Africa\\_a\\_meta-analysis\\_of\\_household\\_economy\\_studies%2Ffile%2F9c96052a75c2b0406c.pdf&ei=K\\_O\\_U7WIhCsyASAYoDQBg&usq=AFOjC\\_NFWMioqgupLvgJvW1qFmxgCDkEbA&bvm=bv.70810081.d.aWw](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.researchgate.net%2Fpublication%2F222814543_What_drives_food_insecurity_in_southern_Africa_a_meta-analysis_of_household_economy_studies%2Ffile%2F9c96052a75c2b0406c.pdf&ei=K_O_U7WIhCsyASAYoDQBg&usq=AFOjC_NFWMioqgupLvgJvW1qFmxgCDkEbA&bvm=bv.70810081.d.aWw). [Accessed July 11, 2013].
- Sekhampu, T., 2013. Determination of the factors affecting the food security status of households in Bophelong, South Africa. International Business & Economics Research Journal, 12(5): 543-550.
- The Economist, 2008. The economist intelligence unit's democracy index. Available from: <https://graphics.eiu.com/PDF/Democracy%20Index%202008.pdf>. [Accessed February 17, 2011].
- World Bank, 2011. World development indicators. Available from: <http://datbank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators>. [Accessed June 20, 2011].