HAS TRADE LIBERALIZATION IMPROVED FOOD AVAILEBILTY IN DEVELOPING COUNTRIES? AN EMPIRICAL ANALYSIS

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Abstract

Trade liberalization has been promoted by the World Bank and IMF based on the argument that openness to trade will contribute to economic growth and development. More specifically, trade liberalization was expected to reduce poverty and improve food availability for local consumption, and thereby contributing to the reduction of malnutrition and to the overall efforts of food security of a nation. Despite the lack of consensus, most developing countries took the challenge to liberalize their economies. Quarter of a century later, to our knowledge, there is little or no consensus about the empirical relationship between trade liberalization events and food availability/security. The purpose of this paper is to examine empirically the effect of trade liberalization on food availability in selected developing countries. An econometric analysis of panel data seems to suggest that trade liberalization exerted a negative short run effect on food availability in the sample countries. The overall (or net) results, however, fail to support the view that the medium to long run effect of trade liberalization on food availability is favorable. The results of the study provide further evidence on the ambiguity of the impacts of trade, and trade liberalization in particular, on food security.

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Introduction

Almost all developing countries have carried out some form of trade liberalization over the last several decades due to both internal and external forces facilitated through the structural adjustment programs, World Trade Organization, and/or regional trade agreements (Sachs and Warner, 1995; IMF, 1998; Rodriguez and Rodrik, 2000). The rationale for trade liberalization is couched in terms of its presumed favorable effect on economic growth mainly through induced efficiency gains in the allocation of resources. However, whether trade liberalization promotes economic growth and improves overall societal welfare remains a controversial issue. A case in point is the effect of trade liberalization on food availability and security.

Trade liberalization is a process of becoming open to international trade through a systematic reduction and eventual elimination of tariffs and other barriers between trading partners. Trade liberalization measures may include, among others, reducing or eliminating trade barriers such as tariffs, quotas, import and export licensing requirements, foreign exchange control, export subsidies and taxes. The most direct and simplest theoretical argument for trade liberalization is that it forces nations to focus on those products for which there is a comparative advantage. This, in turn, leads to an increase in exports; and the earnings can be used to import food products for local consumption. However, many have argued that increasing food imports is possible but at the expense of domestic production. Furthermore, and from a food security point of view, increasing domestic/local production will do more to reduce malnutrition and uncertainty of food supply than depending upon imports (Greenaway and Sapsford, 1994; OECD, 1998; Greenaway, Morgan and Wright, 2002; FAO, 2003; Santos-Paulino, 2005).

Food security is conceptualized here as food available for human consumption at the national level both from domestic production, commercial imports and food aid. It is common and very intuitive to address the issue of food security/insecurity at the individual and/or household level. However, it has also been argued and shown that the availability of economic resources at the national level and the economic growth that is expected to result from trade liberalization largely determine the extent of overall food and nutrition security of a nation (FAO, 2003; IFPRI, 2006). Hence, the focus here is on whether liberalization contributed toward total food availability regardless of the source.

As indicated above, it is now a widely accepted view that most developing countries have implemented outward-oriented (liberalized) trade policy regimes/strategies over the last two to three decades. The question is: what have been its effects? More specifically, does trade liberalization improve food availability/security? There appears to be no consensus, both at the theoretical and empirical levels, in the existing literature in answering this question.

The paper seeks to empirically investigate the effect of trade liberalization on food availability and, hopefully, contribute to the policy debate since the push for openness and trade liberalization still continues despite the ambiguity of their impacts. The rest of the paper is organized as follows. The next section provides a brief literature review on the relationship between trade liberalization and food security followed in the third section by an overview of the sample data on the two variables. An econometric model is specified and the findings are presented and discussed in the fourth section. The last section offers summary and conclusions.

The link between trade liberalization and food security: A brief literature review

The salient arguments on both sides of the issue at the theoretical level are summarized in table 1 where the answer to our research question: "***does trade liberalization improve food availability/ security?*** "is presented as affirmative, negative, or uncertain. Apparently, whether trade liberalization improves food security is theoretically ambiguous, as the nature and magnitude of the effect depends on a number of factors including: the pace, sequencing and scope of liberalization, the extent of adaptability of the poor (in terms of location and skill and the constraints they face) to changing economic conditions; the degree of exposure of the country to food imports; the presence of favorable initial conditions and accompanying measures such as adequate regulatory and export capacity; and the time horizon (short-term versus medium to long term) considered.

