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Effects of food prices on poverty: The case of Paraguay, a food exporter and a non-fully urbanized country*

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Abstract

A vast proportion of households in developing countries like Paraguay are both consumers and producers of food, and thus the effects of food price fluctuations on welfare are not obvious. Historically, the agricultural sector in Paraguay has played a key role in economic development and has contributed significantly, and increasingly, to economic growth. In recent years, sharp movements in commodity prices have been added to the inherent volatility of the sector linked to climate conditions. In this work, we use the 2011/12 expenditure and income survey, as well as monthly price data for 127 food items for the period 2007/15, to simulate the effect of a potential hike in food prices on welfare. Our main results suggest that the expenditure effect is negative and regressive everywhere, but larger in rural than urban areas. The income effect is positive and progressive in rural areas and negligible in urban ones. Therefore, we find that the potential overall impact of an unexpected increase in food prices in Paraguay is a very flat U-shaped curve. We conclude with a simple exercise where we simulate a policy response in order to help those affected by the initial increase in food prices.

JEL Codes: D31, I38, Q12

Keywords: food prices, distribution, poverty, policy response, Paraguay

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1 Introduction

When commodity prices spiked in 2007/08 and then again in late 2010, the development community turned their concerned eyes to the impact that the staples' price fluctuations could have on the poorest. Yet, in countries where a large proportion of households are both consumers and producers of food, the effect of food price fluctuation on their welfare - and ultimately, on poverty - could be ambiguous. On one hand, higher prices lower individuals' purchasing power and thus restricts the goods and services that they can acquire, given their budget. On the other, as producers, to the extent that they can sell food items at a higher price, their budget set expands allowing them to achieve a higher welfare. While the theoretical analysis is not new (Hicks (1939), Singh *et al.* (1986), Deaton (1989)), the empirical literature analyzing the distributional consequences of food price changes for specific countries in such contexts remains thin and inconclusive.

The objective of this paper is to evaluate the effect of an unexpected food price spike on poverty and inequality in Paraguay. Historically, the agricultural sector in this country has played a fundamental role in the economic development and has contributed significantly to economic growth (World Bank, 1995). Approximately 65 percent of households in rural areas relies on some sort of agriculture-related income (either working on their own land or as wage employees), and even in urban areas this share is about 17 percent.

During the past decade, Paraguay's extreme poverty rates have been stubbornly stable at around 18 percent, despite the sizable growth in average individuals' incomes and high (though fluctuating) rates of economic growth. Part of the explanation of the pervasive high extreme poverty rates relates to the fact that prices of basic food items have soared, especially between 2005 and 2007, outpacing the overall rate of inflation, rendering the basic food basket more expensive than in the past. Therefore, while real income of the poorest quintile was growing, it was not sufficient to compensate for the increased value of the food basket.

The analytical framework that we use to analyze the effect of an unexpected food price hike on households' welfare is based on the compensating variation. We consider three different effects: the *expenditure effect*, as consumers face more expensive prices; the *income effect*, as profits for farm holders or wages for employees in agricultural activities increase; and finally, a *government policy response*, simulated as an increase in the amount of the cash transfer to current beneficiaries of the existing social program Tekoporã.

In concrete, we simulate an increase in food prices similar to the one observed between September 2010 and August 2011. During this period, annual food inflation was 17 percent while overall inflation was around 9 percent (5.4 percent if we exclude food items). The simulation considers heterogeneous price movements across 9 subcategories of food items (for instance, the price change of cereals was assumed to be lower than that of poultry). We exploit two sources of information: the 2011/12 Income and Expenditure Survey (*Encuesta de Ingresos y Gastos y Condiciones de Vida* – EIG-CV hereafter), and monthly price data collected in Greater Asunción (Central Bank of Paraguay). Finally, we simulate the potential effect of a policy response by using the 2015 Permanent Household Survey (*Encuesta Permanente de*

Hogares – EPH henceforth).

Our main results suggest that the expenditure effect is negative and, as expected, regressive everywhere, but larger in rural than urban areas. The income effect, largely dominated by greater profits of those self-employed as compared to higher wages, is positive and progressive in rural areas while negligibly in urban areas. Therefore, we find that the overall impact of an unexpectedly increase in food prices in Paraguay is U-shaped, similar to what Ferreira *et al.* (2013) found for Brazil, with an increase in extreme and moderate poverty. Government response, materialized through an increase in the amount of the cash transfer to existing beneficiaries of social welfare programs, will have ambiguous effect on those vulnerable households. For instance, quadrupling the amount of the existing monthly cash transfer would compensate the loss due to higher food prices but not everywhere. There would be less households in extreme poverty in rural areas while an extra effort would be necessary to help those in urban ones. One the other hand, moderate poverty would be more than two point less than pre-shock levels after the compensation.

We aim to contribute to a relatively scarce but growing literature. Existing studies tells us that the distributional effect of staple prices differ depending on the proportion of net consumers and producers at different parts of the distribution. Deaton (1989) pioneer's work, analyzed the distributional effects of price changes on households' real income in Thailand, considering their role as both consumers and producers, followed then by Benjamin & Deaton (1993) and Ravallion & van de Walle (1991), for price changes in Ivory Cost and Indonesia respectively. Ravallion (1990) incorporated labor market responses to changes in food prices in rural Bangladesh into the estimation of welfare effects. Ivanic & Martin (2008), is arguably one of the first attempts to do a cross country analysis. Using household survey data for ten low-income countries they found an overall poverty-increasing impact of higher food prices because, in their sample, most poor are net consumers of food (both in urban and rural areas). Similarly, Robles & Torero (2010) analyzed the effects of a hike in food prices in four Latin American countries, documenting that those affected the most are, obviously, importing countries, and poor households in urban and semi urban areas. Finally, there are two interesting study cases of a single country in the region. Ferreira *et al.* (2013) study the impact of food prices on welfare in Brazil in 2008, considering the income effect of prices (only) on wages, while Attanasio *et al.* (2013) estimated the effects of food prices in Mexico accounting for substitution effects on the demand side (but did not include income effects on the producer side).

We believe our contribution is twofold. First, we contribute to the empirical literature by providing evidence of the effects of a hypothetic price increase disentangling the impacts on consumers and producers as well as in rural and urban areas. We focus on a country that has not been studied yet and where the agricultural sector plays a major role in the country's economy. Second, a more technical one, we add a component to the income effect, i.e., the profit effect, that was not considered in the existing literature (at least in the Latin American domain) and that explains a substantial part of the final result given the economic structure of the country.

The paper is structured as follows. Section 2 introduces several stylized facts of the Paraguayan economy, while Section 3 presents the various sources of information used. Given that prices are regularly observed only in urban areas, Section 4

discusses whether these prices are indeed a good approximation of prices faced in rural areas. Section 5 brings together the analytical framework to assess the effect of a price increase on households' welfare as well as a brief literature review. Section 6 presents the main results of the simulations and Section 7 the potential effects of different policy responses. Finally, the last section ends with some concluding remarks.

2 Context

Paraguay is a small country with approximately 8 million inhabitants, located in South America. Its economy depends increasingly, and significantly, on agriculture and, as a consequence, has become more volatile (World Bank, 2014b). Growth in this sector has explained over 80 percent of the variation of real GDP growth since the early 90s. In the period 2003/13, per capita GDP (in constant 1994 U.S. dollars) grew by 33 percent, but experienced a major dip during the 2009 drought and global financial crisis, when it fell by 5.2 percent with respect to previous year. Yet, the record growth of 11.2 percent in 2010, driven by a 50 percent surge in agriculture, more than compensated that previous loss. In 2014, the agriculture sector represents 25 percent of total GDP; when adding the agro-industrial it accounts for the 50 percent of Paraguayan real GDP (2014). In addition, the agricultural sector represents 40 percent of national exports (World Bank (2014b) and World Bank (2014a)).

Since 2005, the prices of many food items have risen considerably. The international food price index experienced a hike in the middle of 2008, at 80 percent higher than in 2005, though dropping massively by the end of the year (Figure 1). A second hike was observed in early 2011, reaching 90 percent of the 2005 value. "Price increases of this magnitude for basic foodstuffs, over a relatively short period, led to widespread concern about possible impacts on hunger and deprivation" (Ferreira *et al.* , 2013) and various countries put in place various instruments to help vulnerable families cope with these sudden price fluctuations – such as restricting exports (Argentina, Bolivia and Ecuador), imposing price restrictions in domestic markets (Argentina, Bolivia, Honduras, Mexico, and Panama), and compensating households purchasing power loses with increased cash transfers (most countries in the Latin American region).[1]

In countries such as Paraguay, who are large producers and exporters of foodstuff, the hike in prices lead to both a lost for net buyers of food items (mostly, urban households) and a gain for net sellers. "While the welfare of these households [net food buyers] will tend to decline with the price increases, those aggregate income gains must accrue to someone, and where the gainers are in the initial income distribution is likely to matter for the overall poverty and distributional consequences of the price shock" (Ferreira *et al.* , 2013).

