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The Impact of Food Prices on Poverty and Food Security

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food crises, welfare impacts, agricultural supply response, wage adjustments

Abstract

Recent food price fluctuations have sparked renewed interest in the impact of food prices on poverty and food security. This paper reviews the literature and analyzes why different authors often reach different conclusions regarding the welfare impacts of food price changes. We first show that systematic measurement errors in household surveys may seriously affect estimates of the poor's dependence on food purchases at any given point in time. We then turn to the theoretical case for why the rural poor might ultimately benefit from higher food prices, with a particular focus on agricultural supply responses and resultant increases in demand for unskilled farm labor, which raise the wages of the poor. Consistent with these predictions, more sophisticated simulation models and new econometric evidence suggest that sustained increases in food prices have often benefited the poor and likely contributed to faster global poverty reduction from the mid-2000s onward. Conversely, the recent decline in agricultural prices could retard global poverty reduction.

1. INTRODUCTION

Sharp increases in international food prices understandably raise serious concerns for the world's poor. After several decades of secular decline, the international prices of staple grains increased rapidly in the mid-2000s, roughly doubling from mid-2005 to mid-2008, before collapsing during the global financial crisis. They spiked again in 2010 and 2011, and then briefly stabilized before plummeting again from mid-2014 onward (**Figure 1**). The importance of better understanding the complex relationship between food prices and household welfare in developing countries can scarcely be exaggerated. In the decade 2006–2015 the Food and Agricultural Organization (FAO) food price index was 76.5% higher than in the preceding decade and 31.5% more volatile, as measured by the coefficient of variation (**Table 1**). With continued economic turbulence and the likelihood that climate change will bring about more frequent climatic shocks (IPCC 2012), more volatile agricultural prices will be the new norm. It therefore behooves the economics profession to improve its understanding of how sudden and secular changes in food prices affect the poor.

Moreover, these large and very sudden changes in food prices have not been confined to international markets. Increasingly rich data on domestic food price trends in developing countries suggest that international food price shocks are indeed transmitted into domestic markets, albeit with some variability (Dawe 2008, Headey & Fan 2010, Ivanic & Martin 2014a, Minot 2011) and some lags (Ivanic & Martin 2014a). **Figure 2**, based on the prices of four key tradable agricultural goods, shows a pattern of short run insulation followed by relatively quick pass through into domestic markets. It therefore becomes very important to understand both the initial price impacts, resistance to which is a key objective of policy makers in developing countries, and the impact on the poor of the sustained higher domestic prices that follow once the changes in world prices are transmitted into developing countries.

Dramatic changes in the price of food could have commensurately dramatic impacts on the world's poor. Economists, however, typically distinguish between changes in the levels of prices and the volatility/uncertainty of prices. In this review, we focus on the former, as the impacts of volatile and uncertain price movements are complex and merit more discussion than we can provide

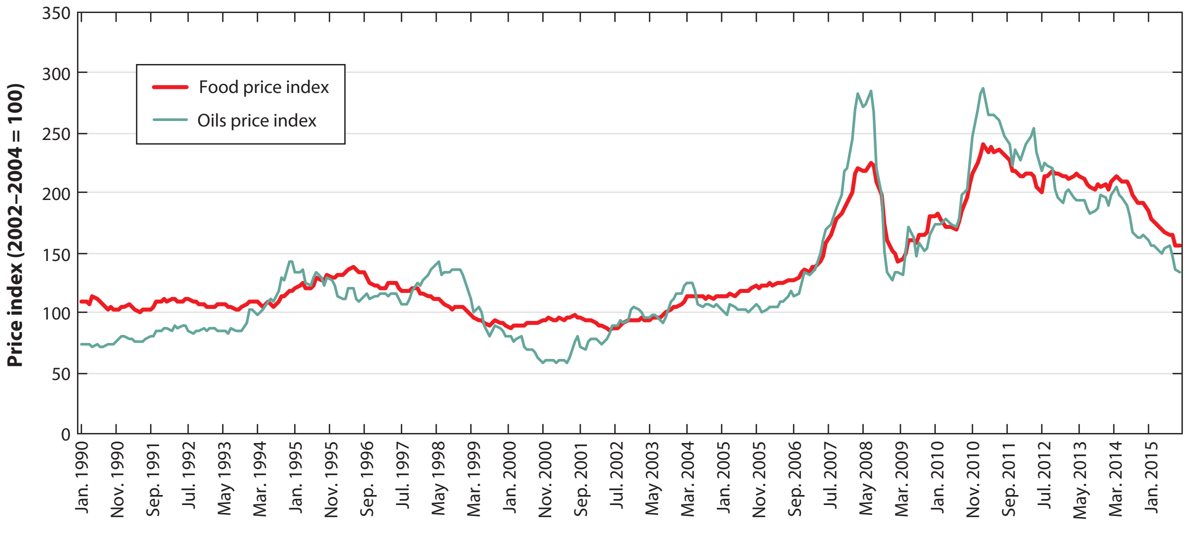

Figure 1

Trends in the Food and Agricultural Organization (FAO) food price and oils price indices, 1990–2015. Data from FAO (2015).

Table 1 Levels and volatility of the Food and Agricultural Organization (FAO) food price index over the past two decades (data from FAO 2015)

Years	Average price index value	Standard deviation	Coefficient of variation
1996–2005	105.7	14.2	13.4%
2006–2015	186.5	32.9	17.6%
Difference	76.5%	132.1%	31.5%

here. On the production side, the convexity of the profit function implies that price volatility with full information creates benefits to producers, though this result will be overturned if forecast errors are large relative to the predictable element of price volatility, leading to a reduction in output (Sandmo 1971). On the consumption side, conventional consumer surplus measures (or the concavity of the consumer expenditure function) surprisingly reveal a gain to consumers from volatility. However, Turnovsky et al. (1980, p. 143) point out that, using standard expected utility approaches, this favorable impact will not necessarily apply to staple commodities with low income elasticities and large budget shares. Extending this framework and applying it to data for Ethiopia, Bellemare et al. (2013) conclude that the welfare gains from price stabilization are increasing in household income, making price stabilization a regressive policy. This led Barrett & Bellemare (2011) to argue that food volatility does not matter for poor net food buyers and that the core problem of recent times has been the high level of food prices. Our view is that there remains much to learn on these topics, although here we follow Barrett and Bellemare's recommendation to focus on the risks associated with short- and long-run changes in price levels.

Another important feature of our review is that it focuses on changes in price levels that are not driven by factors such as productivity changes or changes in consumer demand in developing countries, in other words, exogenous or external price changes. The high prices in the 2007–2011 period appear to have been consistent with this assumption; identified causal factors included grain demand for biofuels, speculative and/or panicky reactions by governments and the private

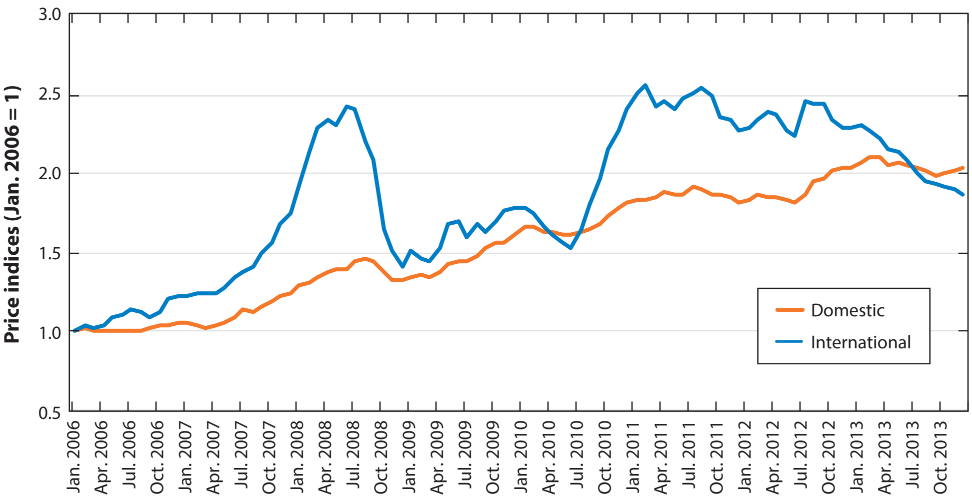

Figure 2

Domestic and world price indices for rice, wheat, maize, oil, and sugar in developing countries indicate high rates of international price transmission. Data from Ivanic & Martin (2015).

sector actors, and secular declines in yields and stocks in relatively high-income countries (see, for example, Abbott et al. 2008; Headey & Fan 2008, 2010; Piesse & Thirtle 2009). If an increase in prices was caused by events within the country itself (e.g., droughts, economic crises, productivity slowdowns), the analysis would need to be extended to take into account the direct effects of these shocks on the incomes of the poor, in addition to the subsequent price effects.

