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Food Price Crisis, Poverty and Inequality

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**ABSTRACT**

This paper simulates how a doubling of food prices affects absolute poverty and the food-price-adjusted real income distribution. We assume unsubsidized world food prices in order to derive the cost of poverty deepening and poverty expansion. We also estimate the degree to which inequality increases if no measures are put in place to offset rising food prices. Both measures are vulnerability indicators useful for social policy planning. Our results show that low income countries experience dramatic increases in absolute poverty as a result of doubling food prices. Middle income countries experience the greatest decrease in absolute income, which contributes most to an increase in world income inequality. The paper estimates that the global dollar value of the absolute poverty gap ($1.25/day) has the potential to increase by four hundred percent, with poverty deepening accounting for two thirds of the increase.

Keywords: Food price crisis, income inequality, poverty, food price elasticity of real income, food price elasticity of real income distribution, social policy.
1. INTRODUCTION

The food price crisis beginning in 2007 is perhaps the biggest cost push inflation event since the oil crises of the 1970s. Between January 2007 and June 2008, the Food and Agriculture Organization’s (FAO) Food Price Index jumped from 134.0 to 224.8. Although the index dropped in the second half of 2008, closing at 148.1 in December, it has since followed a general upward trend and peaked at 237.9 in February of 2011. In November of 2012, the Food Price Index stood at 210.9 (FAO, 2013). Many observers conclude that “food prices are expected to remain high and volatile” (FAO, 2011, p. 20).

As stated by Engel’s law, low income households spend a larger fraction of their budgets on food items than do high income households. The recent dramatic rise in food prices has therefore affected poor households more than rich ones. This asymmetric deterioration of real income poses considerable risks to political stability and has likely contributed substantially to recent antigovernment upheavals around the world (Schneider, 2008). It has even been argued that uprisings in the Arab world beginning in 2010 cannot be fully understood independently from the food price crisis (Zurayk, 2011). In the case of Egypt, for example, the authoritarian bargain “by which citizens relinquish political rights for economic security” (Desai et al, 2009, p. 93) began to crumble when the army had to be enlisted to bake bread for the hungry citizens.

The tendency for political instability in countries vulnerable to food price shocks is often aggravated by beggar-thy-neighbor policies and a lack of international policy cooperation (IMF, 2008). For example, when segments of society suffer from high food prices, governments often feel politically obliged to issue export bans. These export restrictions drive up market prices among trading partners and, in essence, only export poverty and aggravate regional political
instability. Similarly, the substitution of food by subsidized fuel crops, especially in corn markets, has led to substantial shortages of global corn supplies.

The purpose of this study is to present a methodology for examining the effects of the food price crisis on relative changes in pre-tax/transfer income. The effects of food price increases on post-tax/transfer income are important for comparative poverty studies, but the goal in this paper is different. One of our objectives is to provide a measure of total worldwide resources needed (cash transfer equivalent) to counteract increases in the UN’s measure of the absolute poverty gap (below $1.25/day/person) caused by food price increases. In other words, the measure developed in this paper provides the total dollar amount that would be needed to completely compensate the extreme poor for the real income loss due to a doubling of food prices. This estimate is an important benchmark for assessing the global fiscal pressure stemming from the food price crisis. While our findings focus on the overall global redistributive cost of the food price crisis, our methodology can also be applied on a country-by-country basis.

Many studies have attempted to quantify the effects of the food price crisis on absolute poverty. But no study, to our knowledge, has yet comprehensively examined relative changes in real income across the income distribution. This is surprising because the literature suggests that what matters for political stability is not absolute but relative poverty (see, for example, Lichbach, 1989). Information about the impact of the food price crisis on income inequality is therefore as important as knowledge about its effect on absolute poverty.

Studies estimating the effects of the food price crisis on poverty vary in methodology, data sources, and data quality. Some studies focus on short-run effects, others on the long-run.
Sometimes the focus is on rural, at other times on urban poverty. Lastly, the assumptions regarding the pass-through from international to national food prices differ.