Paraguay is a net exporter of agricultural and livestock products (including vegetable, and animal bi-products) but a net importer of foodstuffs such as prepared foods, beverages, spirits and vinegar, tobacco and manufactured tobacco substitutes

[1] Country examples from Table 1 in World Bank (2008).

(Table 1). As stated, the Paraguayan economy depends increasingly and significantly on agriculture. Yet, two-thirds of the extreme poor live in rural area and rely heavily on this volatile sector. Between 2003 and 2013, Paraguay performed substantially well in terms of poverty reduction, seeing sizable reductions in moderate and extreme (monetary) poverty. This is the result of a period of average significant growth combined with a reduction in inequality. A significant proportion of the improvements in welfare were only experienced after 2011; before this, extreme poverty remained stable despite per capita GDP increasing by 22 percent, while between 2011 and 2013 extreme poverty almost halved (Figure 2). A key factor behind the evolution of poverty rates in this decade relates to changes in food prices throughout the period (World Bank, 2015).

While both growth and distribution were contributing to a significant increase of the income of the poor during the period 2003/2011, food prices were rising at a higher rate than general prices in the economy, mitigating to a significant extent the reduction in extreme poverty that would have otherwise resulted. In contrast, all three forces –growth, inequality reduction and decreasing food prices– have been working in the same direction since 2011 (Figure 3). Disproportionately high income growth among the less well-off and especially in rural areas is a strong factor behind the recent improvement in poverty reduction. In both periods, rising labor incomes have been the driving force both because of increased earnings and increased number of earners. Meanwhile non-labor incomes such as public transfers only started to play a significant role in the past two years – perhaps due to important increases in coverage of the main social programs (World Bank, 2015).

Extreme poverty lines (also called 'food poverty lines') are updated annually using the food consumer price index for the Metropolitan Area of Asuncion, provided by the Central Bank of Paraguay (BCP).[2] Figure 4 presents the evolution of the *real* value of the extreme poverty lines adjusted by the general price consumer index. Food prices have grown at a faster rate than general prices, as reflected by the ascending value of the food lines. Food prices, relative to overall prices, were relatively stable until 2005 but soared in 2005-07, in line with the evolution of world prices of many staple food commodities. Since 2007 the growth in food prices slowed down relative to other pries though by 2013 the extreme poverty line remained slightly higher than five years earlier.

3 Data

In this paper we use three sources of information. The 2011/12 Income and Expenditure survey (*Encuesta de Ingresos y Gastos y Condiciones de Vida* EIC-CV) that contains detailed information on household expenditure on food and non-food

[2]Extreme poverty lines were constructed on the basis of the 1997/98 expenditure survey (*Encuesta Integrada de Hogares* EIH 1997/98). They were built based on the consumption patterns of a reference population and a minimum caloric requirement. Three lines are used: Metropolitan Area of Asunción, Rest of Urban area and Rural Areas. Ideally, each line should be inflated according to the observed price movements in its areas. Unfortunately, price information are only collected in the metropolitan area of Asunción and thus the three lines are updated using the same price data.

items as well as detailed income data, including an agricultural module. This survey was carried out by the National Statistical Office from Paraguay (DGEEC for its acronym in Spanish) during a whole year from August 2011 to July 2012, and collected information for 5,417 household from both urban and rural areas. Its design allows doing robust estimations for urban and rural areas, and also for the departments of Asunción, San Pedro, Caaguazú, Itapúa, Alto Paraná, Central and rest of departments (this includes all the remaining areas).[3]

Secondly, we use comprehensive monthly price data at item level for the period 2007/2015, that feeds the Consumer Price Index (CPI hereafter) published by the Central Bank of Paraguay.[4] The general CPI includes 450 items, 359 goods and 91 services. Of these, 127 are used in the food CPI. Item weights for both CPI and food CPI allow us grouping individual items into sub-groups, such as Oils and Butters, Cereals and related products, Meat, Fresh and canned vegetables, among others.

Finally, we exploited the annual household survey, *Encuesta Permanente de Hogares* (EPH) 2015. This survey is also carried out by DGEEC and generally used to estimate official poverty and inequality figures. It has detailed income information including labor, and various sources of non-labor income such as rents, interest or dividends, remittances (both internal and external), pensions, among others. In addition, unlike the EIG-CV, the EPH contains information related to existing social programs like *Tekoporã* (a conditional cash transfer program to families with school-aged children) and *Adultos Mayores* (non-contributory pension plan which contemplates a monthly monetary transfer equivalent to one quarter of the current minimum wage). We use this survey to simulate alternative policy responses that will presented and discussed in section 7.

4 Do rural prices move similarly to those in Asunción?

The CPI plays an important role in a country's economic performance given that it is one of the most relevant signals to guide not only public decisions but also private actions. The Paraguayan CPI is produced by the Central Bank[5] and, is dis-aggregated into several sub-components such as food, clothes, public services, health, and transport costs. Prices are only collected in the metropolitan area of Asunción, thus it is not possible to monitor price changes neither in the rural/urban spectrum nor at the departmental level, as it is possible in various other countries in the region (such as Brazil).

The CPI is used to annually update the value of Paraguay's national extreme and moderate poverty lines using food and general CPI respectively. The assumption is that while price levels might differ across regions or areas of the country, price changes (inflation) is relatively similar across the country. This is a reasonable as-

[3] With the only exception of the departments of Alto Paraguay and Boquerón whose population represent less than 2% of total country's population.

[4] The Consumer Price data uses December 2007 as its base year and the item weight information comes from the 2005/06 Household Budget Survey (*Encuesta de Presupuestos Familiares*).

[5] Available at www.bcp.gov.py.

sumption in cases where transport costs are relatively low and distribution systems are highly developed, though less true in developing countries (Deaton, 1997). Having access to unit values (even if imperfect substitutes for prices) for different areas and over a whole year allow us to test, at least to some extent, whether the assumption holds true. Before jumping into the analysis, a few caveats are in place. First, unit values are different from prices. Unit values are the implicit prices reported by households when asked about the quantity (i.e., in kilos, or grams) and total expenditure for goods. These values are affected by the quality (a kilo of prime rib costs more than a kilo of ground beef) and type of place of purchase (i.e., small shop or large supermarket), which could vary across the country, as well as the quantity bought in each purchase. There are also measurement errors, especially when some information in the calculation (quantity or expenditure) is missing for a given good. Second, the survey was not purposely designed to provide accurate price estimates for sub-periods (months, trimesters, etc) but for the whole year, therefore the representativeness by rural/urban area for these sub-periods is not assured. Nonetheless, the distribution of interviews across months (and bi-month) by urban/rural as well as by socioeconomic status is relatively smooth across time (see Table 2).

Based on the item weights used in the CPI (Banco Central de Paraguay, 2007) and unit values from EIG-CV, we generated a monthly price indexes, for both urban and rural areas. A preliminary analysis suggests that (a) urban and rural price indexes move quite closely across the year and, (b) that these are close to the food price index reported by the Central Bank. The implication is that the assumption used to update the poverty lines is, at least for the period under analysis, not at odds with the information coming out from unit prices gathered at household level. For our purpose, the remaining implication (c) is that it would not be inappropriate for the analysis that follows to use the CPI-BCP information to produce simulations using the EIG-CV (Figure 5).

5 Analytical Framework

Traditional approaches trying to measure the distributional impact of changes in prices often involve the comparison of the Gini coefficient before and after the price changes occur. However, summarizing the effects in a single measure ignores useful information that can be learned from the data (Benjamin & Deaton, 1993). In this context, micro-simulation can be useful to explore the structure of income distribution with more detail.

The idea that we explore in this paper is the following. Households consume a set of goods at given set of prices, and thus an increase in prices make them poorer because with the same income they can buy less goods (*expenditure effect*).[6] In addition, households derive higher income from producing and selling products whose price has increased and/or from working as wage employees in activities where the remuneration has risen due to increased profits from higher prices of sold products (*income effect*).

[6]Technically the *expenditure effect* consist of two effects: pure substitution effect (change in relative prices) and income effect (with the same amount of income households can buy less). For a comprehensive discussion on this refer to Mas-Colell *et al.* (1995).

The analytical framework we follow in this paper is based on the agricultural model proposed by Singh *et al.* (1986), continued among others by Deaton (1989), and with the variation adopted by Brambilla & Porto (2009). The unit of analysis is the household indexed by h and, in equilibrium, household expenditures (including savings) e^h have to be financed with household income (including transfers).

$$e^h(p, u^h, x^h) = \sum_j w_j + \sum_i \Pi_i^h(p, \phi) + T^h + x_0^h \tag{1}$$

where i indexes goods and j household members. Household expenditure (e^h) is a function of the set of prices of consumption goods p, the utility derived from this consumption u^h and some other household characteristics x^h (i.e., household composition). Expenditure needs to equal, in equilibrium, household income, which is the sum of individual wages w that might be determined, up to some extent, by the prices of goods produced (first term), the profits derived from own production and sale of goods (second term), transfers that the household may receive (T^h), and other exogenous income (x_0^h).