Although we confine our review to understanding the welfare impacts of exogenous changes in prices, there is nevertheless ample literature on this subject and similarly ample controversy. Poor people invariably spend the bulk of their income on food (Engel's law), but most of the world's poor also work in agriculture or agriculture-related sectors, meaning that high prices have both positive and negative impacts, especially in rural areas. In the short run, higher food prices ought to harm any household that is a net consumer of food, but they ought to benefit any household that is a net producer of food, as Deaton's (1989) classic study illustrated. Unsurprisingly, Deaton's simple net-benefit ratio approach continued to be widely used in the context of the 2007–2008 and 2010–2011 food price spikes. Earlier reviews of this literature invariably show that the net effect of higher international food prices was to increase poverty (Headey & Fan 2008, 2010). Though there was little direct consideration of this question prior to the crisis, the prevailing wisdom in the agricultural and development economics professions seemed to be that the longer-term stagnation of agricultural prices over the 1980s and 1990s was a constraint to poverty reduction (Swinnen 2011, Swinnen & Squicciarini 2012).

On a more technical level, Headey & Fan (2010) question the ability of household surveys to accurately measure a household's net food position. They discuss various adaptive responses to higher food prices that would imply that Deaton's (1989) approach overstates the adverse impacts of food price changes. Over the longer term the more standard concern is that food price changes have very different effects in general equilibrium though agricultural supply responses, which will include changes in the demand for labor and therefore changes in wages and employment. Ivanic & Martin (2008) therefore explored the sensitivity of the simple net-benefit ratio approach to introducing a simple wage response elasticity. Several subsequent simulation studies explored the sensitivity of short-run predictions to longer-term general equilibrium adjustments (Ivanic & Martin 2014a, Jacoby 2016, Van Campenhout et al. 2013), whereas Headey (2013) used cross-country empirics to test the effects of exogenous food price changes on national poverty estimates. Despite the use of different methods and samples, all four studies show that the longer term impacts of food prices changes are more favorable for the poor. Thus, the welfare impacts of higher food prices are now thought to be much more complex, varying not only across locations and livelihoods, but over time as well.

In this article, we review existing and new evidence on the complex relationship between food prices and household welfare. This evidence was obtained using an array of methods, including various types of simulation models (partial and general equilibrium) and econometric analyses (of household survey data, time-series data on food price and wages, and cross-country regressions). Here, we cover the main methodologies employed in food price-welfare analyses. Note, however, that we do not aspire to be comprehensive. In particular, many studies apply Deaton's (1989) approach to national survey data, which we review as a body of literature rather than on a case-by-case basis. Second, we exclude from our review studies that, remarkably in our opinion, consider only the impact on the consumer cost of food, thereby ignoring the poor's dual roles as consumers and producers of food.[1]

[1]Most notably, the United States Department of Agriculture (USDA) and the FAO attempted to gauge the impact of higher prices (and the global financial crisis) on calorie availability on a national level (FAO 2009, USDA 2009). The USDA model

The remainder of this article is structured as follows. Section 2 covers short-run welfare analyses that mostly follow Deaton's (1989) original workhorse model. In contrast with previous reviews, we try much harder to explain why it is that these analyses almost invariably suggest that higher food prices increase poverty in the short run, even in rural areas. We argue, based on recent methodological studies of survey techniques in developing countries, that there appears to be serious measurement error of net-benefit ratios in standard household surveys. Section 3 addresses the more standard concern that the longer-term impacts of higher food prices are generally more beneficial to the poor. In this section we also examine new econometric evidence on the impacts of higher food prices on agricultural production and unskilled wages in developing countries. The general consensus of this long-run research, which covers a broad range of methods and data, is that higher food prices mostly benefit the rural poor but mostly hurt the urban poor. The latter, of course, are fewer in number, implying that higher food prices likely reduce global poverty in aggregate. Finally, Section 4 concludes with a summary of findings and discussion of knowledge gaps in this literature—of which there are many—and how they might be bridged.

2. SHORT-RUN IMPACTS OF HIGHER FOOD PRICES ON HOUSEHOLD INCOME AND POVERTY

Prior to the 2007–2008 food price crisis, relatively little research examined the impact of higher food prices on household welfare, though earlier strands of research debated the longer-term benefits of changes in agriculture's terms of trade, largely from the perspective of structural transformation and income distribution perspectives (de Janvry & Subbarao 1984, Sah & Stiglitz 1984). Deaton's (1989) partial equilibrium approach typically only models the first-order impacts of higher prices, with the decisive influence on welfare outcomes the result of whether a household is a net consumer or net producer of food, as in:

$$\mathrm{d}B = (y - q) \cdot \mathrm{d}p, \qquad (1)$$

where $\mathrm{d}B$ is the change in real income from a food price change, y is the quantity of food produced, q is household food consumption, and $\mathrm{d}p$ is the change in real food prices. Though this model assumes away any adaptive response to higher food prices, this assumption is likely appropriate for small price changes and may be appropriate even for large price changes in the short run. This is because (*a*) compensated demand elasticities are very small, implying little scope for substitution away from more expensive foods to have a large impact on real household income (Ivanic & Martin 2014b); and (*b*) planting decisions are infrequent, meaning that rapid increases in food prices are unlikely to produce much supply response until the next agricultural season.[2] Another important source of welfare impacts—the impact of food price changes on wages for unskilled labor—may take considerable time to occur (though little is known about this issue in practice). Hence, supply and wage responses are considered in the next section as long-run responses.

contained no household information on production of food and instead had to model national calorie availability, with food price increases largely assumed to affect calorie availability via changes in net imports. These models predicted large increases in undernourishment; the USDA model predicted that higher food prices would render 75 million people hungry, and the FAO used the USDA estimate to predict that global hunger surpassed 1 billion in 2009. Both agencies subsequently retracted these estimates and acknowledged that their assumptions overstated the severity of the food, fuel, and financial crises on hunger. Another study published in the *British Medical Journal* conducted a systematic review with a meta-analysis of calorie-food-price elasticities and concluded that because these elasticities are generally positive, higher food prices would decrease calorie consumption (Green et al. 2013). The authors made no allowance whatsoever for the poor's role as producers of food or sellers of labor.

[2] We thank John Hoddinott for drawing this issue to our attention, specifically in the context of Kenya.