Table 1: The Link between Trade Liberalization and Food Security: The Arguments

Does trade liberalization improve food security?	
Yes, because:	No or uncertain, because:
• The increase in economic growth (through induced changes in relative prices and the resulting efficiency gains from resource allocation based on current comparative advantage) reduces poverty and improves food security.	• Adverse changes in income distribution against the poor could occur due to induced changes in the structure of production. The poor may in the short run experience increased income risks, worsening their food security condition.
• Trade liberalization possibly engenders a fall in domestic food prices (as they should have been higher under	• The induced fall in domestic food prices (if they were to fall) could adversely affect the food security status of the poor

protection) thereby increases quantity of food consumed.	where their major source of income is food production.
• Opening up the economy reduces the variability of staple foods supply (by helping offset adverse domestic supply shocks).	• In the presence of less stable and less predictable world markets (than trade under protection), liberalizing the trade regime could increase the variability of staple food supply.
• The increase in foreign exchange earnings (as the economy becomes more competitive and the export sector expands) enhances the capacity of the economy to finance food imports and augment domestic production.	• Liberalization would in the short run negatively affect food imports through higher import bills (for food importers) without an offsetting supply response due to the relative inflexibility of production and trade in the agricultural sector.

Note: See, for example, FAO, 2003; Madeley and Solagral, 2001; IFPRI, 2006, for additional arguments.

The relationship between trade liberalization and food security is, therefore, an empirical question, and has been a subject of a number of studies (e.g. Ingco, 1997; UNDP, 1997; Morrison and Pearce, 2000; Madeley and Solagral, 2001). A review of the relevant literature by Madeley and Solagral (2001) indicates that the evidence is mixed. Some studies find evidence to support the view that trade liberalization contributes to poverty reduction, augments prosperity and accelerates the development process of a country. Other studies report that "the fruit of liberalization and globalization are not reaching the table of the poor" and they emphasize "the ill effects of accelerated or incautious trade liberalization" (Madeley and Solagral, 2001: p. 3 &5,

respectively). The review reveals that trade liberalization has caused many farmers to leave farming thereby countries becoming increasingly dependent on food imports.

If, as observed by Madeley and Solagral (2001), farmers are leaving their land, and dependence on food imports has increased following trade liberalization, what does this imply for overall food security at the national level? This paper attempts to address this issue by taking stock of the experiences of 37 developing countries where some form of trade liberalization occurred during the 1980s and 1990s. The empirical analysis is conducted in two steps. First, we provide an overview of the data and examine the effect of liberalization on food availability using the *before/after* approach. Second, an econometric model is specified and estimated.

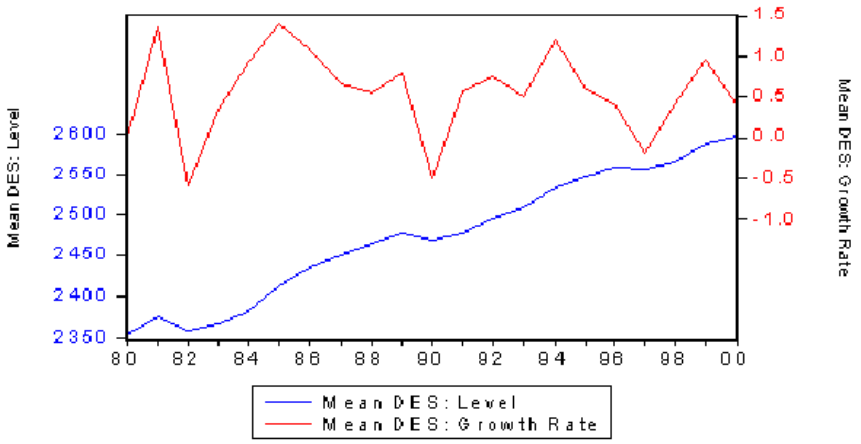
Trade Liberalization and food security: An overview of the data