Clearly, it can be seen that household's welfare can be directly affected by a change in prices both through decisions on consumption as well as production. Naturally, those effects depend on household "*consumption/production*" choices and endowments, so heterogeneous impacts can be expected.[7] Following equation (1) and, considering that households consume part of their own production, profits are given by the earnings obtained from selling the remaining goods. To show that, we redefined equation (1) as follows,

$$e^h(p, u^h, x^h) = \sum_j w_j(p) + \sum_i p_i(q_i - c_i) + T^h + x_0^h \tag{2}$$

A change in prices p will affect both expenditure (i.e., the sum of p_i times c_i), as well as household income captured by the first term and the first part of the second term. Differentiating equation (2), and after some rearrangements we get the compensating variation (as a share of initial expenditure) associated with a change in the ith price:

$$cv^h \cong \sum_i \sum_j \varepsilon w_i^j \theta^j \frac{dp_i}{p_i} + \sum_i (b_i - s_i) \frac{dp_i}{p_i} \tag{3}$$

where εw_i^j is the elasticity of the wage earned by household member j with respect to the price p_i, θ^j is the share of the wage income of member j in total household income, b_i is the share of household income from production of good i and s_i is the budget share spent in good i.

The compensating variation is commonly defined as the amount of money that the household would need to receive to compensate for the price increase in order to maintain its original utility level (Hicks, 1939). Equation (3) represents the proportional change in money-metric household welfare considering not only impacts

[7] As it is remarked in Brambilla & Porto (2009), equation (1) assumes the principle of "separability" between consumption and production decisions. Refer to this paper for a comprehensive discussion about this.

on consumption and income but also on wages. The first term of the right hand side represents a first-order effect that an increase in prices of food items might have on wages of those employed in the sector that produced them. It is important to note that the response of labor income is capture by the elasticities εw_i^j and also by the share of income contributed by wages of different household members θ^j. From the second term of the right hand side of (3) it is clear that households that are net consumers ($b_i < s_i$) will be worse off if prices go up whereas net producers ($b_i > s_i$) will better off; and of course the opposite is true for price declines. Also it is worth to note that the combination of both terms, represents a good approximation for the first order effects to a change in prices, only valid for small changes as we will discuss below.

In addition, as Brambilla & Porto (2009) and Lederman & Porto (2016) argue, many issues associated with the first-order impacts need to be highlighted. First, the role of imperfect pass-through of international to domestic prices and therefore to households.[8] Second, the existence of spillover effects both on the production (i.e., the expansion of a sector affects up/downstream activities) and the expenditure side (i.e., increase in income due to the expansion of a sector raises the demand for output and thus the derived demand for inputs in other sectors). Finally, the fact that the net-consumer/net-producer approach is very intuitive, it rests in a strong assumption: the presence of small price changes (first order approximation). To relax this assumption or analyze larger price changes, the incorporation of responses in demand and supply becomes crucial (second order effects). As pointed out by Brambilla & Porto (2009) the net position of the household is endogenous when households respond and therefore, for small price changes, it is a "negligible" second order effect. However, for larger price changes the approximation error becomes relevant. As we previously mentioned a consumer always lose from a price increase (i.e., expenditure effect), but if he can adjust his consumption behavior, the losses could be lowered by substituting more expensive goods for cheaper ones.[9] The addition of those substitution effects in our equation (3) led us to obtain an equality as follows:

$$cv^h = \sum_i \sum_j \varepsilon w_i^j \theta^j \frac{dp_i}{p_i} + \sum_i (b_i - s_i) \frac{dp_i}{p_i} + S(\Delta p) \tag{4}$$

where the last term $S(\Delta p)$ corrects for substitution behavior, as a function of the full vector of price changes.[10] In addition to the analysis of second order effects, the literature has tried to quantify consumption responses through the estimation of a system of demand elasticities (own and cross price elasticities).[11] In an interesting contribution, Friedman & Levinsohn (2002) – while did not include wages or income responses in their model – found that incorporating substitution behavior implies substantial level differences (against the situation with no adjustment). Nonethe-

[8] For a detailed discussion, see Feenstra (1989), Rogoff (1996), Goldberg & Knetter (1997), Burstein *et al.* (2003) and Nicita (2009).

[9] Similar arguments can be made for the producer side.

[10] See Ferreira *et al.* (2013) for an interesting discussion on this.

[11] The leading framework to estimate demand systems is Deaton & Muellbauer (1980) and further developments based on it.

less, the distributional consequences are shown to be rather stable across the whole income distribution.

As discussed by Ferreira *et al.* (2013), there is still no evidence (that we are aware of) that has so far fully captured all terms of equation (4), and ours is not the exception. Unfortunately, and regarding our specific estimation, due to the absence of data to estimate the change in consumption following a price variation, we are not able to include second order effects, although we recognize that this may be a component to be considered. Nevertheless, not including substitution effects allow us to estimate an upper bound effect and thus households would not be as bad as our estimations suggest.

Having said that, we focused on equation (3) using a wage-price elasticity of 0.22 and 0.40 (based on Ravallion (1990) and Porto (2015)) for the first term of the right hand side.[12] Regarding the second term, the availability of information on household expenditures and incomes provided by the EIG-CV allow us to compute both consumption and production shares. Specifically, the calculation of production shares represents in our view a relevant contribution of this paper taking into account that some relevant studies do not calculate due to lack of information.[13] We consider that this is an important contribution of this paper. Moreover, Paraguay has the greatest amount of rural population as a share of total population considering all countries in Latin America, and as a consequence own production is a key component in this country. As we will see latter, omitting this income component does not have negligible effects on the final results.

6 Simulation and Results

Between September 2010 and August 2011, prices of food items in Paraguay rose 17 percent (Central Bank of Paraguay), whereas overall inflation was around 9 percent (5.4 percent if we do not include food items). Forty percent of Paraguayan live in rural areas (one of the highest rates in the region), and a third of their income is related to agriculture. Therefore, a potential impact of food price changes on poverty and inequality might be significant, and greater than in neighboring countries. Specifically, the exercise that we do in this paper, simulates an increase in prices similar to the one observed between September 2010 and August 2011 (Figure 6), taking into account to some extent, the heterogeneity of price changes observed across foodstuff. The EIG-CV data allow us to observe the prices of 127 individual food items, which will be grouped into nine food groups, following the classification used in the construction of the Consumer Price Index.[14]

[12] Boyce & Ravallion (1991), Porto (2005), Porto (2006), and Nicita (2009) provide alternative estimations of wage-price elasticity.

[13] For example, Ferreira *et al.* (2013) were not able to compute production shares due to some restrictions in Brazilian data.

[14] In concrete, the simulated inflation for each subgroup j is $Inf_j = (Inf_j - InfNonFood)$, whereas $InfNonFood$ refers to overall inflation without including food items. For the income effect, the simulated inflation is 11.8 percent given that we cannot identify the different crops. On the poverty lines, the baseline extreme line is inflated by 11.8 percent while we do not make any adjustment on the moderate poverty line.

The simulation allows us to calculate the first order effect of this price change. In other words, assuming that the quantities consumed and produced of each item remain the same as before the price change, we compute the resulting household level values of expenditure and incomes and analyze the welfare variation across the income distribution. Technically, this implies that we will estimate and upper bound given that household may have the possibility to substitute either consumption or production decisions.

Considering that prices of food items rose more than those of other goods, the expenditure effect is greatly explained by the food share of household, which as expected, vary across centiles of income per capita, and between urban and rural areas with an average of 37 percent and 47 percent respectively (Figure 7). This is a standard textbook result and is well known as the Engel curve. Our result suggests that the expenditure effect is negative and obviously regressive everywhere, but larger in rural than urban areas (Figures 8a, 8b and 8c).

When comparing extreme poverty rates after an increase in prices, and allowing only the *expenditure effect* to play a role, we see an increase in the number of people not able to afford a basic food basket.[15] As expected, this hike in extreme poverty is greater in rural areas (Table 3). Specifically, extreme poverty increase three points in urban areas and more than six points in rural ones. Something similar occurs with total or moderate poverty that rises approximately half point in urban areas but more than a point and half in rural areas. Inequality rises slightly when considering the *expenditure effect*.

On the other hand, a food price hike leads to higher incomes to small farm holders and those employed in agriculture. The *income effect* that we address in this paper includes not only the effect of prices on wages, as in Ferreira *et al.* (2013), but also greater returns for agriculture entrepreneurs and self-employed. As with the *expenditure effect*, differences across areas are substantial; the probability of having agricultural related income is 17 percent in urban areas whereas 65 percent in rural ones. To do the simulation we consider a price elasticity of wages equal to 0.2 (benchmark case) as it is a good approximation of the very short response in the labor market. Similarly, we explore another alternatives: a) no response (0), b) long run response (0.5) and c) full transmission (1.0).

