Poverty impacts of changes in the price of agricultural commodities Recent evidence from Argentina. An evaluation of public policy responses

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FIRST PRELIMINARY DRAFT - DO NOT QUOTE

I. Introduction and motivation

Among the current research agenda of international trade there is an increasing interest on the study of how the deepening of international relations may affect social welfare, employment, inequality and poverty, with the aim of being able to provide policy recommendations looking to minimize undesirable effects. This new interest has adopted mostly a micro perspective eased by the increasing availability of statistics at the household level, specially for developing and less developed countries.

Due to the increasing integration in world trade markets, Argentina, like another land abundant countries, has benefited greatly from the recent increase in the prices of agricultural commodities that took place during the last decade. For instance, for the main agricultural products exported by the country (soybeans, soybean meal, soybean oil, sunflower oil, maize and wheat), average prices in the 2002-2012 period have increased between 42% and 84% compared to the average of the preceding ten years. As it is shown in Figure 1, this increase in world prices of agricultural commodities has been part of a more general tendency which also happened in other commodity markets.

To have a clearer look of the importance of the change of prices exported by Argentina, in Table 1 we decompose the change in export values between the change in prices and the change in quantities. As shown in the Table, during the period 1992-2002 the price index of exports fell by a 9%, while quantities increased by 130%. On the other hand, in the period 2002-2012 instead, the increase in the value of exports was mainly driven by the change in prices with a 100% rise, while quantities increased only 58%. This change in the source of growth is also present, and even at a greater

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extent in the cases of agricultural commodities and manufacturers intensive in their use, and even more for fuel and energy.[1]

Despite of the benefits, at the macro level, that followed the increase in the price of agricultural commodities, such as the important increase in exports which helped to easy the external restriction that has conditioned the long-run growth possibilities[2], there is a need to consider other effects that may be less desirable. One of this effects is the impact on poverty that may follow to a rise in the price of commodities that are used as intermediate inputs in the production of food goods, which explain a large share of total expenditure in poorer households (see Figure 2).

At the peak of the 2002 economic crisis, when the local currency had already depreciated by almost 300%, the rise in the price of agricultural commodities contributed further to the increase in domestic prices, especially those of tradable goods. As an example, in the period 2002-2006[3], while the overall consumer price index increased by 81%, that of food and beverage increased by 109%, surpassed only by the increase in clothing with a 126% rise. In Figure 3 we can observe an apparent positive relationship between consumer prices and world prices of agricultural commodities.

As a response to the increase in prices, in particular of goods that constitute the food-basket, the government implemented a series of policies among which was the implementation of export taxes to most primary commodities, as well as to manufacturing goods but in this last case at much lower rates (see Table 2). Other important policy was the implementation of a broad system of direct transfers for households at the low end of the income distribution, which are expected to be the most affected by the increase in the prices of goods that constitute the food-basket.

In the next sections I assess the ex-ante impact on poverty of households that can arise due to the increase in the prices of agricultural commodities. Also, I evaluate the ex-ante effects of policies already implemented in the past, the implementation of quite high export duties, as well as to examine other alternatives (e.g., changes in consumption taxes).

[1] In the last decade, exports of fuel have been subject to important restrictions and heavy taxes, which explains that despite of a 350% price increase, quantities fell by 69%

[2] During the period 1992-2001, Argentina exported by 215.95 billions USD, during the following ten years it did by 510.83 billions. Imports, on the other hand, were 215.91 and 361.68 billions USD respectively. The increase of exports acquires a greater importance when we take into account that since 2002 the country has been almost completely excluded from international financial markets.

[3] Due to the growing distrust about the official statistics of prices that started in the year 2007, we only consider the period until 2006. More recently the distrust has extended to other statistics, such as measurements of poverty, employment, and growth.

II. Previous evidence for Argentina

The theoretical developments in trade theory and the policies to foster international trade show that in most cases is possible to identify economic groups that benefit and other that are negatively affected. Given particular institutional arrangements and market functioning, if poor individuals are among the ones that lose, the long run opportunities for the development of a country or region may be compromised.