– As indicated earlier, national food security is measured in terms of overall food availability. Consistent with the related literature (e.g. Smith and Haddad, 2001), in this study, food availability is represented by per capita daily dietary energy supply (DES). Per capita daily energy supply is derived from food balance sheets using country-level data on domestically produced and imported foods including food aid available for hum an consumption minus nonfood use. Trade liberalization episodes examined in this study are those that occurred in the 1980s and 1990s in the sample countries, which are drawn from the list of trade liberalization episodes compiled by Li (2003). The countries that we included in our study are: Benin, Brazil, Cameroon, Chile, Colombia, Costa Rica, Ecuador, Gambia The, Ghana, Guatemala, Guinea-Bissau, Guyana, Honduras, India, Indonesia, Jamaica, Kenya, Korea Rep., Malaysia, Mali, Mauritania, Mexico, Morocco, Nepal, Nigeria, Pakistan, Paraguay, Peru, Philippines, Sri Lanka, Thailand, Tunisia,

Turkey, Uganda, Uruguay, Venezuela, and Zambia. And, the source for DES and unit value of imported food was FAO.

Figure 1 depicts the profile of per capita DES in the study countries over the study period. The sample mean level of DES during this period ranges between 1979 kcal (Zambia) and 3392 kcal (Turkey), averaging at 2475 in the pooled data. The level of per capita DES exhibited an upward trend during the study period, but its growth rate was subject to frequent and wide swings.

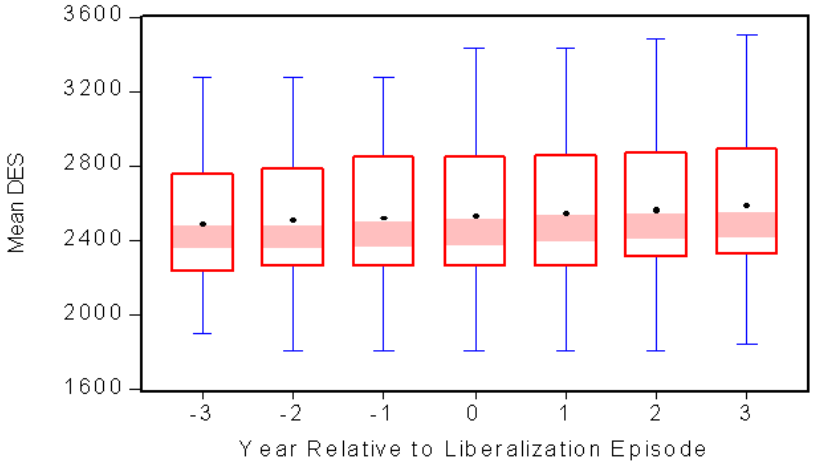
Figure 1. Level and Growth Rate of DES: 1980-2000



How was the profile of DES before, during, and after liberalization episodes? Although inferences cannot be made about the causal relationship between the two variables from the answer to this question, the exercise will nonetheless be useful to characterize the profile of DES during the process of trade liberalization. Accordingly, the profile of DES was examined by partitioning the pooled data on the basis of liberalization episodes. Segmenting the pooled data between observations associated with liberalization episodes and those without indicate that the former group experienced a higher mean DES (2459 kcal) than the latter (2533 kcal). The observed difference is small but statistically significant at the 5 percent level.

Constructing a seven-year profile of mean DES (three years before and after liberalization episodes, averaged across countries) shows marginal improvement from one year to the next relative to the year of liberalization episodes (Figure 2). A similar pattern emerges where the profile of DES before and after liberalization is compared by calendar year. Comparing three-year averages, it is observed that the level of mean DES was higher following liberalization episodes (2566 kcal versus 2508 kcal). However, a t-test of the difference in means between the two groups (before and after) shows that the observed differential is statistically insignificant even at the 10 percent level.