De Hoyoz and Medvedev (2009) focus on the short-run effects of the food price crisis. They use data on domestic price increases in developing countries and find that while international food prices had increased by 74 percent between January 2005 and December 2007, the average price pass-through in a sample of 76 countries was only 5.6 percent. The authors calculate that this price hike has increased the $1.25/day real poverty rate in the developing world from 28.7 to 31.1 percent. The authors also report great differences across regions. According to their findings, poverty in Eastern Europe and Central Asia and Latin America remained roughly unchanged, while the headcount ratios in East Asia and the Middle East and North Africa increased by around 6 and 2.4 percentage points, respectively (De Hoyos and Medvedev, 2009, p. 23). Such studies therefore focus on the effects on poverty largely holding constant current food security policies, whereas our focus in this paper is on the total fiscal cost of the food price crisis.

Ivancic and Martin (2008) simulate a scenario that incorporates the food price inflation on world markets between 2005 and 2007. The authors work with household surveys from nine low-income countries that provide information on the production, purchases, and consumption of major food categories, namely dairy, maize, poultry, rice, and wheat. The authors find that the food price crisis has increased $1/day poverty by approximately 4.5 percentage points. It should be noted that to arrive at this particular estimate the authors used a food price inflation rate of about 70%, which is appropriate for the two-year period, and they additionally assume that only 66% of the price increase is passed through to domestic consumers. In other words,
they assume a 46% food price inflation effect to calculate the change in the poverty rate. Later in the paper, we will present estimates for the conventional $1.25/day poverty rate, assuming a 100% food price inflation, and a 100% pass-through to consumers, for the world as a whole.

Using a sample of 72 countries, Dessus et al (2008) concentrate exclusively on urban poverty. Also working with only partial pass-throughs of global food price inflation, they find that the food price crisis has increased the $1.25/day poverty rate among the 20 countries hit worst by the food price crisis by on average five percent. The average cost of the corresponding poverty gap is estimated to be between 0.2 and 2.8 percent of GDP.

Wodon and Zaman (2010) and the Asian Development Bank (2011) each present studies with an explicit regional focus. Wodon and Zaman (2010) concentrate on Sub Saharan Africa and assume a 50% rise in food prices. They estimate that this has increased the $1.25/day poverty rate by roughly six percent and has also expanded the poverty gap by six percent. The Asian Development Bank (2011) published a report entitled Global Food Price Inflation and Developing Asia, which reports food price elasticities of the $1.25/day poverty rate between 0.65 and 0.70. In other words, assuming a (low) 30 percent food price inflation scenario, the Asian Development Bank sees approximately a 19.5-21 percent increase in the $1.25/day poverty rate for developing Asia.

The existing literature hints of at least two areas that require further research. First, the impact of the food price crisis on income inequality is essentially never addressed. Second, the global poverty dimensions of the food price crisis assuming a full pass-through of food prices has not yet been estimated. Such estimates, however, are important for at least three policy decisions. First, they allow for benchmarks that are useful for social policy budgeting. Second,
they provide cost estimates of potential increased aid needs. Third, they can be used to compare the costs of transfers with other social policy instruments, such as food-price subsidies.

This study proposes a methodology and uses it to provide these missing estimates. Specifically, assuming a worst-case scenario of a permanent doubling of food prices, we provide estimates for the food price elasticity of real per capita income, the food price elasticity of income inequality, the number of people at risk of falling below the $1.25/day poverty line ($2005 PPP), the dollar value of the absolute poverty gap, and the deterioration of the world income distribution.

2. METHODOLOGY

To arrive at our estimates, we require only simple calculations grounded in basic economic principles. A useful feature of this approach is that these calculations should be generally accessible to policy analysts of multinational organizations or government agencies. Studies that contain overly arduous analytics can sometimes have diminished influence if they are technically inaccessible to policymakers. In this study, we therefore hope to generate a great deal of insight gleaned from simple, straight-forward calculations.