As Winter et al. (2004) summarizes, the empirical evidence, both in the cases of cross-country and country-case studies, has so far not provided homogeneous results, with liberalization episodes in which the living conditions of the poorer declined. As for the methodology implemented, the progress by the recent studies is reflected in going beyond the traditional theoretical postulates of the Stolper-Samuelson theorem, trying to estimate these effects at the household level. This approach has been eased by the availability of household surveys, specially for developing and less developed countries. The Argentine case is treated in Porto (2006 and 2010), Calfat Barraud (2008) and Barraud (2009), all of which estimate the impact of trade openness on families using household survey data.

The evidence for Argentina (Barraud and Calfat, 2008 and Porto 2006 and 2010) has focused on measuring the effects on poverty that resulted from trade liberalization in the nineties. Barraud and Calfat (2008) show that trade liberalization had a pro-poor effect via the reduction in the price of tradable goods and through the effects on the labor market in the sector of non-tradable goods. In the opposite direction, Barraud (2009) obtained that in the case of households related to the manufacturing sector, trade liberalization between 1988 and 1998 would have had a negative impact on poverty. Porto (2006) finds that the implementation of MERCOSUR[4] benefited the average Argentine household across the entire income distribution. As the author points out, the reason behind this result is that Argentine trade policy protected the rich over the poor, prior to the reform, and granted some protection to the poor, after the reform. Porto (2010) studies the impact of improving access to international agro-manufacture markets on poverty in Argentina through two channels, the effects caused by prices changes on food expenditure and on wages. The main finding is that a better market access would cause poverty to decline in Argentina.

In the present study, the objective is to contribute to the understanding of how the recent increase in the price of agricultural commodities, which is expected to persist over the medium-run, can affect poverty in Argentina, as well as discuss possible policy responses that would serve to minimize possible undesirable effects. None of the previous evidence for Argentina has dealt with this topic.

[4] MERCOSUR is a custom union originally signed by Argentina, Brazil, Paraguay and Uruguay. Venezuela joined recently as the fifth full member, while Bolivia and Chile are associate members under a free trade agreement scheme.

III. Theoretical framework

The theoretical framework assumes a small open economy that produces and trades S primary commodities, of which $S_A \subset S$ are agricultural commodities. Assuming the number of primary commodities is at least as large as the number of factors, then factor rewards are fully determined by commodity prices:

$$W = p\left(P_S^D\right)$$

where W is the vector of factor rewards, and P_S^D is the vector of commodity prices in local currency.

Since our economy is small, we have:

$$P_S^D = EP_S^* \left(1 + \mathrm{T}\right)$$ [5]

where E is the nominal exchange rate, P_S^* is the vector of world commodity prices, and T is the vector that reflects the ad-valorem equivalent of the country trade policy, so we obtain:

$$W = p\left(P_S^*, E, \mathrm{T}\right)$$

There are also M traded manufacturing sectors, of which $M_F \subset M$ produce food goods. The M manufacturing sectors are monopolistically competitive. In each M sector each producer, domestic or foreign, produces a differentiated variety. Manufactures are produced under increasing returns to scale (IRS), using all factors of production and primary commodities. There are also N non-traded sectors that are also monopolistically competitive, with each domestic producer producing a differentiated variety under IRS using only the production factors.

Assuming also that production factors are perfectly mobile across all sectors, the price, in local currency, of each domestic variety of the M and N sectors can be expressed as a function of world commodity prices, and other parameters such that nominal exchange rate, domestic taxes/subsidies, trade policy etc.

To be more specific, let us assume that there are two primary commodities, A1 and A2, whose domestic prices are given by:

$$p_{A1}^d = e.p_{A1}^* \left(1 + \tau_{A1}\right)$$

$$p_{A2}^d = e.p_{A2}^* \left(1 + \tau_{A2}\right)$$

[5] Here I am assuming that there is a perfect pass-through for primary commodities. In the econometric specification I will allow for an imperfect pass-trough.

where e is the nominal exchange rate, τ_{A1} and τ_{A2} are the ad-valorem equivalents of the country trade policy on goods A1 and A2 respectively, and the superscript * makes reference to world values. Then, given the small country assumption we get:

$$w_1 = f_1\left(P^*, \mathrm{T}, e\right)$$

$$w_2 = f_2\left(P^*, \mathrm{T}, e\right)$$

where $P^* = \left(p^*_{A1}, p^*_{A2}\right)$ and $\mathrm{T} = \left(\tau_{A1}, \tau_{A2}\right)$.