Deaton's (1989) original paper shows that higher rice prices benefit middle-income Thai farmers more than the poor or the rich. Barrett & Dorosh (1996) apply Deaton's approach to Madagascar and find that many poor Malagasy farmers are net food consumers. A World Bank study by Friedman & Levinsohn (2002) proposes Deaton's technique as a rapid response tool for ex ante estimates of the impacts of economic crises. As proof of concept, they retrospectively apply the approach to the 1998 Indonesian financial crisis, when rice prices increased by some 200% in the space of a few months, using a pre-crisis survey to estimate short-run welfare impacts. Friedman & Levinsohn (2002) find that the urban poor are the hardest hit by higher food prices, whereas the rural poor are somewhat insulated because of their dual role as producers of food.[3]

Following the 2007–2008 food price crisis, Deaton's (1989) simple model became the standard approach for estimating the welfare impacts of higher food prices. Whereas earlier studies using Deaton's net-benefit approach yield no consistent impacts on poverty across countries, applications of this approach since 2008 more consistently find that higher food prices typically increase poverty in the short run. Exceptions are Vietnam, Cambodia, and China (where many of the poor are rural smallholders seemingly productive enough to be net food producers), as well as a number of country/food combinations such as dairy products in Peru. Early in 2008, Ivanic & Martin (2008) estimated poverty impacts based on Deaton's approach for nine countries, with two stylized assumptions about transmission of international prices into domestic markets (66% and 100% transmission scenarios). They find largely negative impacts on the incomes of the poor, suggesting that global poverty would likely rise as a consequence of the 2007–2008 crisis. Using a much larger data set, albeit one that required substantial imput of farm income shares, de Hoyos & Medvedev (2011) estimate that 155.6 million people would fall into US$1.25/day poverty as the result of observable increases in real food prices in developing countries, with almost all of this increase occurring in South and Southeast Asia (141.2 million people). More recently, Ivanic & Martin (2014b) use surveys from 31 developing countries and again find that higher food prices typically increase global poverty in the short term. A selection of results from that study is reported in **Table 2**. On average, they find that a 50% increase in real food prices increases poverty by 5.8 percentage points. Among the 31 countries, poverty increases in 29 countries and falls in only two (China and Cambodia) in the 50% price rise scenario. In some countries it appears that a 50% or 100% price increase would be absolutely catastrophic for the poor in the short run. Unsurprisingly, a range of other country-level simulation studies not reviewed here, but covered in Headey & Fan (2010) and Compton et al. (2011), also typically find that poverty increases as food prices rise.

Relatively few of these studies consider the gross movements of people into and out of poverty. One that did finds very large gross movements around the poverty line, with 68 million people falling into poverty, whereas 24 million escaped poverty, for a net increase of 44 million (Ivanic et al. 2012). The large gross increases in poverty are likely a key reason for the high political concern about sharp changes in food prices in poor countries.

What explains the generally adverse predictions of these simulation models? Prior to the 2008 crisis, the conventional wisdom was that most of the world's poor work in agriculture or agriculture-related sectors and were therefore suffering from lower agricultural prices, including those based on trade distortions (Swinnen & Squicciarini 2012). However, the multipurpose household surveys used in these simulation models generally suggest that most of the world's

[3] Strikingly, high-frequency survey evidence from that crisis found that households dramatically reduced consumption of more expensive foods (such as eggs) to preserve consumption of cheaper calories, namely rice (Block et al. 2004). Block et al. (2004) use these dietary shifts to explain the large observed increases in child anemia.

Table 2 Simulated changes in US$1.25/day poverty headcount (percentage points) under alternative food price increases (data from Ivanic & Martin 2014b)

Country	Survey year	Scenarios for increases in relative food prices		
		10%	50%	100%
Albania	2005	−0.1	0.7	4.8
Armenia	2004	0.0	1.3	4.9
Bangladesh	2005	1.4	9.7	18.1
Belize	2009	0.5	3.2	8.6
Cambodia	2003	−3.0	−10.1	−14.9
China	2002	−1.3	−4.0	−3.2
Côte d'Ivoire	2002	1.1	7.2	17.6
Ecuador	2006	0.3	2.3	7.2
Guatemala	2006	1.4	9.7	27.2
India	2005	2.6	14.2	25.8
Indonesia	2007	1.7	10.2	25.2
Malawi	2004	0.7	3.1	5.7
Moldova	2009	0.0	1.1	7.9
Mongolia	2002	1.4	8.7	21.6
Nepal	2002	0.5	3.2	6.8
Nicaragua	2005	1.1	5.8	17.4
Niger	2007	0.6	6.9	17.1
Nigeria	2003	1.0	5.6	9.8
Pakistan	2005	2.7	14.0	27.5
Panama	2003	0.3	2.5	8.0
Peru	2007	0.2	1.5	6.9
Rwanda	2005	1.1	4.4	8.5
Sierra Leone	2011	2.4	12.5	22.1
Sri Lanka	2007	1.8	11.6	29.1
Tajikistan	2007	0.8	8.7	28.1
Tanzania	2008	1.9	8.2	14.5
Timor-Leste	2007	1.9	10.0	20.1
Uganda	2005	0.7	3.8	8.7
Vietnam	2010	−0.4	2.1	12.8
Yemen, Rep.	2006	2.0	13.4	33.2
Zambia	2010	1.1	6.0	12.5
World		**0.8**	**5.8**	**13**

poor, even in rural areas, are net food consumers, albeit often only marginally so (Aksoy & Isik-Dikmelik 2008). Clearly, one contributing factor is the inclusion of nonfood cash crops such as cotton in the agricultural production mix, as farmers seek to raise incomes and/or reduce risk exposure. However, the result remains puzzling, particularly in African countries, where many surveys and labor force censuses suggest there is relatively little remunerative employment outside of agriculture. Thus, there is a need to explain how a continent widely regarded as overly dependent on agriculture appears to be so heavily populated by net food consumers.

One possible explanation raised by Headey & Fan (2008, 2010) is measurement error in these surveys,[4] which are far from ideally designed for the purposes of identifying net sellers/consumers. In particular, consumption/expenditure modules often have extremely short recall or diary periods (e.g., two weeks), whereas agricultural production and income are usually recalled for the last season or the last 12 months. To be rendered comparable, food consumption (and sometimes production) are then annualized to estimate the extent of net food consumption/production.

On careful reflection, there are a number of implicit but rather strong assumptions that go into these estimates (Carletto 2012). First, it must be assumed that consumption is not particularly seasonal, which is highly unlikely in most poor countries. Certainly food prices vary seasonally, and one recent paper on Ethiopia finds large seasonal variations in household calorie supply and dietary diversity (Hirvonen et al. 2015).[5]

Second, it must be assumed that food consumption and production are measured without systematic error, as is total household consumption or income (i.e., the measure used to identify the poor and nonpoor). Although this issue is flagged by Headey & Fan (2008, 2010), it is only with the benefit of recent World Bank experiments on survey methods that we can now investigate specific potential biases. In terms of consumption, Beegle et al. (2012b) randomize consumption modules across rural households to gauge the extent to which alternative data collection methods affect consumption estimates relative to a gold standard method (a two-week diary with intensive visits). The most striking result of their study is that only one method (the seven-day recall with a comprehensive list of food products) closely approximates the gold standard. Every other method underestimates consumption by 8–27%. However, a perusal of their more detailed results suggests that both food and nonfood expenditures are equally badly estimated by these alternative methods, meaning that food expenditure shares are relatively impervious to choice of method.[6] Nevertheless, the possibility of substantial measurement error in consumption modules is disconcerting and unlikely to be confined to Tanzania. A recent survey of consumption measurement in 100 household surveys from countries also found evidence of substantial undermeasurement of household consumption (Smith et al. 2014). It recommended improvements in the specificity of food survey lists, better accounting for seasonality and improved measures of food consumption away from home.

On the production side, another World Bank study on Uganda raises serious concerns about the reliability of estimates of food production, especially in agricultural systems characterized by intercropping and coninuously harvested crops or livestock products.[7] These systems are particularly common in tropical Africa (e.g., in the cassava belt). FAO (2015) data, for example, suggest that continuously harvested crops account for 58% of net crop production value in Uganda. To gauge whether recall and other measurement biases are a problem in this context, Deininger et al.

[4] A point of note is that Xinshen Diao provided the original suggestion to consider these measurement problems. And a further point of confession is that Headey & Fan (2008) consider consumption to be better measured than production in households, whereas recent evidence from the World Bank's Living Standards Measurement Studies suggests that this is not the case.

[5] It is also likely that many agricultural surveys are purposely conducted at a specific stage of the agricultural season (e.g., postharvest), though broader socioeconomic surveys often take longer to collect and cover different seasons in different parts of the country.

[6] Specifically, the gold standard estimate of food expenditure shares is 75.5%, and other methods estimate shares varying between 71.7% and 78.6%. The low estimate of 71.7% is derived from 12-month recall questions, which are relatively rarely used.