Figure 2. **Profile of DES Before and After Liberalization Episodes**



Econometric model and estimation results

The results of the before/after approach reported above suffer the well known limitation that they attribute the observed differences solely to liberalization episodes, ignoring the influence of other determinants of DES which may have changed concurrently. The econometric approach deals with this shortcoming by controlling for the relevant co-determinants of DES. We specify an eclectic model that distinguishes between contemporaneous and delayed effects of liberalization while controlling for some of the major factors that are expected to influence food availability. The set of control variables considered includes the level of per capita real GDP

(RGDPPC), irrigated land as a percentage of crop land (IRG), the price of imported foods (MFPRICE), foreign reserves in months of imports (RESVM), and political instability (POL).

A positive association between DES and real GDP per capita is expected through the favorable impact of increased income on food expenditure. The percentage of crop land irrigated is expected to contribute to food security via its positive impact on domestic food production. The foreign price of imports and foreign reserves are relevant as they affect the availability of food from imports. Rising prices of imported food and dwindling foreign reserves are expected to lead to a decline in DES by restricting access to food imports. Political instability negatively affects food availability through its impact on food supply from domestic production.

The estimating model takes the following form, with expected signs indicated in parentheses beneath slope coefficients:

$$logDES_{it} = \alpha + \underset{(?)}{\alpha_1 LIBZ_{it}} + \underset{(?)}{\sum \alpha_{2m} LIBZ_{it-m}} + \underset{(+)}{\alpha_3 logRGDPPC_{it}} + \underset{(+)}{\alpha_4 IRG_{it}} + \underset{(-)}{\alpha_5 logMFPRICE_{it-1}}$$

$$+ \underset{(+)}{\alpha_6 logRESVM_{it-1}} + \underset{(-)}{\alpha_7 POL_{it}} + \varepsilon_i + \nu_t + \mu_{it} \qquad (1)$$

where:

LIBZ = Trade liberalization dummy variable which equals one where/when liberalization occurred and zero otherwise.

POL = Political instability dummy variable which equals one when/where political instability (such as adverse regime changes, ethnic and revolutionary wars, and genocides/politicides) occurred and zero otherwise.

ε = country-specific, time-invariant fixed effects

ν = period-specific, individual-invariant fixed effects

m = order of lag up to three years

μ = stochastic error term

Subscripts i and t denote country and time (year), respectively.Others: as defined above.

As mentioned, the data set used for this study is panel data comprising time series and cross sectional components. Thus, the basic model incorporates unobservable country- and period-specific effects to account for differences among the sample countries and over the study period not accounted for by the included variables, allowing the intercept to vary across countries and over time. The model is estimated with alternative using the Eviews econometric software. Table 2 records the results obtained from estimating the basic model.

Results reported in column I of table 3 are those based on the estimation of the basic model on levels of variables with three lags of liberalization. The explanatory variables of the model are jointly significant and explain 85% of the variation in the dependent variable.

The estimated coefficients of real GDP per capita, foreign reserves and political instability are signed as expected and these variables appear to significantly influence food availability, unlike the other regressors which are imprecisely estimated. However, an examination of residuals obtained from the regressions on levels shows the presence of serial correlation.[1] As a remedy for serial correlation, the model was re-estimated on first differenced data. First-differencing equation (1) yields:

$$\Delta logDES_{it} = \beta_0 + \beta_1 \Delta LIBZ_{it} + \sum \beta_{2m} \Delta LIBZ_{it-m} + \beta_3 \Delta logRGDPPC_{it} + \beta_4 \Delta IRG_{it}$$
$$+ \beta_5 \Delta logMFPRICE_{it-1} + \beta_6 \Delta logRESVM_{it-1} + \beta_7 \Delta POL + \Delta \nu_t + \Delta \mu_{it} \qquad (2)$$

[1] A first-order autocorrelation test in the context of a panel data setting, which involves an auxiliary regression with the lagged residual series included as an additional explanatory variable (see e.g. Wooldridge, 2002:176-77), fails to reject the null of no autocorrelation at the one percent level. The coefficient of the lagged residual is estimated to be 0.753 with a t-ratio of 33.8.

where country-fixed effects are differenced away and a common intercept term is added. [2]

Table 2: Econometric results: Basic model

Dependent Variable: logDES in level and ΔlogDES in first difference (FD) versions