Table 3 presents the overall *income effect* and the effect of each sub-component. Undoubtedly both effects lead to a reduction in poverty but while the wage effect, within the *income effect*, is quite small, the self-employed and own farm profits contribute to a greater extent to poverty reduction and this is greater in rural areas. Two results are important to highlight. First the fact that the wage effect is negligible (*income - wage*) means that the agro-industrial sector is still something not very well developed in Paraguay and, therefore improvements in this sector will then help to boost household income and contribute to poverty reduction. Second, not including the last term (*income - profits*) i.e., the one that refer to self-employed and own farm profits, as in Ferreira *et al.* (2013), leads to an important omission in total household income. This component may also be more important in Paraguay as compared to other neighbor countries given its employment distribution.[16]

[15] For extreme and total poverty calculations we use official poverty lines published by DGEEC.
[16] See Table A1 in the Appendix.

As Figures 8b and 8c suggest, the income effect is positive and progressive in rural areas and negligibly in urban. As we increase the elasticity that we used to simulate the income effect this effect becomes greater but, as stated, wages do not play a substantial role as we can see in Table 4 that presents a summary of the alternative estimations. Overall, and considering the national spectrum, we find that the potential impact of an unexpected increase in food prices in Paraguay on welfare is a very flat U-shaped curve (Figure 8a).[17] [18] Using the same logic as Higgins & Lustig (2013), Table 5 presents a mobility matrix at national level and by area. This table shows in a dis-aggregated way, how the initial composition of socioeconomic classes were before the shock and how it is afterwards (including both the *expenditure* and *income effect*). For instance, 30 percent of the originally poor felt into extreme poverty after the price variation.

7 Policy Responses

As it has been shown in previous section, a shock on food prices increases, as expected, poverty rates. Against this situation governments can use their social protection systems to mitigate this perverse effect.[19] In Paraguay the most important social program is Tekoporã devoted to improve the life's quality of the most deprived; warranting the access of food, health, and education, and strengthening social networks to eradicate inter-generational transmission of poverty. Its design is pretty similar to many conditional cash transfer programs implemented in the region and it is mainly focused on families in extreme poverty and vulnerability, which have among its members children and adolescents between 0-18 years old, disabled persons and pregnant women.[20]

Tekoporã has been gaining relevance and coverage since 2005 and its beneficiaries have increased steadily. In 2005, 4,324 families in poverty and vulnerability conditions were covered by the program, whereas the program currently covers all departments in Paraguay with 131,159 families. Each household receives a lump sum transfer of Gs. 90,000 and a flexible transfer depending on the number of children (of Gs. 40,000 for each child). Then, for instance, a household with four children, receives a total amount of Gs. 250,000.[21]

[17] In this figure we can also see that the choice of the poverty measure and of the poverty line is not trivial as stated by Ravallion & van de Walle (1991).

[18] If we repeat the same exercise that we do in Figure 3 we could see, indeed, that at national level, the three components (i.e., growth, redistribution and line), go against poverty reduction. Nevertheless, the growth effect goes in favor of poverty reduction when narrowing the analysis to rural areas, although it is overweight by the distribution and line effects.

[19] World Bank (Food Price Watch) identifies that policy responses can be addressed via five different fronts: i) the producer side, ii) the consumer side, iii) or both; in addition to iv) foreign trade terms intended to protect national markets, and v) risk management future type of contracts. This paper will focus uniquely on the consumer side.

[20] For a survey of conditional cash transfer programs in the Latin American region refer to Stampini & Tornarolli (2012).

[21] The maximum number of children allowed to claim for the benefit is four. The program also grants Gs. 40,000 for a pregnant woman (up to one pregnant woman), Gs. 150,000 for disability (up to two disable persons) and 225,000 for an indigenous family.

The existence of Tekoporã, allow us simulating a policy response from the government side to help those affected the most by the price shock.[22] To assess this issue, a first methodological obstacle needs to be removed. In particular, the main source of information used in this paper (EIG-CV 2011/2012) does not report a specific question whether the individuals receives or not the program, so an approximation to an hypothetical distribution of them needs to be made. For this purpose, we take advantage of the EPH 2015 where a specific question about the reception (or not) of the program is reported and we followed several steps outlined below.

First, we identify the current number of households receiving Tekoporã in EPH 2015. Second, we propose a probabilistic model to identify those simulated beneficiaries in EIG-CV 2011/2012, but based on EPH 2015. Specifically, we run a probability model (Table 6) using as dependent variable whether the household receives or not the program, and a set of characteristics associated with the household head characteristics, the household structure and dwelling characteristics, as regressors.[23] Thus, through this model we obtain the estimated probability of being Tekoporã beneficiary.[24] Third, using the previous model coefficients we compute the estimated probability in the EIG-CV 2011/2012, and we obtaine a simulated distribution of hypothetical beneficiaries.[25] [26] We set the number of beneficiaries in the EIG-CV 2011/12 to be the same amount of those in EPH 2015.

Afterwards, using the current Tekoporã's scheme and the mimic exercise of beneficiaries in the EIG-CV 2011/2012, we simulate an assistance from the government through an additional transfer to recipients of the program. The implementation of this transfer consists on certain percentage relative to the actual (monthly) program's transfer. Regarding this, we proposed two scenarios (not exhaustive, logically) one where each household receive an extra monthly transfer and the other where each household receives four extra transfers. So, following the previous example, a household with four children will receive a monthly compensation of Gs. 250,000 and Gs. 1,000,000 respectively in each simulated scenario.[27]

[22] A review conducted by the World Bank (2008) shows that a large number of Latin American countries tended to focus their policies on the consumer side, aiming to increase the real income of poor households: school feeding programs and conditional cash transfer programs, like Tekoporã, are among the most popular.

[23] The variables related to household head characteristics are age and marital status; those related with household structure are the number of members, number of siblings and two-parent home. Finally, dwelling characteristics include: geographic area, geographic department, per capita household income, poverty status, number of rooms, walls materials, electricity provision, network water provision, piped gas provision, existence of drain, existence of telephone and existence of bathroom.

[24] It is worth to be remarked that our model fits relatively well, with an R-squared of 0.40.

[25] The comparison between the real distribution (by deciles of per capita household income) of Tekoporã beneficiaries, both obtained through EPH 2015 and simulated with EIG-CV 2011/2012 is shown in the Appendix (Figure A.1).

[26] Simply, what we do is what the literature recognizes as a survey to survey imputation.

[27] Nevertheless, increasing cash assistance is not free of potential problems. Recent research has shown that government aid can also affect market competition and therefore affect prices. Cunha *et al.* (2018) show that in kind transfer, as compared to cash transfers, increase competition at local level, specially in more isolated areas, and then local stores react by reducing their prices. In addition, Hastings & Washington (2010) show that stores increase their prices during the first days of the month because many with beneficiaries of Food Stamps or cash welfare assistance currency do their purchases during this period.

The last two columns in Table 7 present the effects of each scenario (we keep the first two columns as in Table 3 for reference). The first of them, generates a small decline on poverty rates both in extreme and moderate and also in inequality resulting after the price shock (column 3 versus 2). This reduction is almost imperceptible in urban areas while much greater in rural areas (moderate poverty is even lower than before the shock).[28] The second scenario generates more pronounced declines, logically, the transfer is four times bigger. At national level, extreme poverty is reduced by three points reaching almost pre shock values and even moderate poverty is two points less than before the shock. Again, much of the action is coming from rural areas where almost nothing occurs in urban ones. In urban areas the transfer does not compensate enough those households that were affected by the price shock, ending with an extreme poverty higher than the baseline scenario.[29] [30]

8 Conclusions

Movements in food prices have been in the center of the policy debate, specially after the commodity boom that occurred during the last decade. Observed hikes in food prices have had a differential impact in net-food exporter and importer countries. But more interestingly, there may be even *winners* and *losers* within a given country and therefore, a comprehensive analysis should focus both in the effects between countries but also within country. Net consumers and producers could be affected differently by a price increase, with a consequently different welfare effect. The great majority of the empirical literature has analyzed the cross country exposure to price hikes while there is less evidence looking at the effects within country.

This paper contributes to the previous empirical literature by providing evidence of the potential effects of a price increase disentangling the impacts on consumers and producers as well as in rural and urban areas. We do so, focusing on a country where the agricultural sector plays a key role and where the availability of data is far from being the ideal one, thus imposing challenges to the exercise. In addition, we add to this literature, a component to the *income effect* (i.e., the *profit effect*) that was not considered in the existing literature (at least in the Latin American domain) and that explains a substantial part of the final results given the economic structure of the country.

[28] In this setting, the government should make 13 "monthly" payments per year instead of the 12 (one per month) that performs under regular conditions. Based on official information, *Situación Financiera (SITUFIN)* – Ministry of Economic Affairs, the budget spent in Tekoporã represents 0,8% of total government expenses in 2014. The cost of the less generous transfer simulated in this paper is approximately 10% of Tekoporã's spending, that is to say 0.1% of total spending.

[29] To reach the baseline extreme poverty rate at the national level, the government should make more than 16 payments, or an alternative that combines a different transfer amount for those in urban and rural areas. As it is possible to see in Table 7 the most generous transfer moves poverty rates back to baseline levels in rural areas (even lower specially for moderate poverty), so the latter alternative may be to increase the amount for those in urban areas (keeping the amount in rural ones) giving that the income effect is practically inexistent.

[30] Standard errors of these results are somehow large and thus, most of the differences in our poverty measures are not statistically different. Still, we believe that this does not invalidate the exercise.