[7] Another World Bank study tests for recall bias by examining random differences in the length of time between harvest and interview in three African countries (Beegle et al. 2012a), but it finds little evidence of this particular form of recall bias. However, the Deininger et al. (2012) study suggests that the length of time between harvest and interview is a less important issue than the use of recall versus continuous diaries.

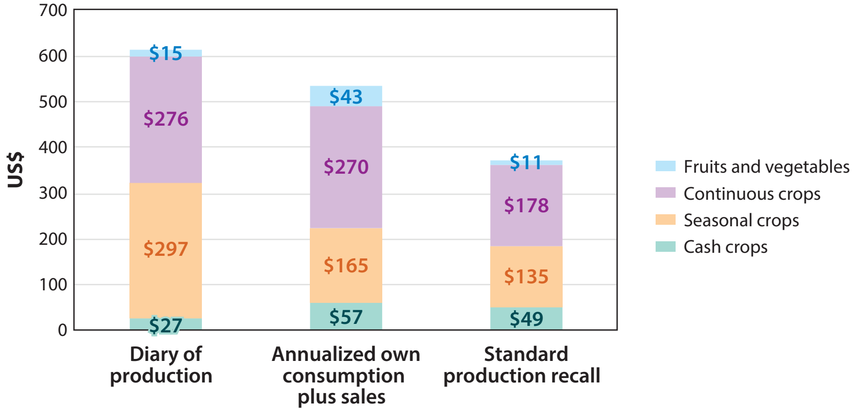

Figure 3

Alternative measurement methods have major effects on estimates of crop production in Uganda. Data from Deininger et al. (2012).

(2012) take advantage of the novel use of diary methods to record households' agricultural production in the Uganda National Household Survey (UNHS). Specifically, they then compare standard recall questions on production with both the diary-based estimates and an annualized estimate of total food sales plus total own consumption (on the grounds that the more detailed 7-day recall consumption module might suffer less from recall bias). The results of this comparison are reported in **Figure 3**.

Strikingly, the conventional recall-based estimates of production are 39% lower than the diary method and 30% lower than the own consumption-plus-sales estimate. Moreover, though the apparent underestimation of production is certainly large in the case of continuous crops (for which the recall-based estimate is just 65% of the diary-based estimate), the problem is actually more important for seasonal crops (the recall-based estimate is just 45% of the diary estimate). Despite some underestimation of cash crop production (including both nonfood crops such as cotton and food crops such as rice) using a diary approach, total agricultural output appears to have been 65% higher using a diary than under conventional recall approaches.

The results from this study are certainly disconcerting from the standpoint of measuring net-benefit ratios. It also seems likely that livestock income, which was not studied by Deininger et al. (2012), might also be underestimated, particularly in the case of dairy, egg, and honey production, all of which are continually harvested. In the worst-case scenario, if there is no underestimation of nonfarm income, and recall-based methods underestimate agricultural production by 40%, then the mean share of food production in total income could easily be underestimated by almost 15 percentage points.[8] Moreover, it seems unlikely that this problem is confined to Uganda, because Deininger et al. (2012) find larger recall biases for seasonal crops than for continuously harvested crops.

[8]This is based on the following calculation. Household surveys using the standard agricultural production recall module from Uganda suggest that as much as 50% of rural household income comes from nonfarm sources. If we assume, then, that mean nonfarm income in the 2005 UNHS is equal to food production income (we abstract from livestock income, which is not reported), then the share of food production income in total income is 46.5% with the standard agricultural production recall module. However, assuming the same level of nonfarm income, the value of food income with the diary-based method rises to 62.7%, yielding a difference of 14.2 percentage points.

What are the implications of these studies for measuring the net-benefit ratios from price changes? These impacts come from two sources: changes in the initial estimate of poverty rates and changes in the relationship between incomes from and expenditures on food. Undercounting of food (and nonfood) consumption results in an overestimation of poverty when poverty measurement is based on expenditures (Beegle et al. 2012a), as will underestimation of food production (Deininger et al. 2012) when poverty is measured from the income side. The effect of overestimation of poverty on the estimated impact of price changes will depend on whether this overestimation increases or reduces the number of vulnerable households near the poverty line and on the estimated direction of effect. In the limit, if poverty overestimation resulted in all households being designated poor, and the impact of higher prices was to raise the poverty rate (as it would if all households were net buyers), then poverty overestimation would reduce any estimate of an adverse impact of higher prices on the poverty rate to zero. By contrast, underestimation of income and/or expenditure from food might put many more households near the poverty line and magnify the gross changes in poverty resulting from higher prices.

However, if food production is underestimated relative to nonfood income—a possibility certainly raised by the results in Deininger et al. (2012)—then this will lead to an underestimation of food consumption shares. If the downward bias in measures of food production is greater than the downward bias in measured food consumption, then net-benefit-ratio measures would provide a pessimistic measure of the impact of higher food prices on poverty by overstating the dependence on food purchases in total food consumption. Suffice it to say, improving measures of both household food production and consumption is, perhaps unexpectedly, an area in which further research is urgently needed both for improving poverty measures and for assessing the short run impacts of food price changes.

3. LONGER-TERM IMPACTS OF HIGHER FOOD PRICES ON HOUSEHOLD INCOME AND POVERTY

Measurement issues aside, the negative impacts of higher food prices on poverty are likely to change if farmers and economies have the time and scope to reallocate resources in response to relative price changes. Indeed, prior to the 2008 crisis, several different bodies of literature highlighted the adverse dimensions of the longer-term stagnation of agricultural prices (see reviews in Swinnen 2011 and Swinnen & Squicciarini 2012). Declining primary commodity prices and their harmful impacts on poor countries (typically net exporters of primary commodities at that time) were the subject of the Prebisch-Singer hypothesis in the 1950s. Subsequent research on industrialization and structural transformation also examined pricing policies and noted that declines in agriculture's terms of trade could redistribute wealth from urban to rural areas (de Janvry & Subbarao 1984, Sah & Stiglitz 1984), and that taxation of agriculture was generally poverty-increasing (Krueger et al. 1991). More recent research on development strategies also highlights that the bulk of the world's poor live in rural areas and are either primarily dependent on agriculture for their main livelihood or on rural nonfarm activities heavily driven by agriculture's multiplier effects on the local economy (Bezemer & Headey 2008, World Bank 2008).

One important difference between these older strands of research and the more recent research employing Deaton's (1989) method is the time frame of analysis. The older literature on agriculture's terms of trade, distortions against agriculture, and poverty reduction strategies was primarily interested in secular movements in relative prices that were sustained enough to permit households and economies as a whole to reallocate resources in response to price changes rather than the short-run impacts of price changes. But what are these adjustments, and how long might they take to influence household incomes? To address these questions, we first turn to simulation studies that use household models based on survey data and perform "what if" experiments under which food prices change and the impacts of these price changes alone are measured. We then turn to studies that examine what actually happened in countries strongly affected by higher food prices.

Simulation Studies

Ivanic & Martin (2014b) distinguish between short-run impacts in which little opportunity for adjustment arises; medium-run adjustments in which labor allocations respond to price changes while other factors are fixed; and longer-term adjustments in which all inputs are responsive (namely, land, capital, and natural resources). The basic intuition of these adjustments is that higher food prices encourage farmers to increase agricultural output or, if different food prices rise by different amounts, to reallocate agricultural resources toward the food products for which prices have risen the most. Agricultural output can be increased by increasing inputs of labor and materials and, in some cases, by increasing the land area used for agriculture. Labor expansion could come from either the household itself (which may involve the sale of external labor services from labor markets) or from increases in hired labor. In neoclassical labor markets, this increased demand for labor results in higher wages, though the size of the wage response is a crucial issue from a welfare standpoint. Ivanic & Martin (2014b) allow for both output adjustments and wage rate responses and find that the poverty-reduction impacts associated with higher wage rates (which include both first- and second-order impacts) are larger than those from output and consumption adjustments (which are all second order).