Explanatory Variables	I: Level (Panel LS)		II: FD (Panel LS)		III: FD (Panel EGLS)	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
LIBZ	-0.0049	0.670	-0.0038	1.001	-0.0044	1.993**
$LIBZ_{-1}$	0.0012	0.142	-0.0012	0.315	-0.0001	0.046
$LIBZ_{-2}$	-0.0014	0.164	-0.0017	0.438	-0.0000	0.0346
$LIBZ_{-3}$	0.0087	1.217	0.0041	1.083	0.0033	1.537
Log(RGDPPC)	0.0444	2.492**	0.0908	3.169***	0.0909	4.619***
IRG	-0.0003	0.468	0.0032	2.317**	0.0026	2.981***
$Log(MFPRICE_{-1})$	-0.0153	1.426	-0.0151	2.341**	-0.0109	2.396**
$Log(RESVM_{-1})$	0.0038	2.648***	0.0016	1.434	0.0019	1.845*
POL	-0.0189	2.066**	-0.0052	0.702	-0.0044	1.004
N	746		740		740	
Adj. R^2	0.849		0.028		0.060	
SER	0.056		0.034		0.034	

Notes:

1. FD= first difference, LS=least squares, EGLS=Estimated generalized least squares, N=number of observations, SER=standard error of regression.
2. Regression on levels using the fixed-effects procedure (with country- and period-specific fixed effects included) generates results reported in column I. Columns II and III record estimates of regressions on first-differenced data of all variables of the model. First differencing removes the country-fixed effects, and the period fixed effects were found to be statistically insignificant and were, therefore, excluded. As a consequence, results in column II are pooled OLS estimates based on the transformed data while those in column III are feasible generalized least square estimates based on cross-section weights and White cross-section standard errors and covariance.
3. The t-statistics are absolute values of t-ratios. Triple, double, and single asterisks denote significance at the 1%, 5% and 10% level, respectively.

[2] An F-test of the significance of the fixed period effects in the differenced data fails to reject the null that they are redundant: F (20, 710)=0.635, with pvalue=0.89. Therefore, the period fixed effects are dropped from the regression.

The estimation of equation (2) generates results appearing in the last two columns of table 2. Estimates in column II, which are obtained applying OLS on the transformed pooled data, are generally consistent in terms of signs, with their counterparts from regressions on levels with the exception of the irrigation variable. The coefficients of the liberalization variable, both current and lagged, remain statistically insignificant. The first-differencing enhanced the statistical significance of the majority of the regressors. The major exceptions are the coefficients of foreign reserves and political instability which are now statistically less significant.

While panel data has the advantage of increasing the number of observations and the degrees of freedom compared to a time-series data of a single country, the setting introduces the possibility of cross-sectional heteroscedasticity, with implications for the efficiency of the estimators and the validity of hypothesis testing and inference. The results of the Breusch-Pagan test for heteroscedasticity indicate that its presence cannot be ruled out at the conventional level of significance.[3] As a remedial measure, the model was re-estimated using the estimated generalized least squares method with cross-sectional weights and a White cross-section standard errors and covariance. The estimates thus obtained are reported in the last column of table 2. Apparently, the correction for heteroscedasticity improved the statistical significance of most of the regressors. The contemporaneous effect now emerges statistically significant at the five percent level, and the coefficient of the three-time lag is positive with lower standard errors than in the previous case. On the other hand, the effects of first two lags of the liberalization variable remain imperceptible regardless of the estimation method employed.

Dropping these variables and re-estimating the model produces the results recorded in column I of table 3, which leaves the observed effects of the retained variables essentially

[3] Regressing the squared residuals from the regression of column II on the explanatory variables of the model yields the following statistics: LM =16.5 (p-value=0.06) and F = 1.8 (p-value=0.06).

unaltered. The results seem to suggest that the contemporaneous impact of liberalization is negative while the effect with a longer lack is likely to be positive. However, a Wald test fails to reject the null hypothesis that the sum of the two effects is zero, suggesting that the short-run adverse effect is hardly reversed during the time horizon considered in the analysis.[4]

The regression results are generally robust to the inclusion of regional dummy variables which were included to account for possible differences among regions in the degree of food availability (column II of table 3). All the regional dummy variables are statistically insignificant and exerted no appreciable influence on the coefficients of the other explanatory variables of the model except on the three-time lagged liberalization variable which now becomes significantly at the 10 percent level. The last set of results (column III) is obtained by controlling for the lagged dependent variable to account for the effects of inertia and initial conditions. This variable emerges significantly negative, suggesting that current improvement in DES in partly the result of initial condition of lower food availability.