Our methodology is to derive the change in real (food-price adjusted) income for different income groups based on their food expenditure shares (FES) for a doubling of food prices. Once we have computed the change in real income for each income group, we derive a new Gini coefficient of overall real-income inequality. Comparing the pre and post crisis Gini coefficients allows us to calculate the percentage change in overall income inequality caused by
a full pass-through of a doubling of food prices. We show how income inequality changes within countries and for the world income distribution as a whole. Finally, we use our results to estimate the number of households for whom adjusted real income falls below the $1.25/day poverty rate and use this number to estimate the dollar value of the absolute poverty gap expansion induced by the food price crisis.

In other words, we provide the following five estimates:

A. The food price elasticity of real income, \( FES \)

B. The food price elasticity of income inequality, \( FES \)

C. The number of people newly falling below the $1.25/day poverty line.

D. The dollar value of the global poverty gap deepening and expansion.

E. The deterioration of world income inequality.

**Estimating the Food Price Elasticity of Real Income**

For the purpose of estimating the food price elasticity of real income, we calculate for each country \( i \), the real income, \( yr \), for a doubling of the food price index (FPI) using the formula

\[
yr_i = \frac{y_i}{FES_i \times 2 + (1 - FES_i) \times 1}
\]

where \( y_i \) is nominal income and the multiplicand “2” is the food price index which captures the doubling of food prices from a pre-crisis food price level of one. The pre and post crisis price level of non-food items are kept at one. A doubling of food prices corresponds roughly to the increase of the Food and Agricultural Organization’s Food Price Index between 2000 and 2012.
It should be noted that Equation (1) holds nominal income fixed and does not take into account how a doubling of world food prices might affect nominal GDP. While one might expect nominal GDP to be affected by changing world food prices in some countries, in practice there is little evidence that this is the case. For example, using World Bank data we found no significant correlation across countries between the growth of food exports (as a percent of total merchandise exports) and nominal income growth. One reason for this is that higher food prices are often offset by higher agricultural input prices (Wise, 2011). This is particularly relevant to smallholder farmers in developing economies, where input factors such as fertilizers and fuel account for a greater share of production costs than is the case for capital intensive farming with large economies of scale. Benefits of higher food prices have mostly accrued to large multinational producers of agricultural inputs, such as seed and fertilizer. The increased profits of these firms, while large, are not large enough to have a significant effect on the GDP of the industrialized economies where they typically reside. In light of these factors, a simplified partial equilibrium approach, holding nominal income fixed, provides reasonable estimates.

Using (1) we then determine, employing the simple mid-point formula, the food price elasticity of real income, $\mu_i$, as

$$
\mu_i = \frac{y_{r,i} - y_i}{0.5(y_{r,i} + y_i)} \frac{2 - 1}{1.5}
$$

(2)
Estimating the Food Price Elasticity of Income Inequality

We determine for each country’s population quintile, \( q \), the pre-crisis per capita income as

\[
y_{iq} = \frac{Income\ Share_{iq} \times y_i \times Population}{0.2 \times Population} = \frac{Income\ Share_{iq} \times y_i}{0.2}
\]

(3)

As described in more detail in the next section, we use available data on national food expenditure shares and national per capita incomes to generate an estimated regression line that reflects Engle’s law as

\[
FES_i = \beta_0 + \beta_1 \times \ln\left( y_i \right) + \varepsilon_i
\]

(4)

We then apply the estimated coefficients from (4), to estimate the food expenditure shares for each income quintile in each country in our sample as

\[
\hat{FES}_{iq} = \hat{\beta}_0 + \hat{\beta}_1 \times \ln\left( y_{iq} \right)
\]

(5)

where the “hats” on the \( \beta \)’s represent the coefficient estimates derived in (4). The natural log transformation on the right hand side is undertaken to account for the non-linearity in the relationship between \( FES \) and per capita income.