To take into account both the direct commodity price impacts and those arising through induced changes in wages, Ivanic & Martin (2014b) begin with a profit function representing the production activities of the household firm and a full expenditure function (Deaton & Muellbauer 1981) representing households' activities both as consumers and as suppliers of labor. Following Anderson & Neary (1992, p. 59), they obtain a money measure of welfare change using a net expenditure function,

$$B = \pi(\mathbf{p}, \mathbf{w}) - e(\mathbf{p}, \mathbf{w}, u) = \mathrm{z}(\mathbf{p}, \mathbf{w}, u), \tag{2}$$

where B is a money measure of welfare change; $\pi(\mathbf{p}, \mathbf{w})$ is a profit function for the household's business activities defined over output prices, $\boldsymbol{p}$, and input prices, $\boldsymbol{w}$; and $e(p, w, u)$ is a full expenditure function for the household given and the exogenously fixed utility level, u, a wage rate, w, and consumer prices, p.

The Deaton net-benefit measure of welfare change is obtained much more simply than in Deaton's original derivation by differentiating Equation 2 by p to obtain:

$$\mathrm{d}B = (\pi_p - e_p)\mathrm{d}\mathbf{p} = \mathbf{z_p}\mathrm{d}\mathbf{p} = (y - q)\cdot \mathrm{d}p \tag{3}$$

This expression can be generalized to obtain a first-order measure of welfare change that takes into account the impact of wage rate changes induced by changes in commodity prices:

$$\mathrm{d}B = \mathbf{z_p}\mathrm{d}\mathbf{p} + z_w \frac{\partial w}{\partial p}\mathrm{d}p, \tag{4}$$

where $z_w = (\pi_w - e_w)$ is the households' total supply of labor ($-e_w$), less the demand for labor by the household firm (represented by the negative quantity $\boldsymbol{\pi}_{\mathbf{w}}$); and $\frac{\partial w}{\partial p}$ is the Stolper-Samuelson response of the wage rate to the commodity price.

Identifying the wage rate impact of the commodity price change more simply as $\mathrm{d}w = \frac{\partial w}{\partial p}\mathrm{d}p$, Ivanic & Martin (2014b) incorporate the second-order impacts of adjustments in output,

Table 3 Decomposing the global poverty impacts of higher food prices (data from Ivanic & Martin 2014b)

Scenario	Net benefit	Net benefit plus wages	Long run
10%	0.8	−1.1	−1.4
50%	5.8	−3.9	−5.8
100%	13.0	−5.7	−8.7

consumption, and labor allocation in the second-order approximation:

$$\Delta B = [\mathbf{z_p} \quad z_w]\begin{bmatrix}\Delta \mathbf{p} \\ \Delta w\end{bmatrix} + \frac{1}{2}[\Delta \mathbf{p} \quad \Delta w]\begin{bmatrix}\mathbf{z_{pp}} & \mathbf{z_{pw}} \\ \mathbf{z_{wp}} & \mathbf{z_{ww}}\end{bmatrix}\begin{bmatrix}\Delta \mathbf{p} \\ \Delta w\end{bmatrix}, \tag{5}$$

where $\mathbf{z_{pp}}$ captures the adjustments in net output of each good as outputs are increased and consumption reduced in response to price increases; $\mathbf{z_{ww}}$ captures the increase in sales of labor as demand by the household firm declines and/or family labor supply increases in response to higher food prices; $\mathbf{z_{wp}}$ is the impact of higher prices on net labor supply (as, for example, when higher output prices cause the farm firm to use more labor), and $\mathbf{z_{pw}}$ captures the impacts of higher wages on net sales of agricultural output.

A critical issue when estimating the wage rate impacts of higher food prices is the magnitude of the impact of higher food prices on wage rates. Jacoby (2016) uses a simple Jones-type medium-run model, with only labor mobile, to deterministically illustrate that existing economic structures in India predict a positive wage-price elasticity on the order of 1.09 to 1.17. His econometric estimates of this elasticity from a panel of Indian districts cannot reject the null hypothesis that this elasticity is equal to unity. Ivanic & Martin (2014b) likewise estimate Stolper-Samuelson elasticities of unskilled wage rates with respect to output prices for the 31 countries in their Global Trade Analysis Project (GTAP) model. They also find that most of these wage-price or Stolper-Samuelson elasticities are roughly equal to unity, and that the elasticities for important commodities, such as rice in Bangladesh, are similar in magnitude to estimates derived from the econometric literature (Rashid 2002, Ravallion 1990). This provides the reassuring finding that a range of different methods consistently yield wage-food price elasticities that are large in magnitude and typically close to unity (for aggregate food prices), meaning that unskilled wages should adjust substantially to any increase in food prices in the long run.[9]

Combining information on the Stolper-Samuelson elasticities with parameter estimates obtained from simulation models allowed Ivanic & Martin (2014b) to decompose the poverty impacts of higher food prices into (*a*) a component due to the direct net-benefit impact, (*b*) a portion due to the first-order wage rate impact on net sales of labor, and (*c*) a portion due to the second-order adjustment terms identified in Equation 5. The results of this decomposition for global poverty rates are given in **Table 3** for small (10%), medium (50%), and large (100%) price shocks. The results show that for each price shock, the net-benefit (or short-run) measure shows an increase in poverty; that adding wage impacts reverses this impact; and that allowing for quantity adjustments further increases the poverty reduction resulting from the change. They also indicate that the first-order impact due to higher wages has a larger favorable impact on poverty than the second-order adjustments in quantities.

[9]It is also important to note that even if we were to instead assume surplus labor, increased demand for labor would still result in rising employment and hence a welfare gain for households that are net sellers of labor (e.g., the landless).

Jacoby (2016) and Van Campenhout et al. (2013) find similar conclusions for rural India and for Uganda, respectively. Jacoby shows that under the simpler net-benefit-ratio approach, higher food prices imply reductions in real household welfare for all but the richest rural quintile, whereas the factor income adjustments in Equation 3 imply welfare improvements even for the poor. In a methodologically very different study from Uganda, Van Campenhout et al. (2013) use a national-level, computable general equilibrium model to reach similar conclusions: With wage adjustments the rural poor benefit from higher food prices, but without them they lose.

One possible objection to these results might be that these countries are in some way atypical. Ivanic & Martin's (2014b) 31-country study addresses this concern and does indeed demonstrate that labor market adjustments strongly influence predicted poverty outcomes. **Figure 3** contrasts the short- and medium-run \$1.25/day poverty impacts of 50% food price increases for all 31 countries, though we also group countries into three categories: (*a*) the largest seven developing countries in the sample, which account for well over half of the world's poor; (*b*) other less poor developing countries, mostly in Eastern Europe, Central Asia, and Latin America; and (*c*) other poorer developing countries, mostly in Africa. Presented this way, some striking patterns emerge. In the largest developing countries, all but China are expected to incur increases in poverty in the short run, but wage adjustments to higher food prices produce large medium-term declines in poverty for India, Pakistan, and Vietnam. In Bangladesh, wage adjustments cancel out the adverse short-run impacts, whereas the impacts on poverty in Indonesia and Nigeria are still negative, though more modest in the case of Indonesia. Because of the large declines in poverty in China and India [the latter result is notably in close accordance with Jacoby's (2016) estimates for rural India], it is highly likely that global poverty would decline as the result of wage adjustments to higher prices.

For smaller and less poor countries, wage adjustments either nullify or overturn the adverse impacts of higher food prices on poverty. In no country does poverty increase by more than one percentage point, and the average change in poverty is close to zero. Lastly, for smaller but very poor countries, the results are highly heterogeneous. In Cambodia, wage adjustments appear to lead to further declines in poverty, producing a dramatic 14.6 percentage point reduction in the poverty headcount. There are also predicted declines in poverty for Nepal, Côte d'Ivoire, and Malawi, though poverty still increases in several other countries.

In summary, the salient result from **Figure 4** is that allowing wage adjustments in this model makes a dramatic difference to any conclusions about the poverty impacts of higher food prices, particularly at a global level. Across the 31 countries, adding wage adjustments reduces the predicted change in poverty by 6.8 percentage points but by 10.2 percentage points in the largest countries.