With respect to the other explanatory variables of the model, the estimates suggest that per capita real GDP, proportion of crop land irrigated, and the availability of foreign reserves positively influence national food security. On the other hand, a rise in the price of food imports is found to adversely affect food availability. As expected, the incidence of political instability enters the regression negatively, although the effect is statistically insignificant.

[4] The Wald test for the null hypothesis that the sum of the two coefficients is zero yields an F-statistic of 0.11 with a p-value of 0.74.

Table 3: Econometric Results: Modified Model

Dependent Variable: Δ logDES

X variables	I		II		III	
	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic
ΔLIBZ	-0.0044	2.102**	-0.0042	1.983**	-0.0044	2.060**
$\Delta LIBZ_{-3}$	0.0033	1.584	0.0033	1.653*	0.0033	1.586
Δlog(RGDPPC)	0.0908	4.514***	0.0978	4.745***	0.0978	4.986***
ΔIRG	0.0026	2.885***	0.0026	2.589***	0.0026	2.919***
$\Delta \log(MFPRICE_{-1})$	-0.0109	2.349**	-0.0111	2.448**	-0.0095	1.960**
$\Delta \log(RESVM_{-1})$	0.0019	1.840*	0.0018	1.777*	0.0016	1.598
ΔPOL	-0.0044	1.004	-0.0042	0.924	-0.0057	1.308
$\Delta logDES_{-1}$	---	---	---	---	-0.1249	3.127***
Asia	---	---	0.0000	0.0570	---	---
Latin America	---	---	0.0021	1.612	---	---
North Africa	---	---	0.0053	1.462	---	---
Sub-Saharan Africa	---	---	0.0028	1.418	---	---
N	740		740		740	
Adj. R^2	0.062		0.061		0.074	
SER	0.034		0.034		0.033	

Notes:

All estimates in this table are obtained using the feasible GLS method with cross sectional weights. Column I is a re-estimation of the basic model having dropped the highly insignificant two lags of liberalization. Columns II and III, respectively, add regional dummies and the lag of the dependent variable to the estimating model. See also notes to table 2. The Asia dummy variable includes Turkey.

Summary and conclusion

The purpose of this paper has been to examine the food-security effect of trade liberalization in developing countries. Representing national food security by per capita daily dietary energy supply and trade liberalization by a dummy variable of episodes, and with a set of control variables, the study found trade liberalization to have exerted a negative contemporaneous and a positive but weak delayed effect on food availability. The negative current effect provides evidence to the view that trade liberalization could adversely affect food security because of structural rigidities and rising food import bills in the short run. The observed positive effect with a longer lag, although it is not robustly significant at the conventional level, seems to be consistent with the assertion that in time the efficiency gains will accrue as to outweigh the associated costs. However, the finding that the sum of the two effects are not statistically different from zero fails to support the view that the medium to long run effect of trade liberalization on food security is favorable. This could be due to the weak relationship between trade liberalization and economic growth as observed by early studies such as Stiglitz and Charlton (2005).

The results of the study provide further evidence on how food security responds to trade liberalization in the short and medium to long run. However, the results should be interpreted with caution. First, the dummy variable used to represent liberalization episodes lumps together different kinds of trade liberalization measures irrespective of their scope, pace, sequencing, permanence or reversal, and thereby assumes all to have the same effect. Therefore, the estimated and reported effect is the average effect of different types of liberalization measures, which could have disparate impacts depending on their scope, pace, and other dimensions. Second, due to paucity of micro data, the study was not conducted at the household or individual

level, which is a more useful unit of analysis to determine the effect of liberalization on the more vulnerable groups of society (the issue of availability versus access). Nonetheless, to the extent that the short-run effect at the national level is negative and is not to be reversed in the medium to long run, then it can be justifiably conjectured that the effect on the poor at the household level will not be positively different unless the distribution of income changes in favor of the poor following liberalization.

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