Concretely, we simulate a food price hike similar to the one experienced in Paraguay between September 2010 and August 2011 of approximately 17 percent. Using microlevel data, we estimate the impact of such increase in households' welfare, considering both the effect on families' purchasing power and their potential effects on incomes through increase sales of their food products and rise in wages for those employed in the agricultural sector. The analytical framework that we use to analyze the price increase is based on the compensating variation, assuming that households are entitled to their pre-shock level of utility. We consider three different effects: the *expenditure effect*, as consumers face more expensive prices; the *income effects*, derived either as greater wages for employees in agricultural activities or greater profits for those self-employed: and finally the *government policy response*, simulated as an increase in the cash transfer to current beneficiaries of the existing social program Tekoporã. One caveat of our results is that, as we discussed, we were not able to estimate behavioral responses after the shock (i.e., second order effects); that is to say, we estimated the *mechanical* effect without introducing behavioral reactions. Given this, we think that our estimations could be understood as upper bounds, where households have no room to adjust.

To do the simulations we exploit various sources of information. We use the Income and Expenditure (EIG-CV 2011/2012) and the Permanent Household (EPH 2015) surveys. In addition, we use detailed monthly price data collected in Greater Asunción gathered by the Central Bank of Paraguay. Our results show that the effects of the shock on poverty and inequality could be non-trivial, particularly for those in rural areas. Specifically, we find that the potential overall impact of an unexpected increase in food prices in Paraguay is a U-shaped curve, meaning that the poorest and richest are the one less affected though the differences throughout the distribution are not huge. Yet, governments such as Paraguay, that have in place a relative extensive social assistance system could take measures to react quickly to such shocks, and thus protect the most vulnerable. The paper simulates such policy response, with varying degrees of generosity of the transfer.

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Tables and figures

Table 1: Exports and Imports by sub-category for Paraguay, year 2012

	Value (USD in millions)		Share of total (%)	
Category	Exports	Imports	Exports	Imports
Animal Products	825	60	15.8	0.5
Vegetable Products	2,709	139	52.0	1.2
Animal and Vegetable Bi-Products	183	24	3.5	0.2
Foodstuffs	507	716	9.7	6.4
Mineral Products	45	1,400	0.9	12.5
Chemical Products	122	1,499	2.3	13.4
Plastics and Rubbers	96	567	1.8	5.1
Animal Hides	125	46	2.4	0.4
Wood Products	98	17	1.9	0.1
Paper Goods	15	274	0.3	2.4
Textiles	155	418	3.0	3.7
Footwear and Headwear	33	121	0.6	1.1
Stone And Glass	11	134	0.2	1.2
Precious Metals	115	6	2.2	0.1
Metals	66	582	1.3	5.2
Machines	71	3,321	1.4	29.7
Transportation	7	1,203	0.1	10.7
Instruments	4	146	0.1	1.3
Weapons	0	12	0.0	0.1
Miscellaneous	19	509	0.4	4.5
Arts and Antiques	0	1	0.0	0.0
Total	5,207	11,198	100.0	100.0

Source: AJG Simoes, CA Hidalgo. The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. (2011)

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Table 2: Monthly distribution of household interviews

	% household per area	
Date	Rural	Urban
Aug-11	6.2	8.4
Sep-11	9.8	7.8
Oct-11	7.3	8.9
Nov-11	7.6	10.2
Dec-11	8.2	6.4
Jan-12	7.4	9.4
Feb-12	9.0	8.3
Mar-12	8.6	7.3
Apr-12	8.6	6.4
May-12	12.8	8.9
Jun-12	7.3	8.1
Jul-12	7.3	9.8
Total	100.0	100.0

Source: Own calculations based on EIG CV 2011/12.
Notes: Each cell presents the corresponding share of households that have been interviewed in a given time period and area, as a function of the total interviews in that area.

Table 3: Extreme and moderate poverty, and inequality (price elasticity = 0.2)

			Income			
	Baseline	Expenditure	All	Wages	Profits	Net (exp + inc)
National						
Extreme	13.37	17.79	15.62	16.21	15.65	17.14
	(0.46)	(0.52)	(0.49)	(0.50)	(0.49)	(0.51)
Moderate	25.78	26.81	24.97	25.78	24.97	26.27
	(0.59)	(0.60)	(0.59)	(0.59)	(0.59)	(0.60)
Inequality	0.527	0.533	0.527	0.527	0.527	0.533
Urban						
Extreme	5.91	8.69	7.73	7.80	7.73	8.65
	(0.40)	(0.48)	(0.46)	(0.46)	(0.46)	(0.48)
Moderate	15.03	15.75	14.98	15.03	14.98	15.71
	(0.61)	(0.62)	(0.61)	(0.61)	(0.61)	(0.62)
Inequality	0.489	0.494	0.490	0.489	0.490	0.494
Rural						
Extreme	24.23	31.03	27.11	28.45	27.18	29.49
	(0.97)	(1.04)	(1.00)	(1.02)	(1.00)	(1.03)
Moderate	41.43	42.92	39.51	41.43	39.51	41.64
	(1.11)	(1.12)	(1.10)	(1.11)	(1.10)	(1.11)
Inequality	0.523	0.534	0.526	0.523	0.526	0.537

Source: Own calculations based on EIG CV 2011/12.
Notes: Standard errors in parentheses. Inequality refers to the Gini coefficient. In this table we consider a price elasticity of 0.2 and full pass-through of profits linked to self-employed earnings.

Table 4: Summary of simulations: elasticity and pass-through of profits alternatives

		Net effect - Wage elasticity alternatives			
	Baseline	0	0.2	0.5	1
Full profit pass-through					
National					
Extreme	13.37	17.16	17.14	17.12	17.02
	(0.46)	(0.51)	(0.51)	(0.51)	(0.51)
Moderate	25.78	26.27	26.27	26.26	26.20
	(0.59)	(0.60)	(0.60)	(0.60)	(0.60)
Inequality	0.527	0.533	0.533	0.533	0.533
Urban					
Extreme	5.91	8.69	8.65	8.65	8.64
	(0.40)	(0.48)	(0.48)	(0.48)	(0.48)
Moderate	15.03	15.71	15.71	15.71	15.71
	(0.61)	(0.62)	(0.62)	(0.62)	(0.62)
Inequality	0.489	0.494	0.494	0.494	0.494
Rural					
Extreme	24.23	29.49	29.49	29.45	29.23
	(0.97)	(1.03)	(1.03)	(1.03)	(1.02)
Moderate	41.43	41.64	41.64	41.61	41.47
	(1.11)	(1.11)	(1.11)	(1.11)	(1.11)
Inequality	0.523	0.537	0.537	0.537	0.537
No profit pass-through					
National					
Extreme	13.37	17.79	17.76	17.73	17.68
	(0.46)	(0.52)	(0.52)	(0.52)	(0.52)
Moderate	25.78	26.81	26.81	26.80	26.74
	(0.59)	(0.60)	(0.60)	(0.60)	(0.60)
Inequality	0.527	0.533	0.533	0.533	0.533
Urban					
Extreme	5.91	8.69	8.69	8.65	8.64
	(0.40)	(0.48)	(0.48)	(0.48)	(0.48)
Moderate	15.03	15.75	15.75	15.75	15.75
	(0.61)	(0.62)	(0.62)	(0.62)	(0.62)
Inequality	0.489	0.494	0.494	0.494	0.494
Rural					
Extreme	24.23	31.03	30.96	30.95	30.83
	(0.97)	(1.04)	(1.04)	(1.04)	(1.04)
Moderate	41.43	42.92	42.92	42.89	42.74
	(1.11)	(1.12)	(1.12)	(1.12)	(1.11)
Inequality	0.523	0.534	0.534	0.534	0.534

Source: Own calculations based on EIG CV 2011/12.
Notes: Standard errors in parentheses. Inequality refers to the Gini coefficient.

Table 5: Mobility Matrix before and after the shock (simulation)

National		Net - Post Shock (expenditure + income)				
		Ext. Poor	Mod. Poor	Vulnerable	Non Poor	Total
Pre Shock	Ext. Poor	100%	0%	0%	0%	13.37%
	Mod. Poor	30%	67%	2%	0%	12.41%
	Vulnerable	0%	2%	98%	0%	38.04%
	Non Poor	0%	0%	2%	98%	36.17%

Urban		Net - Post Shock (expenditure + income)				
		Ext. Poor	Mod. Poor	Vulnerable	Non Poor	Total
Pre Shock	Ext. Poor	100%	0%	0%	0%	5.91%
	Mod. Poor	30%	70%	0%	0%	9.12%
	Vulnerable	0%	2%	98%	0%	36.20%
	Non Poor	0%	0%	2%	98%	48.77%

Rural		Net - Post Shock (expenditure + income)				
		Ext. Poor	Mod. Poor	Vulnerable	Non Poor	Total
Pre Shock	Ext. Poor	100%	0%	0%	0%	24.23%
	Mod. Poor	31%	66%	4%	0%	17.20%
	Vulnerable	0%	2%	97%	1%	40.73%
	Non Poor	0%	0%	2%	98%	17.84%

Source: Own calculations based on EIG CV 2011/12.
Notes: This table should be read from left to right. For instance, for those individuals that were in an extreme poverty status in the pre-shock situation, after the shock (simulation) some of them ended up in the same situation (extreme poverty), while others move to moderate, vulnerable or non poor status. Values in this table are based on a simulation that considers a price elasticity of 0.2 and full pass-through of profits linked to self-employed earnings.