Econometric Studies

Of course, the great strength of simulation models—their rigorous and detailed structure—is also their potential weakness: Some of the results of these models are imposed by assumption. Of particular concern is that labor markets in developing countries may not work the way the model assumes they work. Validation against historical data is therefore essential.

Headey (2013) pursues this course by examining trends and determinants in a pertinent food insecurity indicator from the Gallup World Poll (GWP). Since 2005–2006, the GWP has been asking households in developing countries a simple question about whether they had incurred difficulties in affording food in the last 12 months. Using a large cross-country panel from 2005–2006 onward, Headey (2013) finds that the GWP food insecurity did not increase during the 2007–2008 crisis. Indeed, in the largest countries the GWP food insecurity declined from 32.7%

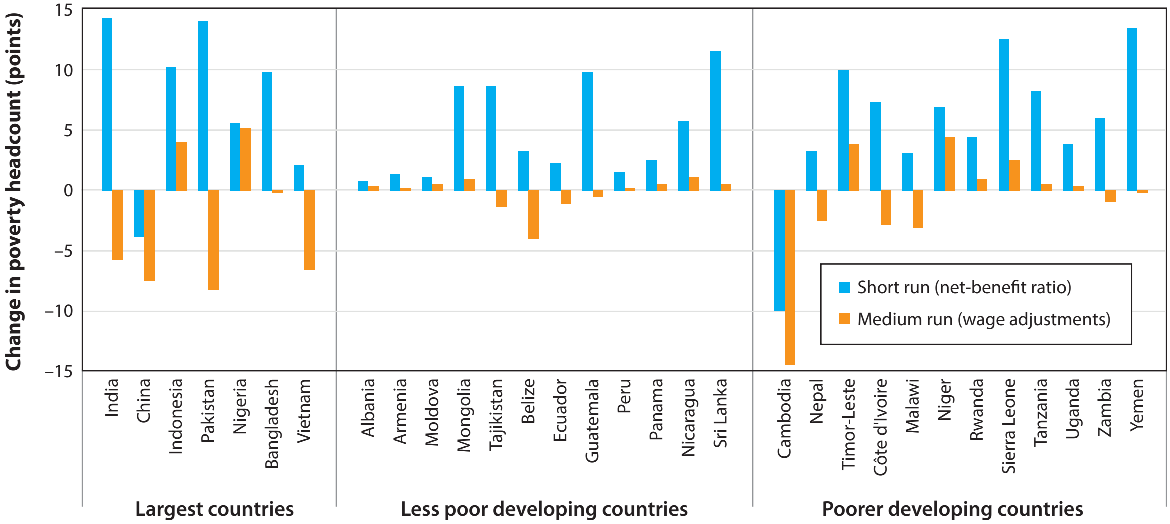

Figure 4

The predicted impacts of a 50% food price increase on poverty are very different in the short and medium run. Data from Ivanic & Martin (2014b).

in the 2005–2006 round to 28.0% in the 2008 round, with a notable decline in India especially. In sub-Saharan Africa there was little change overall across these two rounds, but this masked substantial diversity, with self-assessed food insecurity rising in some countries and falling in others. Latin America saw modest increases in self-reported food insecurity, and in Central Asia and Eastern Europe there was little change. Strikingly, Middle Eastern countries saw the largest increases in self-reported food insecurity (from 19.7% in 2005–2006 to 26.0% in 2008), just prior to the Arab Spring.

Overall, these results are fairly similar to the medium-run predictions of Ivanic & Martin (2014b), notably with respect to larger developing countries. The more heterogeneous impact of higher food prices on African populations is also the principal finding of another paper examining trends in self-assessed food insecurity using Afrobarometer data for 2005–2008. Verpoorten et al. (2013) also find the expected result that rural areas saw declining food insecurity, and urban areas experienced some increase. The World Bank's POVCAL data are even more optimistic about trends in household welfare during the latter half of the 2000s, with poverty falling substantially in every region, including Africa (Beegle et al. 2016).

Apart from the multitude of issues involved in accurately measuring poverty and food insecurity, a limitation of only examining changes in overall food security or poverty is the lack of control for other factors that may be affecting these measures, particularly the strong economic growth that developing countries recorded in the 2000s. For primary exporters this economic growth might have been substantially driven by rising commodity prices (including nonfood commodities such as oil, minerals, and various cash crops). This makes the 2007–2008 food crisis very different to the Asian financial crisis, for example, when food prices rose rapidly in the context of a general economic collapse. Hence, it is important to econometrically identify the partial derivative of poverty with respect to real food price changes, as the simulation studies do.

Headey (2014) accomplishes this via a cross-country regression analysis of the World Bank's POVCAL data set. The POVCAL panel is unbalanced in the sense that the interval between household surveys varies from one year to up to six years. Headey (2014, 2016) examines whether changes in poverty within a country are significantly associated with changes in relative food prices, as measured by the food consumer price index (CPI) relative to the nonfood CPI. He finds that the increases in food prices predict reductions in poverty over these long-run periods, even after controlling for a wide array of other drivers of poverty reductions, such as economic growth, changes in terms of trade, cereal yield shocks, and general inflation. In subsequent work (Headey 2016), the results also prove robust from the use of international prices as an instrument for domestic price changes to shortening the episode length (e.g., 2–4-year episodes), and to changing the poverty line ($2/day instead of $1.25/day).

As with the other methods described above, there are important caveats to this approach. International poverty measurement is not straightforward, and there is a valid concern that the use of CPIs to generate real expenditure measures in the POVCAL data set might overstate expenditure growth for the poor (because the CPI bundle often represents prices for richer households who consume less food than the poor). And of course, cross-country regression models could potentially be plagued by a host of misspecification problems.

To circumvent some of the measurement problems associated with the POVCAL data and to help rule in the agricultural supply and wage response mechanisms discussed earlier, **Table 2** instead uses FAOSTAT agricultural production indicators to test the supply response from developing-country farmers to changes in international prices (weighted by each country's consumption pattern). The regressions control for time period dummies to capture global economic shocks, and the data are structured to exactly coincide with the POVCAL episodes used in studies by Headey (2014, 2016). The results contradict the widely held perception that poor country farmers would not benefit from higher food prices. Changes in international food prices robustly predict increases in agricultural production, food production, crop production, crop production per hectare, crop area harvested, and cereal yields, with elasticities varying from a low of 0.06 for area harvested to 0.16 for crop production. Data plotted in **Figure 4** confirm that this relationship is even evident in inspecting annual changes in agricultural production and international food prices (note, however, the different scales of the two series). In both **Table 4** and **Figure 5**, we observe that supply responses are reasonably large, which suggests that farmers did indeed allocate more resources to agricultural production and rather quickly at that. Moreover, additional robustness tests reported in Headey (2016) show that supply responses in the 2005–2012 period are generally much higher than in the preceding decade, suggesting that the unusually large price increases in recent years catalyzed an exceptionally strong supply response.

Do we also see any evidence of wage responses to higher prices in the recent period of price volatility? As we noted above, most of the literature on wage responses to higher food prices has focused on Bangladesh, where high frequency data for rural and urban wages are readily available. If higher food prices increase the demand for rural labor, then rural wages rise. Under the perfect integration of rural and urban labor markets, urban wages also rise. However, in Bangladesh it appears that rural wages are responsive to higher rice prices in the relatively short run, but urban wages are not. Hence, the effect of higher food prices is to substantially reduce the rural-urban gap in wages. Trends in the rural-urban wage ratio and in the real price of rice are shown in **Figure 6** for the period 2001–2011. In the first half of the decade the rural-urban wage gap was large, with rural wages only 55–60% of urban wages. However, as food prices started to increase in the second half of the decade, so too did the rural-urban wage ratio. Indeed, by 2011 the rural-urban wage ratio had increased to 80%.