Equipped with the results from Equation (5), and similar to Equation (1), we calculate the real food-price-adjusted per capita income for each quintile in each country as

\[
y_{r, iq} = \frac{y_{iq}}{\hat{FES}_{iq} \times 2 + (1 - \hat{FES}_{iq}) \times 1}
\]

(6)
Using (6), we next determine, for each income quintile in each country, the share of the country’s total food-price adjusted real income. This allows the construction of a Lorenz curve and the post-food-price-crisis Gini-coefficient for each country as

\[ \text{Post–Crisis Gini}_i = \frac{\text{Area between Equal Distribution and Lorenz Curve}}{\text{Area under Equal Distribution Curve}} \]  

We finally compute, using again the midpoint formula, the food price elasticity of income inequality, \( \nu_i \), following the doubling of food prices as

\[ \nu_i = \frac{\text{Post Crisis Gini}_i - \text{Pre Crisis Gini}_i}{0.5 \left( \text{Post Crisis Gini}_i + \text{Pre Crisis Gini}_i \right)} \]  

**Estimating the Number of People Worldwide Newly Falling below the $1.25/Day Poverty Line**

To estimate the increase in the percent of the world population that falls below the $1.25/day poverty line in terms of their real food-price adjusted income, we first estimate for the world a cumulative income/day function, \( F(y) \), for pre-crisis income. From this we can derive a cumulative post-crisis real income/day distribution, \( F(yr) \). Doing this simply requires matching the pre-crisis income/day cumulative density with the equivalent post-crisis real income values (for a graphical illustration, see Figure 4 below). The change in the percent of the world population falling below the $1.25 poverty line can then be calculated as

\[ \text{Change in Percentage below}$\, \$1.25/\text{day} = F \left( \text{yr} = \$1.25 \right) - F \left( y = \$1.25 \right) \]
Estimating the Dollar Value of the Global Poverty Gap after a Doubling of World Food Prices

Finally, the estimated pre and post-crisis cumulative income/day distributions can be used to estimate the dollar value of the pre-existing poverty gap, the dollar value of the deepening of the pre-existing poverty gap, and the expansion of the poverty gap (capturing those whose post-crisis real incomes fall below $1.25/day from nominal pre-crisis levels above $1.25/day). Assuming a world population of seven billion, 7(10^9), the three values are estimated as

\[
\text{Poverty Gap Pre-Existing} = \sum_{y = 0.01}^{1.25} (1.25 - y) \times 365 \times [F(y) - F(y - 0.01)] \times 7(10^9) \quad (10)
\]

\[
\text{Poverty Gap Deepening} = \sum_{y = 0.01}^{1.25} (y* - yr) \times 365 \times [F(y) - F(y - 0.01)] \times 7(10^9) \quad (11)
\]

\[
\text{Poverty Gap Expansion} = \sum_{y = 1.25}^{y*} (y* - yr) \times 365 \times [F(y) - F(y - 0.01)] \times 7(10^9) \quad (12)
\]

where \(y^*\) in Equation (11) and (12) is the pre-crisis income level that corresponds to the post-crisis real income level of yr=$1.25.

Estimating the Deterioration of World Income Inequality

We estimate the deterioration of the world income inequality in two ways. First, we compute, similar to Equation (7), a Gini coefficient across countries, using national average
incomes (see Figure 6 below). With this measure we then determine the change in per-capita-income inequality across countries simply as

\[
\text{Change in Cross-Country Income Inequality} = \text{Gini}_{\text{Post Crisis}}^{\text{Across Countries}} - \text{Gini}_{\text{Pre Crisis}}^{\text{Across Countries}}
\] (13)

In addition to obtaining in this way an indicator of the change of inequality across countries, graphing the Lorenz curves associated with these Gini coefficients provides a useful visualization of which countries experience the greatest absolute decrease in income and therefore contribute most to the increase in world income inequality.

The second approach measures inequality in the distribution of world income across all human beings assuming a borderless world. For this purpose we transform the cumulative global income distributions \( F(y) \) and \( F(yr) \) as developed in Subsection 2C into Lorenz curves (see Figure 7 below) and determine the change in world income inequality across individuals as

\[
\text{Change in World Income Inequality} = \text{World Gini}_{\text{Post Crisis}} - \text{World Gini}_{\text{Pre Crisis}}
\] (14)

3. DATA AND ESTIMATION RESULTS

We rely mostly on data from the 2011 World Bank Development Indicator Database, except for Food Expenditure Shares (FES), which are not included in that data. Fortunately, we were able to get the FES variable from the United States Department of Agriculture Economic Research Service (USDA, 2013), which to our knowledge is the best source for comparable food expenditure shares across countries. The FES observations provided by the USDA are only for
the year 1996, but it is unlikely that there is much annual variability in FES. In our view these observations are good pre-crisis references that are unlikely to have changed much by 2006, the eve of the food price crisis.