Table 6: Probit model of the probability to be an eligible household. EPH 2015

Explanatory Variables	
Household Head Characteristics	
Age	-0.005**
	(0.002)
Marital Status (=1 if married)	0.137**
	(0.068)
Household Structure	
Total number of members	-0.088***
	(0.033)
Total number of children [0;18]	0.282***
	(0.040)
Household with both parents	0.106
	(0.080)
Dwelling Characteristics	
Type of dwelling (=1 if house)	0.855
	(0.563)
Rooms (=1 if less than 2)	0.166**
	(0.069)
Bedroom (=1 if bedroom =1)	-0.262***
	(0.080)
Walls (=1 if brick made)	-0.365***
	(0.065)
Water	0.191***
	(0.062)
Electricity	0.492*
	(0.282)
Telephone	-0.340
	(0.257)
Bath	1.202**
	(0.481)
Gas	-0.564***
	(0.090)
Owner	0.174**
	(0.081)
Sewage	-0.374***
	(0.073)
Other variables	
Area (=1 if urban)	-0.309***
	(0.072)
San Pedro	0.165
	(0.233)
Caaguazú	-0.263
	(0.231)
Itapúa	-0.599**
	(0.249)
Alto Paraná	-0.731***
	(0.247)
Central	-0.823***
	(0.298)
Rest	-0.188
	(0.220)
Per capita income	-0.000***
	(0.000)
Moderate poor	0.124
	(0.086)
Non poor	0.094
	(0.101)

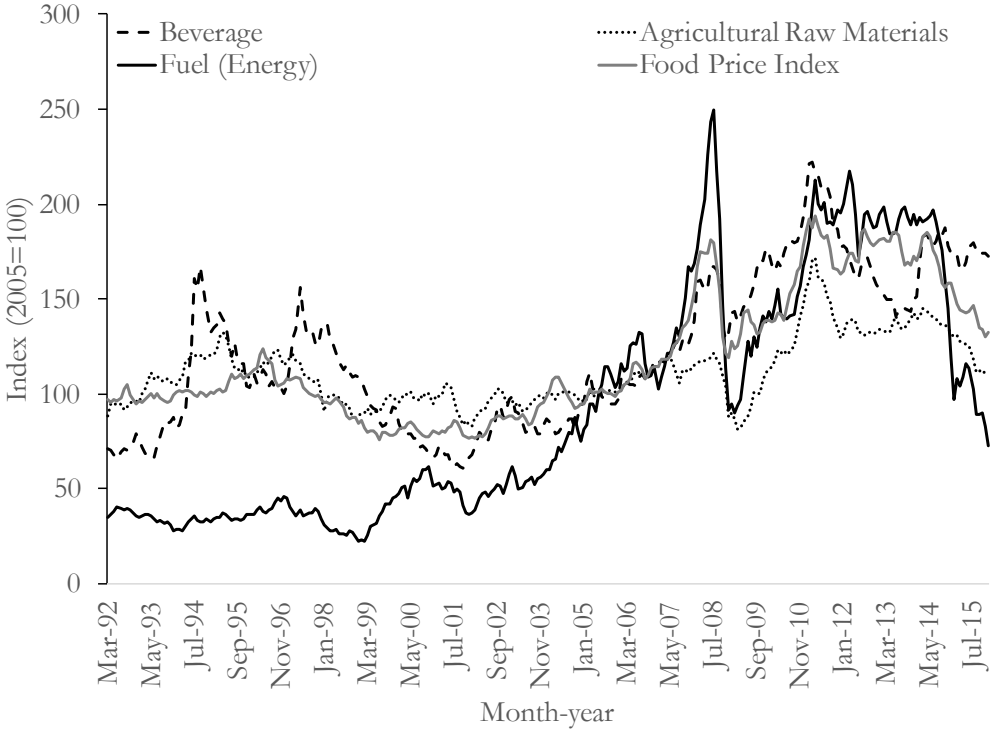
Regression based on 8,229 households, with an adjusted-R2 of 0.40. Standard errors in parentheses.

Table 7: Policy response simulations

			Policy Response	
	Baseline	Net (exp + inc)	One add.	Four add.
National				
Extreme	13.37	17.14	16.32	14.31
	(0.46)	(0.51)	(0.50)	(0.48)
Moderate	25.78	26.27	25.73	23.06
	(0.59)	(0.60)	(0.59)	(0.57)
Inequality	0.527	0.533	0.530	0.520
Urban				
Extreme	5.91	8.65	8.55	8.15
	(0.40)	(0.48)	(0.48)	(0.47)
Moderate	15.03	15.71	15.63	15.11
	(0.61)	(0.62)	(0.62)	(0.61)
Inequality	0.489	0.494	0.493	0.491
Rural				
Extreme	24.23	29.49	27.62	23.28
	(0.97)	(1.03)	(1.01)	(0.95)
Moderate	41.43	41.64	40.42	34.63
	(1.11)	(1.11)	(1.11)	(1.07)
Inequality	0.523	0.537	0.528	0.505

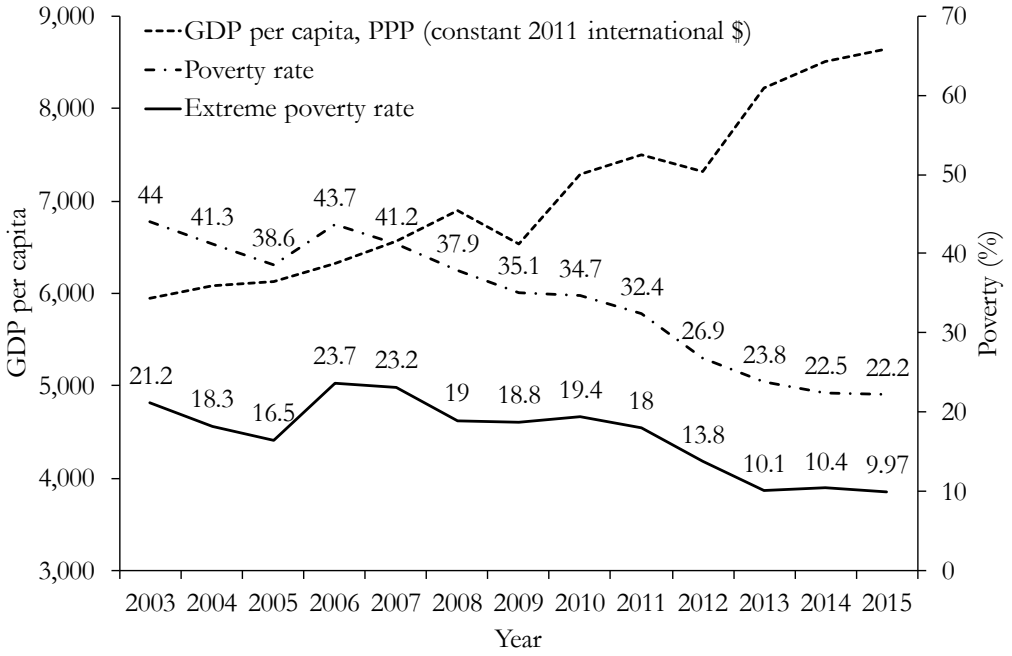
Source: Own calculations based on EIG CV 2011/12.
Notes: Standard errors in parentheses. Inequality refers to the Gini coefficient. In this table we consider a price elasticity of 0.2 and full pass-through of profits linked to self-employed jobs. The policy response refers to either one or four extra monthly payments of Tekoporã.