Of course, there could be other explanations for the falling gap between urban and rural wages (e.g., rapid emigration from rural areas could have tightened rural labor markets but introduced slack in urban markets). Thus, to explore the relationship between food prices and wages more rigorously we estimate short- and long-run wage-food price elasticities in a vector error correction

Table 4 Instrumental variable (GMM, generalized method of moments) regressions of the agricultural supply response to changes in instrumented domestic food prices changes[a]

Regression number	1	2	3
Dependent variable (growth rates)	**Agricultural production**	**Food production**	**Crop production**
Estimator	**IV GMM**	**IV GMM**	**IV GMM**
Change in log of domestic food prices	1.76** (0.76)	2.48** (0.97)	2.86*** (1.11)
N	300	300	300
Tests			
Kleibergen-Paap rk Wald F statistic	12.20	12.20	12.20
Kleibergen-Paap rk LM statistic	0.01	0.01	0.01
Stock-Wright LM statistic	0.00	0.01	0.21
Regression number	**4**	**5**	**6**
Dependent variable (growth rates)	**Crop production per hectare**	**Crop area harvested**	**Cereal yields**
Estimator	**IV GMM**	**IV GMM**	**IV GMM**
Change in log of domestic food prices	0.95 (0.84)	1.90** (0.87)	2.41** (1.19)
N	300	300	300
Tests			
Kleibergen-Paap rk Wald F statistic	12.20	12.20	10.82
Kleibergen-Paap rk LM statistic	0.01	0.01	0.01
Stock-Wright LM statistic	0.02	0.01	0.09

Based on authors' estimates.

[a]See text for definitions of the variables. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors clustered at the country level are reported in parentheses. The excluded instrument is the change in international prices (see Headey 2016 for details). All regressions control for time dummies. The Kleibergen-Paap rk Wald F statistic measures weak instruments, with critical values varying between 5.53 and 16.38, suggesting that the regressions in the table may suffer from a weak instrument problem. The null hypothesis of the Kleibergen-Paap rk LM statistic is that the equation is underidentified. The Stock-Wright LM test has the null hypothesis that the coefficient on the change in real food prices is equal to zero and overidentifying restrictions are valid.

model (VECM). Consistent with our graphical analysis, the VECM, with one lag, finds a statistically significant short-run elasticity between wages and rice prices of 0.14 and a long-run elasticity of 1.11 (**Table 5**). The long run elasticity is larger than that derived by Rashid (2002) but is very similar to Jacoby's (2016) estimates for India and Ivanic & Martin's (2014b) more structural estimate for Bangladesh from the GTAP model. For urban wages we also find evidence of long-run cointegration (an elasticity of 0.78) but a short-run elasticity that is highly insignificant and close to zero (−0.02). This suggests that rural and urban labor markets are themselves integrated in the long run but not in the short run. The short-run results for rural and urban wages are also robust to various sensitivity analyses,[10] though one result of potential importance is that an ordinary least squares (OLS) auto-distributed lag model with a second lag of rice price changes also yields a significant coefficient of 0.08 and a first lag elasticity of 0.11 (these results are reported in Headey 2016). This suggests that a 100% increase in rice prices increases wages by approximately 19% over two quarters.

[10]If we run a VECM with food prices and both rural and urban wages, we derive the same rural wage-rice price elasticity of 0.14 and again derive an insignificant urban wage-food price elasticity. An OLS regression of growth rates of rural wages against lagged growth rates in rice prices and wages (with a time trend) also yields an almost identical short-run rural wage-food price elasticity (0.13) and insignificant elasticities for urban wages.

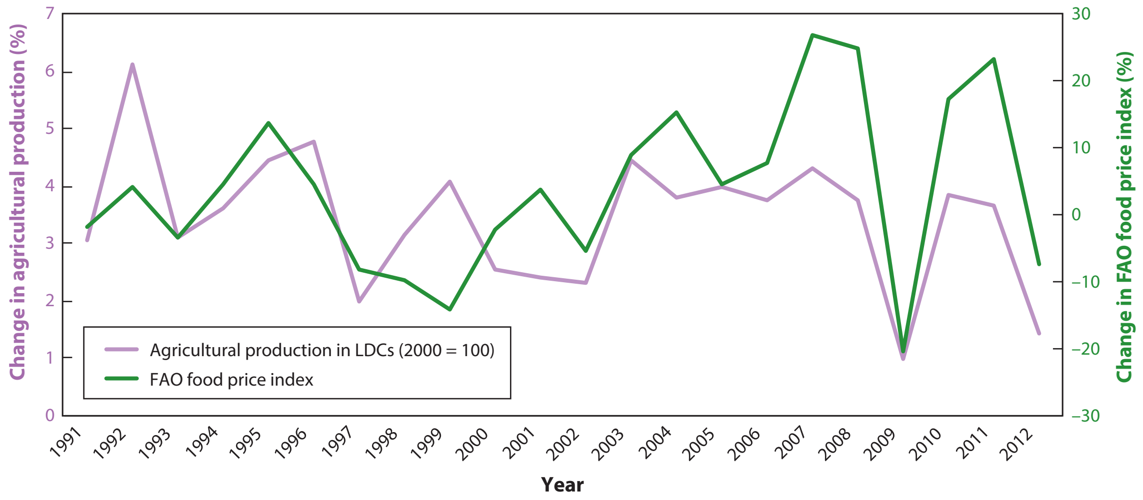

Figure 5

Annual changes in international food prices is closely associated with agricultural production in less-developed countries. Data from FAO (2015). Abbreviations: FAO, Food and Agricultural Organization; LDC, less-developed country.

Hence, wage adjustments seem to occur relatively quickly in Bangladesh, though these short-run adjustments are only partial, and real wages still appear to have declined in the short run (i.e., at the peak of the food price crisis in mid-2008 and mid-2011). Moreover, caution should be applied in drawing inferences from Bangladesh's experience. Wages might adjust quickly in Bangladesh because of the intensive year-round nature of agricultural production. Indeed, the more structural wage-food price elasticities derived by Ivanic & Martin (2014b) vary substantially across countries.

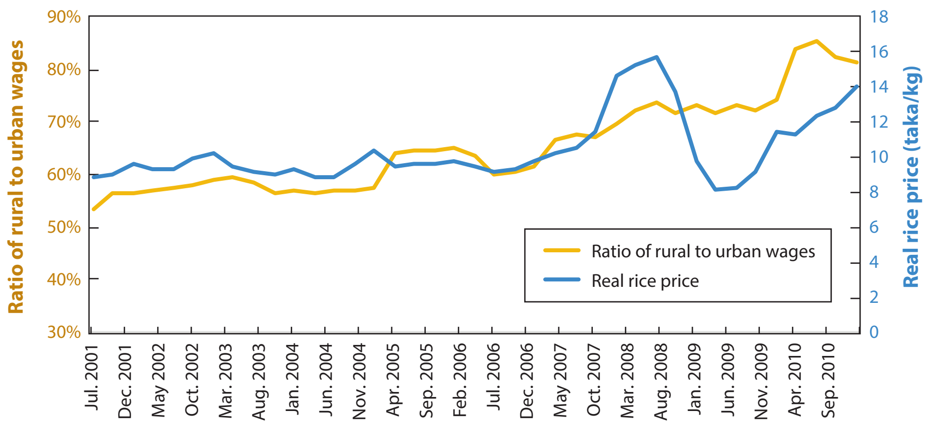

Figure 6

Increasing rice prices in Bangladesh are accompanied by larger increases in rural wages than in urban wages. Figure based on authors' estimates from data from BBS (2014).

Table 5 Vector error correction model estimates for rural and urban wage models

Regression Number	1	2
Wage series included	Rural wages	Urban wages
Number of observations	37	37
R-squared: wage regression	0.58	0.45
R-squared: rice price regression	0.51	0.48
Short-run coefficients: wage regression		
Cointegration term, lag 1	−0.005 (0.035)	−0.04 (0.04)
Rural wages, lag 1	0.15 (0.159)	0.10 (0.17)
Rice prices, lag 1	0.14** (0.058)	−0.02 (0.05)
Short-run coefficients: rice price regression		
Cointegration term, lag 1	0.33*** (0.035)	0.38 (0.11)
Rural wages, lag 1	0.15 (0.159)	−0.31 (0.54)
Rice prices, lag 1	0.135 (0.058)	0.63*** (0.114)
Cointegrating relationship		
Wages	1	1
Rice prices	−1.11*** (0.13)	−0.78***
Constant	−1.56	−2.92

Based on authors' estimates. Rural and urban wages refer to indices of wages for different unskilled or semi-skilled occupations (see Headey 2016). Rice prices are nominal domestic prices for the most common rice varieties. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors are reported in parentheses.