While food expenditures shares are typically reported relative to post-tax/transfer incomes, USDA’s food expenditures shares are relative to per capita GDP. The documentation accompanying the dataset states that its “method begins at a highly disaggregated level, with a country’s gross domestic product divided into a large number of detailed consumption categories” (Seale et al, p. 8). The obtained food expenditure shares are accordingly all derived at the macro level for each country and are representative for national pre-tax/transfer per capita income shares, as assumed in our analysis.

From the 2011 World Bank Development Indicator Database (WDI, 2013b) we use country income shares by quintiles, using only observations that fall within the 1993-1999 period in order to use quintile shares that are relatively contemporaneous with the USDA FES data for 1996. We also use from the WDI, for each country, the 1996 GDP per capita in $2005 PPP and the 1996 population figures.

Because of missing observations on mostly income quintiles for some countries, our final dataset consists of 75 country observations, including mostly developing economies. A list of countries included in our final sample can be found in the Appendix.

The income shares per quintile are labeled Low20, Sec20, Trd20, Frt20, and Hgh20, respectively. The labels for the 1996 GDP per capita ($2005 PPP) and population are y and Pop, respectively.
The Food Price Elasticity of Real Income and its Determinants

The estimated food price inflation elasticity of real income (Equation 2) in our sample of 75 countries has a mean of -48.6, a standard deviation of 14.6, and a minimum and maximum value of -73.2 and -19.7, respectively (see Table 1).

As can be seen from Equation (2), the relationship between the food price elasticity of real income is deterministic with \( \frac{d\mu}{dy} > 0 \). This relationship is presented in the first panel of Figure 1. Because of the inverse relationship between per-capita income and food expenditure shares, the absolute value of the food price elasticity of real income is also inversely correlated with food expenditure shares, presented in panel 2 of Figure 1. In other words, the greater is the food expenditure share, the greater is the relative income reduction from a food price increase. Panel 3 of Figure 1 shows that there is not a clear relationship between initial income inequality and the food price elasticity of real income, \( \text{Gini} \) but the weak inverse relationship possibly captures the fact that high inequality countries tend to be poorer.

Figure 1

The Relationship between Food Price Elasticity of Income (\( \mu \)), Initial Income, Food Expenditure Shares, and Income Inequality

[Graphs showing the relationship between food price elasticity, income, food expenditure shares, and income inequality]
The Food Price Elasticity of the Real Income Distribution and its Determinants

As far as the food price elasticity of income inequality is concerned, Figure 2 shows Engel’s Law, the strong inverse relationship between (the natural log of) per capita income, $y$, and food expenditure shares, $FES$ (Equation 4). This is the result we used to approximate the food expenditure shares of all countries’ population quintiles (Equation 5), their real income when $FPI=2$ (Equation 6), and the food price inflation corrected income inequality (Equation 7). Both the intercept and the slope coefficient of Equation (4) are highly significant ($p<1\%$).

Figure 2

Engel’s Law (Equation 5)

Regression Results (N=75)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Regression Coefficient</th>
<th>Standard Error</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>147.705</td>
<td>7.978</td>
<td>18.514</td>
</tr>
<tr>
<td>Real Per Capita Income (ln)</td>
<td>-12.816</td>
<td>0.937</td>
<td>-13.679</td>
</tr>
</tbody>
</table>

R-Squared = 71.9%

The food price inflation elasticity of the real income distribution in our sample of 75 countries has a mean of 11.4, a standard deviation of 1.5, and a minimum and maximum value of 8.3 and 15.3, respectively (Table 1).