Figure 1: Monthly evolution of commodity prices, 1992-2015 (2005=100, in terms of U.S. dollars)



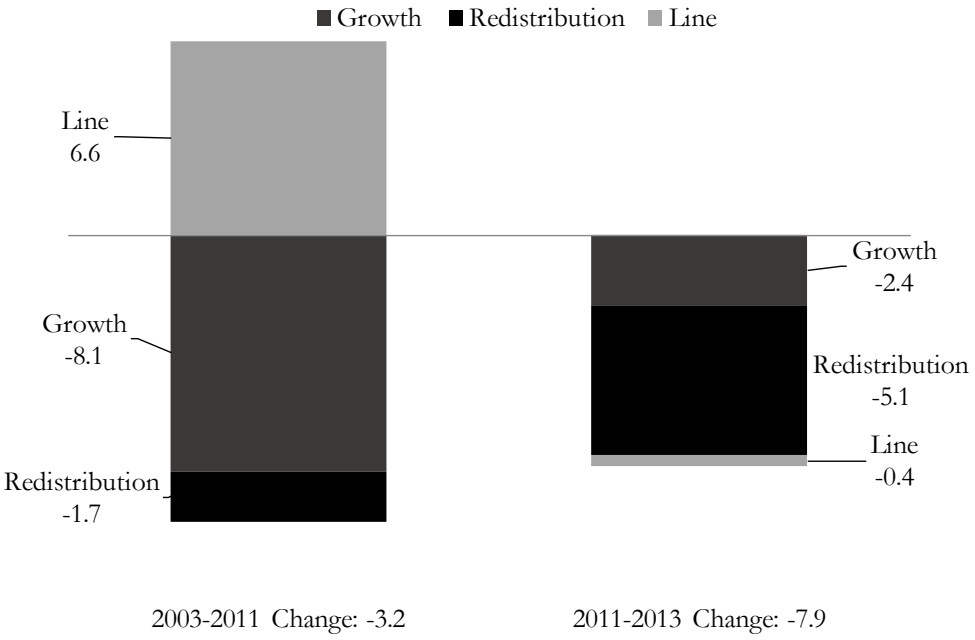
Source: IMF available at http://www.imf.org/external/np/res/commod/Table1a.pdf

Figure 2: GDP and poverty rates evolution



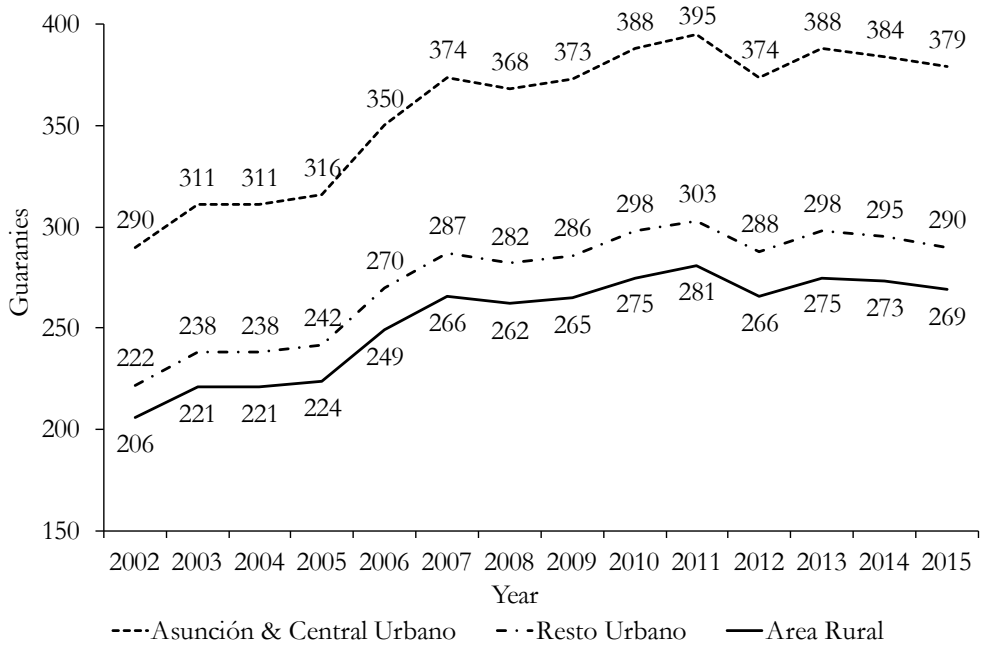
Source: DGEEC, WDI and own calculations.

Figure 3: Decomposition of changes in extreme poverty



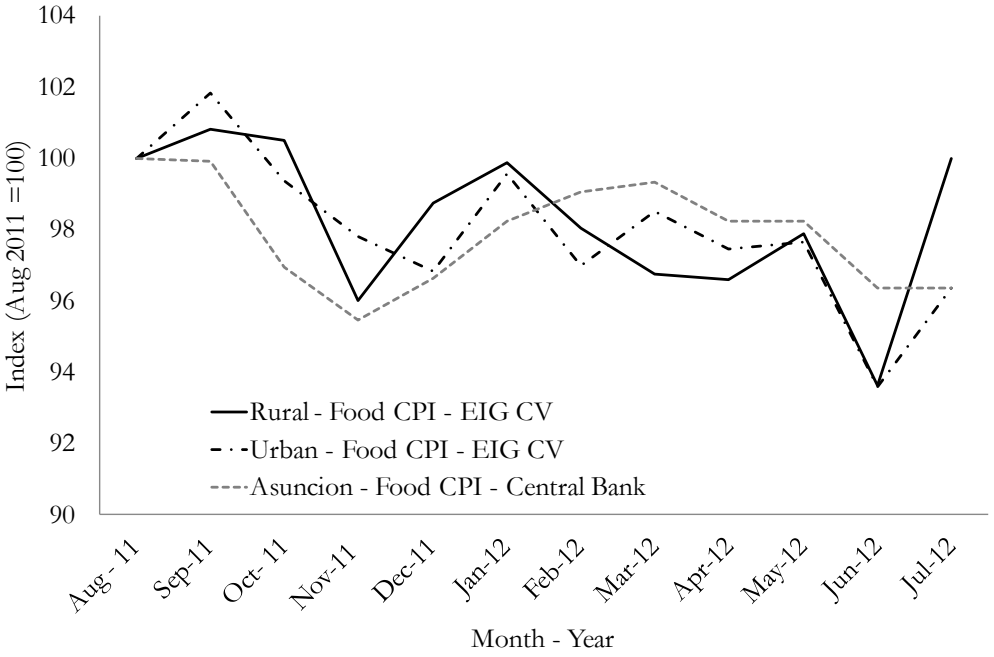
Source: DGEEC and own calculations.
Notes: Each bar presents the contribution of each component to the changes in poverty for a given period. Those bars below the horizontal line mean that their contribution went in favor to poverty reduction while those above against poverty reduction.

Figure 4: Evolution of extreme poverty lines



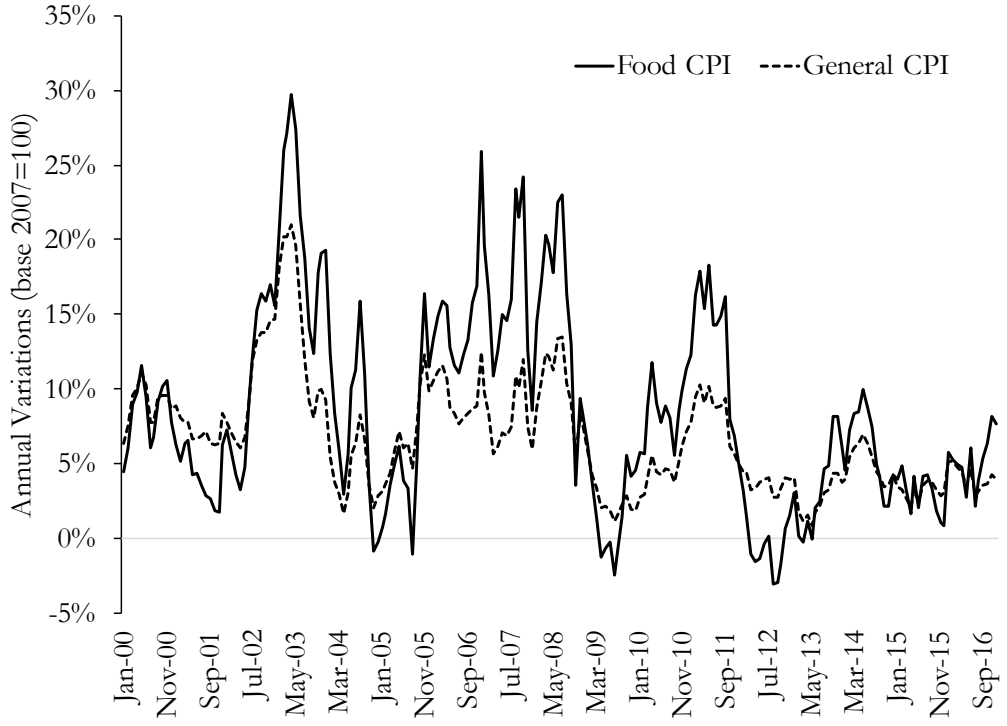
Source: DGEEC and own calculations.
Notes: All values in this figure are expressed in thousands of Guaranies and in real values of October 2015.