Each variety i produced by the manufacturing sector m is produced under IRS using the two factor of productions and the two primary commodities, with total cost equal to:

$$TC_{i,m} = C_{i,m}\left(\alpha_m + \beta_m x_{i,m}\right)$$

where α_m is the fixed input requirement, β_m is the input per unit of output produced by each firm, $x_{i,m}$, and $C_{i,m}$ is a Cobb-Douglas composite defined as:

$$C_{i,m} = w_1^{\mu_m} w_2^{\delta_m} \left(p^d_{A1}\right)^{\gamma_m} \left(p^d_{A2}\right)^{1-\mu_m-\delta_m-\gamma_m}$$

Each industry is monopolistically competitive, with each firm in sector m facing a constant elasticity of demand equal to σ_m, so the producer price of a domestically produced variety i in sector m is given by:

$$p_{i,m} = C_{i,m}\beta_m\left(\frac{\sigma_m}{\sigma_m - 1}\right)\left(1 + \tau_m^{exp}\right)$$

where τ_m^{exp} is the ad-valorem equivalent of the trade policy on exports by sector m. Then, the consumer price is given by:

$$p^c_{i,m} = p_{i,m}\left(1 + t_{VA}\right)$$

where t_{VA} is the consumption tax rate which we assume is common across all sectors in the economy. For an imported variety, and defining τ_m^{imp} as the ad-valorem equivalent of trade costs on imports, the consumer price is equal to:

$$p^c_{i,m^*} = e.p_{i,m^*}\left(1 + \tau_m^{imp}\right)\left(1 + t_{VA}\right)$$

Finally, assuming that in each sector m all firms are symmetric, the price index for all varieties (domestic and imported) in sector m is given by:

$$P_m = \left[N_m\left(p^c_{i,m}\right)^{1-\sigma_m} + N_{m^*}\left(p^c_{i,m^*}\right)^{1-\sigma_m}\right]^{\frac{1}{1-\sigma_m}}$$

where N_m and N_{m*} are, respectively, the number of domestic and foreign produced varieties.

Working in a similar way as for the M sectors we have the following relationships for each non traded sector n:

$$TC_{i,n} = C_{i,n}\left(\alpha_n + \beta_n x_{i,n}\right)$$

$$C_{i,n} = w_1^{\eta_n} w_2^{1-\eta_n}$$

$$p_{i,n} = C_{i,n}\beta_n\left(\frac{\sigma_n}{\sigma_n - 1}\right)$$

$$p_{i,n}^c = p_{i,n}\left(1 + t_{VA}\right)$$

$$P_n = \left[N_n \left(p_{i,n}^c\right)^{1-\sigma_n} \right]^{\frac{1}{1-\sigma_n}}$$

As it emerges clearly from the price indices for the M and N sectors, they are function, among other factors, of international commodity prices. These relationships, as well as the effect on factor prices, are the ones we need to estimate in the empirical section.

IV. Empirical framework

The methodology will follow that of Deaton (1989) and Benjamin and Deaton (1993), which consists of estimating two links, one that connects world commodity prices to domestic prices (goods and factors), and a second one connecting domestic prices to household welfare.

For the first of the links mentioned above, I consider the following general specification:

$$P_{i,t} = F_1\left(P^*_{S_A,t}, P^*_{S\neq S_A,t}, \mathbf{B}_t\right) \qquad \text{for } i \in M, N \qquad (1)$$

where $\mathbf{B_t}$ is a set of additional regressors (exchange rate, trade policy, etc.); and second that:

$$w_{j,t} = F_2\left(P_{S_A,t}, P_{S\neq S_A,t}, \mathbf{Z}_j\right) \qquad (2)$$

where $w_{j,t}$ is the log of the hourly wage rate of individual j, and $\mathbf{Z}_j$ is a set of additional regressors such as personal characteristics (i.e. education level, gender, age, etc.) and other controls.

Equation (1) provides the elasticities of domestic prices with respect to world commodity prices, while equation (2) provides with the wage elasticities.