4. CONCLUSIONS AND KNOWLEDGE GAPS

In this survey, we first consider the approaches used in the different studies of the impacts of higher food prices on the poor. We find that most of these studies use the Deaton (1989) net-benefit approach to assessing the impacts of higher food prices on the real incomes of the poor, and hence the impacts on poverty rates, poverty gaps, and other summary measures of impact. We agree that this approach to measurement is appropriate for assessing short-run impacts. But one potential concern with this approach is with the quality of the underlying data on consumption and production, which can influence both poverty distributions (including poverty headcounts and the number of people in close proximity to the poverty line) and the poor's dependence on food purchases. Although these studies do not provide a definitive assessment of the extent of any bias in the poverty measures, they raise serious concerns about the quality of current approaches and suggest that considerable investment in further research is needed if reliable measures of the poverty impacts of future price changes are to be obtained.

Our survey then turns to the longer-term implications of sustained changes in food prices. This is a particularly important question given a pronounced tendency among developing country policy makers to insulate against short-term increases in prices while passing through longer-term changes (Ivanic & Martin 2015). In this context, we find it is important to consider two factors ignored in short-run analysis. The first is the impact of higher food prices on demand and wage rates for unskilled labor in developing countries. The second factor is the need to take into account the welfare impacts of adjustments in output, inputs, and labor allocation on welfare. We show how welfare measures can be developed that expand on the short-run impacts of food price changes to include these two additional channels of effect. Using this approach, the longer-run poverty impacts of higher food prices appear to differ substantially from the short-run impacts. Country-specific and cross-country results typically suggest that the overall impact of including these additional channels of effect is to reverse the initial and typically adverse short-run impact. Econometric analyses of recent production and wage series from developing countries also confirm the existence of positive supply and wage responses. Hence, these findings provide a way of reconciling the findings from short-run analysis with those from longer-run analysis and observations of the impacts of higher food prices on poverty.

Since the 2007–2008 crisis, this understanding has certainly improved; in particular, there is now much more acknowledgment that sustained higher food prices will often benefit the rural masses, certainly much more so than short-run estimates based on the net-benefit ratio would suggest. Nonetheless, there remain many unknowns about the complex relationships among food prices, agricultural production, labor markets, and household welfare. Here we offer some brief reflections on knowledge gaps in this literature.

One gap of potential importance is the issue of measurement errors in household surveys, which we raised in Section 2. Various methodological experiments in survey design have certainly improved our understanding of systematic biases in the measurement of both consumption and agricultural income, but no research to date has specifically focused on the measurement of the net-benefit ratio. Future experimental work on survey methods would do well to explore this issue.[11]

Yet even without measurement errors, simulation approaches still provide little information on the dynamics of poverty in the presence of food price volatility. Without more frequent surveys—yearly, if not multiple times per year—it is difficult to say anything definitive about how effectively and how quickly households adapt to higher prices. In a more volatile world, climatically and economically, there are grounds to consider greater investment in more frequent surveys, perhaps through a system of sentinel sites in vulnerable regions, or by using a combination of less frequent thick household survey rounds (with longer and more detailed questionnaires) and more frequent thin survey rounds (more focused on shock-sensitive welfare indicators). These ideas are discussed in more depth by Barrett & Headey (2014). A last point of note on this issue is the distinct lack of higher frequency surveys in Africa especially (Beegle et al. 2016), despite that continent being more vulnerable to climatic, economic, and political shocks. Africa, it seems, still needs much more financial and technical support for data collection.

Another option for high-frequency welfare monitoring would be to encourage more widespread collection of wage data for unskilled labor occupations. This is a long-standing practice in several South Asian countries (India, Pakistan, and, of course, Bangladesh), and in Ethiopia the wages of daily laborers are also collected as part of the (predominantly urban) consumer price survey. Because wages for casual labor may be good proxies for the reservation wage of the poor (Deaton & Dreze 2002), they might serve as a good high-frequency poverty indicator. Certainly the evidence presented above suggests that they are an important metric in food price analyses.

Lastly, the focus of this review is on household-level indicators of poverty and food security, rather than individual-level indicators, such as nutrition or food consumption indicators. This omission was not through choice, but rather through the paucity of any recent research on food prices and individual nutrition or food consumption outcomes. Yet earlier work certainly suggests that this omission should be readdressed. Research on the intrahousehold distribution of food in India, for example, strongly suggests the existence of significant gender discrimination (Behrman 1988a,b; Bhalotra 2010; Haddad et al. 1996). In Indonesia, a remarkable study by Block et al. (2004) uses a series of repeated cross-section surveys conducted at three-month intervals to track

[11]On a related note, research on food prices and welfare has almost invariably used urban-based food prices under the assumption that all households pay the same prices for the same goods. This assumption seems unlikely to hold, both across rural and urban households and across different levels of household income.

the short-run nutritional impacts of the 1998 financial crisis. Strikingly, they found indications that although calorie intake stayed the same, consumption of protein- and micronutrient-rich foods, particularly eggs, declined markedly during the crisis. Indeed, anemia levels among young children—an indicator of micronutrient deficiency—rose from a precrisis level of 50% to 68% at the peak of the crisis. Unfortunately, we know very little about how well such a response might generalize across other localities and other crises, though there is certainly some suggestion that dietary diversity indicators might be a better gauge of food insecurity than calorie intake (Headey & Ecker 2013, Headey et al. 2014). In Bangladesh, for example, Torlesse et al. (2003) find that higher rice prices reduce household dietary diversity in the short run, which is associated with increases in the prevalence of underweight children.

These are all important topics for future research, with the common thread being the need for collection of much better data, the lack of which constrains both simulation and econometric approaches to the welfare analysis of food price changes. Indeed, it might reasonably be hoped that better data, along with extensions to our theoretical understanding of the welfare impacts of food price changes, could substantially reconcile some of the different conclusions found in this important literature.

SUMMARY POINTS

1. This paper reviews literature on the impacts of changes in food prices on household poverty and food security, a literature which expanded rapidly with the food price crisis of 2007–2008, when the international prices of major staple foods doubled in the space of a few years.
2. Early estimates of the impacts of higher food prices use the net-benefit ratio, which suggests that most of the poor are net consumers of food who would lose from higher prices.
3. Inadequate attention is paid to the challenge of accurately measuring the net-benefit ratio given that recent World Bank studies suggest there could be serious errors in estimates of both food consumption and food production.
4. A more recent literature also focuses on how households and economies adjust to higher food prices over the longer term, with substantial emphasis on agricultural supply responses and the impacts of these responses on the demand for unskilled labor.
5. Both simulation and econometric evidence on the longer-term impacts of higher food prices suggests that higher food prices often benefit the poor through these mechanisms.
6. Despite increased consensus on the longer-term impacts of high food prices, there remain many knowledge gaps, and there is a particular need for better data on food consumption and production.

FUTURE ISSUES

1. Measurement issues emerge as a major concern for future work, particularly evidence from World Bank studies on sizeable underestimation of both food consumption and food production in developing countries. These errors are large enough to have profound implications for estimates of the net-benefit ratio and hence whether households are helped or hindered by higher food prices.

2. Scarcely any research has studied the short-run impacts of higher food prices using repeated cross sections or panel data; the lack of higher frequency monitoring of poor populations is a major issue of concern and an area for future investment.
3. Little research has studied the impacts of higher food prices on individuals (rather than households) and on maternal and child nutrition outcomes in particular. Previous food crises suggest that these impacts can be profound.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

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