Figure 5: Evolution of urban, rural and CB indexes



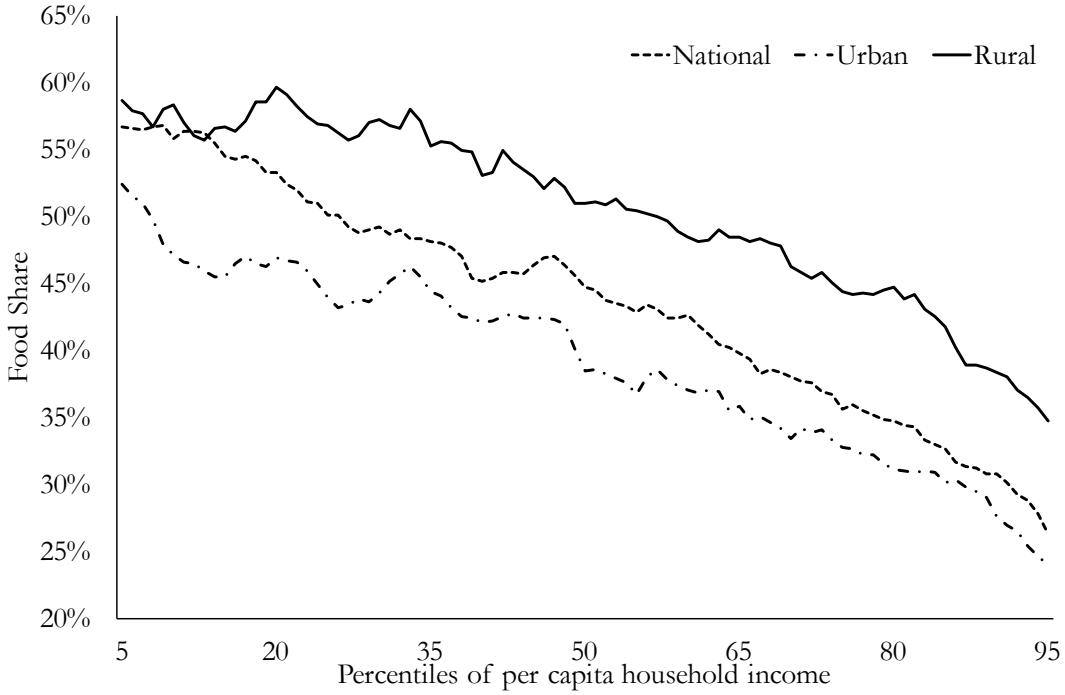
Source: BCP and own calculations using EIG-CV 2011/12.
Notes: The Central Bank's Index refers to the official CPI used in Paraguay; while the other two alternatives are two indexes that try to mimic the official one based on the EIG-CV 2011/2012.

Figure 6: Annual variations in the food and general price index



Source: Central Bank of Paraguay.

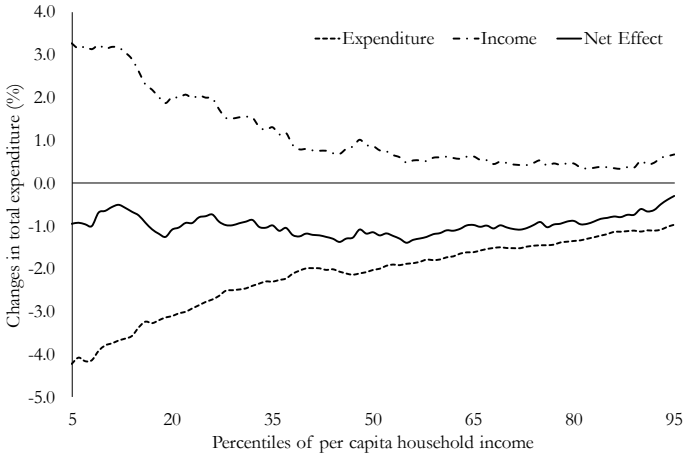
Figure 7: Food share on total expenditure by area



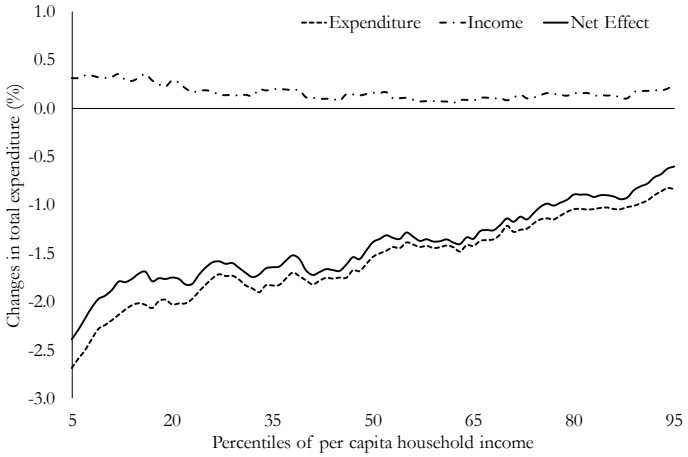
Source: Own calculations based on EIG CV 2011/12.
Notes: The food share presented in this figure corresponds to the moving average of each centile.

Figure 8: Expenditure, Income and net effect (price elasticity = 0.2)

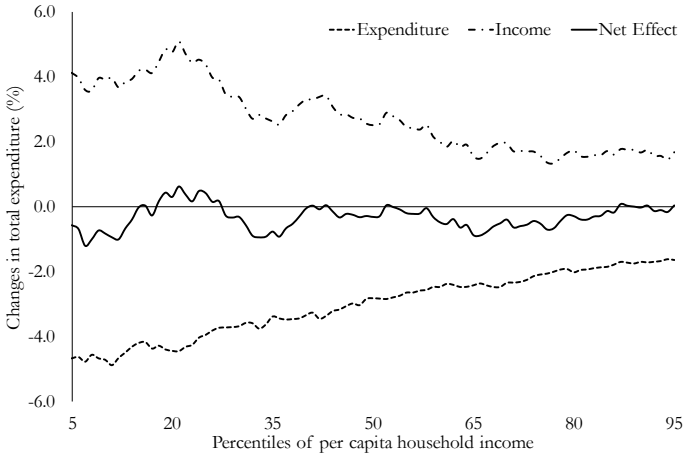
(a) All country



(b) Urban areas



(c) Rural areas



Source: Own calculations based on EIG CV 2011/12.
Notes: Each effect in these figures was estimated as the moving average of each centile.

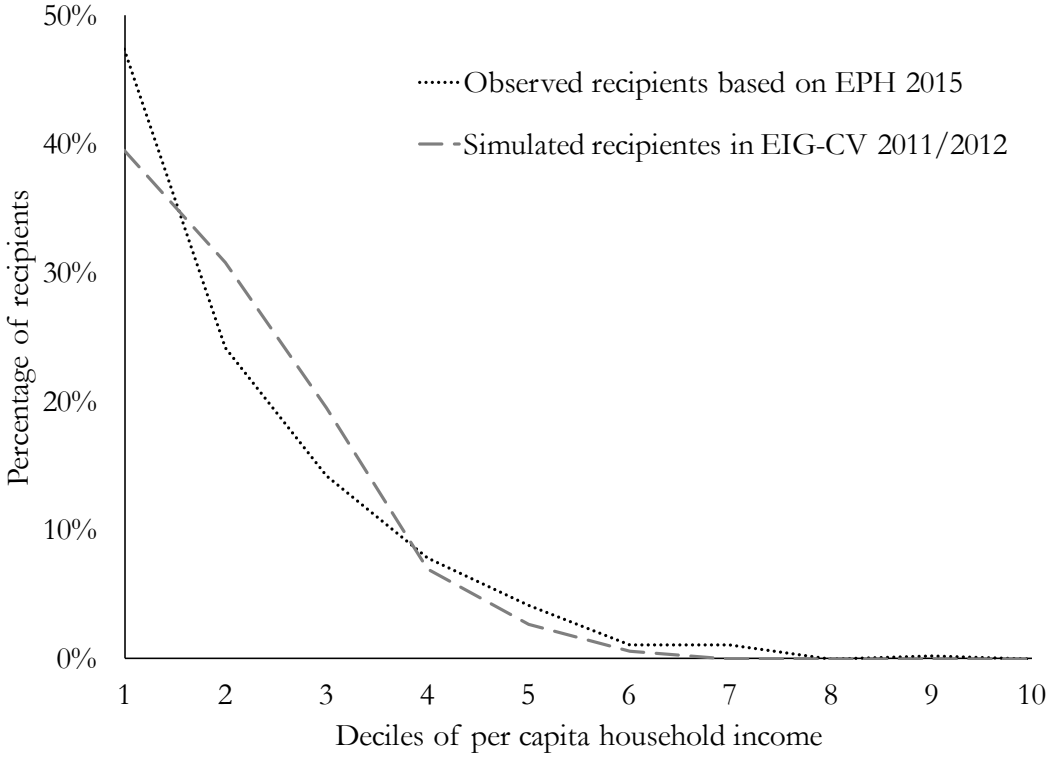
A Appendix

Table A1: Employment distribution in Paraguay, year 2012

	Employee		Self Employed	
Quintil	Agro	Other	Agro	Other
I	0.7%	2.6%	6.4%	3.8%
II	0.6%	7.7%	4.6%	5.0%
III	0.5%	11.6%	2.4%	5.7%
IV	0.4%	14.3%	1.5%	6.8%
V	0.5%	16.8%	1.1%	7.0%
Total	2.7%	53.1%	15.9%	28.3%

Source: Own calculations based on EIG CV 2011/12.
Notes: Each cell is the ratio of the numbers of workers for a given category, sector and quintil, over the total number of workers in the country. Quintiles were calculated based on the per capita income distribution.

Figure A.1: Tekoporã recipients simulation



Source: Own calculations based on EIG CV 2011/12 and EPH 2015.
Notes: The simulation in the EIG-CV 2011/2012 is the result of imposing the coefficients estimated in a probability model on the eligibility to receive the program based on the EPH 2015.