Table 1

Food Price Inflation Elasticity of Real Income and the Real Income Inequality – Summary Statistics (N=75)

|                     | Food Price Elasticity of Real Income, $FPI$ | Food Price Elasticity of Real Income Inequality, $FPI$
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Mean</td>
<td>-48.6%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Minimum</td>
<td>-73.3%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Maximum</td>
<td>-19.7%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>14.6</td>
<td>1.5</td>
</tr>
</tbody>
</table>
How is the food price elasticity of income inequality related to initial per capita income, food expenditure shares, and initial income inequality? As can be seen from the first scatter plot in Figure 3, since richer countries tend to be more equal, it follows that richer countries are also more vulnerable to an increase of relative poverty. Likewise, the second scatter plot in Figure 3 shows that because countries with higher food expenditure shares are on average poorer, the relationship between food expenditure shares and the food price elasticity of relative poverty is negative. The third scatter plot in Figure 3 shows that countries with high initial income inequality face lower percentage deteriorations of their Gini coefficient (which also could be derived from Equation 8).

**Figure 3**

The Relationship between Food Price Elasticity of Income (\( \frac{d}{dy} \)), Initial Income, Food Expenditure Shares, and Income Inequality

Number of People worldwide being at Risk of Falling below the $1.25/Day Poverty Line

As explained in Subsection 2C, in order to gauge the number of people worldwide being at risk of falling below the $1.25/day poverty line, we first estimate a cumulative income/day distribution function. Table 2 provides global headcount percentages for different income/day
levels ($2005 PPP) from the World Bank, which allows us to estimate the cumulative world income distribution function.

Table 2

<table>
<thead>
<tr>
<th>Dollars per Day</th>
<th>0.125</th>
<th>0.25</th>
<th>1.25</th>
<th>2.5</th>
<th>5</th>
<th>10</th>
<th>25</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>0.06</td>
<td>0.33</td>
<td>25.26</td>
<td>56.68</td>
<td>79.15</td>
<td>92.7</td>
<td>98.88</td>
<td>99.78</td>
</tr>
</tbody>
</table>


Using logistic regression, we determine the underlying cumulative income distribution to be

\[
F(y) = \frac{99.656}{1 + 4.211e^{-1.791\ln(\text{Income/day})}}
\]  

Equation (15) is the cumulative income distribution before the crisis. Equation (15) has an R-squared of 99.9 percent. By matching the simulated post-crisis real incomes to the cumulative percentages of the equivalent pre-crisis values, the post-crisis cumulative income/day distribution is obtained.

Prior to the food price crisis, 26.1 percent of the world population lived on 1.25/day or less ($2005 PPP). The doubling of food prices drives everyone with a pre-crisis income/day of $2.03 or less to a post crisis real income of a $1.25/day or less. Before the crisis, 45.6 percent lived at $2.03/day or less, suggesting that another 19.5 percent of the world’s population would fall below the $1.25/day poverty line in real terms if a doubling of food prices on international markets were fully passed through to all households. Assuming a world population of seven
billion, there are almost 1.4 billion additional people at risk of being pushed into extreme poverty. Figure 4 visualizes the global pre and post crisis cumulative income distributions.

Figure 4
Pre and Post Crisis Cumulative Income/Day Distribution

Determining the Worst-Case Scenario Global Poverty Gap

Following the methodology outlined in Subsection 2D, we estimate the global poverty gap prior to the food price crisis at $330.85 billion. The poverty deepening associated with a full pass-through of a doubling of food prices is estimated at $1.06 trillion, and the poverty gap expansion at $527.43 billion. For 2010, the World Bank reports a world GDP of $67.67 trillion (in $2005 PPP). Accordingly, the extreme poverty gap prior to the food price crisis accounts for
0.49 percent of world GDP, poverty deepening for 1.56 percent, and the poverty gap expansion for 0.78 percent. Figure 5 visualizes the three poverty indicators.

**Figure 5**

*Old Poverty Gap, Poverty Deepening, and New Poverty Gap due to Doubling of Food Prices*

Estimating the Deterioration of the World Income Distribution

Figure 6 shows the Lorenz curves of the pre and post crisis distribution of per capita incomes for our sample of 75 countries. It reflects inequality across countries based on average national incomes (Equation 13). A full pass-through of a doubling of food prices increases
across-country inequality from a Gini coefficient of 39.1 to 41.8. As expected, the increase in inequality occurs mostly in the inter-quartile range of the population share, suggesting that middle income countries are the most vulnerable to an increase in income inequality. This is because of the inverse relationship between per capita income and food expenditure shares, which can be illustrated using a simple numerical example. Assume that incomes are normally distributed and defined as $y \in [0,1]$. Moreover, if we represent Engel’s Law simply as $FES = 1 - y$, then total food purchases ($FP$) are $FP = (1 - y)y$. The dollar value of food purchases are therefore greatest when $y = 0.5$, thus the median income country loses the most absolute real income and this contributes most to increases in income inequality.

**Figure 6**

**Food Price Inflation and Income Inequality among Countries**

Note: Population share here is essentially our 75 countries arranged from lowest to highest GDP per capita and the income share is relative to the sum of the 75 per capita incomes.
A different picture arises when considering the world income distribution in Figure 7 (Equation 14). From this perspective, already high pre-crisis global income inequality increases from a Gini coefficient of 84.4 to 90.1. A visual inspection of Figure 7 also suggests again that the greatest contribution to the increase in inequality is caused by the loss of real income in the medium to medium-high incomes.

Figure 7
Food Price Inflation and Income Inequality “Among Earthlings”

Note: Population share here is the world population arranged from lowest to highest individual income and the income share is relative to world GDP.
4. CONCLUSIONS

According to the UN Food and Agriculture Organization, world food prices have roughly doubled since 2006 and most observers expect that prices will remain high. This paper provides an examination of the worst case scenario of the food price crisis, which we define as a permanent pass-through of a doubling of food prices to households. If the food price crisis continues, as most observers expect, then most countries will have no alternative but to accept this scenario.

Our results can be summarized as follows: A full pass-through of a doubling of food prices reduces real income by, on average, 48.6 percent and increases income inequality as measured by the Gini coefficient by 11.4 percent. The impact of food price inflation on absolute poverty and income inequality depends on pre-crisis per capita incomes, food expenditure shares, and pre-existing levels of income inequality. We find that for people already living below $1.25/day, the poverty gap increases from about $330 billion to roughly $1 trillion (poverty deepening). Our estimates indicate that a doubling of food prices increases the percentage of people living on a food price inflation adjusted $1.25/day or less from 26.1 to 45.6 percent, a 19.5 percentage point increase (poverty expansion), increasing the poverty gap by an additional $527 billion. In other words, the total poverty gap increases from 0.49% to 2.83% of World GDP.

Using average national incomes as a reference, the food price crisis increases inequality across the 75 countries of our sample from a pre-crisis Gini coefficient of 39.1 to a post-crisis value of 41.8. As far as world income inequality is concerned (assuming a borderless world), the pre and post crisis Gini coefficients are estimated at 84.4 and 90.1, respectively. Our results
show that the countries and individuals most vulnerable to absolute poverty are those with low incomes, but it is the middle-income households and middle income countries that experience the greatest absolute reduction of real income and therefore contribute the most to an increase in income inequality.

These findings suggest that the food price crisis will pose enormous fiscal challenges to low income countries, development agencies and international development cooperation. Given the magnitude of the expected increase in absolute poverty, most developing countries will have to rely on global partnerships to confront these challenges. Our findings indicate an urgent need for more cost effective targeted social assistance programs and a need for more sophisticated international aid commitments. For example, the common practice of using general food price subsidies as a social policy will no longer be sustainable. Even if developing economies manage to implement new cost-effective targeted social assistance programs, the fiscal burden of the food price crisis will likely be beyond the capacity of most developing countries, making global partnerships an essential part of the solution.

Another important finding is the effect of the food price crisis on income inequality. We show that middle income households and middle income countries experience the greatest absolute loss in real income from rising food prices. Although rising food prices may not throw middle income households into absolute poverty, these households will experience a significant deterioration in their relative economic status. This can lead to support for political upheaval from those middle income households that find themselves trapped in deteriorating economic circumstances because of permanently higher food costs.
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