Equation (1) will be estimated using time series data on world commodity prices, domestic index prices of traded and non-traded sectors, and other controls such as exchange rate, trade policy variables, etc. Equation (2) will be estimated using monthly on average wages for primary sectors, manufactures, and services.

For the second link, the welfare effect on household h will be measured by the compensating variation relative to total initial expenditure (Porto, 2006):

$$\frac{dx_0^h}{e^h} = \left(-\sum_{m \in M} s_m^h \frac{\partial \ln P_m}{\partial \ln p_{s_A}} - \sum_{n \in N} s_n^h \frac{\partial \ln P_n}{\partial \ln p_{s_A}} + \sum_j \theta_j^h \varepsilon_{w,p_{s_A}}^j \right) d \ln p_{s_A} \qquad (3)$$

where s_m^h is the budget share spent on varieties produced by the traded sector m, s_n^h is the budget share spent on varieties produced by the non-traded sector n, θ_j^h is the share of labor income of member j in household h, $\varepsilon_{w,p_{s_A}}^j$ is the wage elasticity that captures the proportional change in the wage rate of household member j as a response to the change in the world price of an agricultural commodity p_{s_A}[6]; P_m and P_n are price indices for the traded and non-traded sectors. As it is clear from (3) I do not consider second order effects of changes of a single commodity price on other commodity prices. Due to data availability I do not take into account the effects on non-labor income. Also, because of data restrictions, I assume households do not produce for their own consumption.

As mentioned before, the domestic prices of M and N varieties, as well as the primary commodities are also affected by public policies. Using these relationships, and the results form equations (1) and (2), it is possible to simulate alternative policy options that may help to counteract the potential negative effects on poverty derived from the increase in agricultural commodity prices.

Finally, once the welfare effects have been recovered, I run non-parametric regressions of the changes in welfare as a function of household expenditure per capita.

V. Results

Equation (1) above is estimated using monthly data on prices for the period 1992 to 2006. In particular, the following specification is estimated:

$$\ln P_{m,t}^d = \alpha + \sum_{s \in S} \beta_s \ln P_{s,t}^* + \delta \ln E_t + \varphi \ln XD_{A,t} + \eta TREND + \lambda_t + u_{m,t} \qquad (4)$$

[6] I do not include the effect of changes in the number of hours worked.

where:

$P^{d}_{m,t}$: domestic price index of sector m;

$P^{*}_{s,t}$: world price of commodity s;

E_t : nominal exchange rate;

$XD_{A,t}$: export duty rate on exports of agricultural commodities;

$TREND$: time trend;

λ_t : monthly specific effect;

t: month of the year;

$u_{m,t}$: error term.

To avoid the problem of spurious correlation, and to control for the presence of seasonality in the data, I estimate the equation in differences with respect to the same month of the previous year. I use four primary commodities indices: agricultural food (FOOD), fuel (FUEL), metals (METALS) and agricultural raw materials (ARM). I estimate the equation separately for nine groups of consumption goods: food and beverage (FB), clothing (CLO), housing (HOU), equipment (EQU), health (HLT), transport and communication (TC), leisure (LEI), education (EDU), and other goods (OTH). See the Appendix for more details on the group definitions and data sources. Table 3 reports the results for equation (4) for each of the four groups of consumption.

To recover the wage elastiticies I estimate the following equation:

$$\ln W_{g,t} = \alpha + \sum_{s \in S} \beta_s \ln P^{*}_{s,t} + \delta \ln E_t + \varphi \ln XD_{A,t} + \eta TREND + \lambda_t + u_{m,t} \qquad (5)$$

where $W_{g,t}$ is the average wage rate paid by sector *g* (primaries, manufactures, and services), and $P^{*}_{s,t}$, E_t, and $XD_{A,t}$ are as defined above in the price equation. As with equation (4) I estimate equation (5) in differences with respect to the same month of the previous year. Table 4 reports the outcomes for the wage equation using monthly data from July 1994 to December 2006.

Using the elasticities reported in Table 3, budget shares from the National Survey of Household Expenditures (ENGHo) 2004/2005, and assuming a 100% increase in the international price of agricultural commodities, applying equation (3), I can calculate the effect on welfare for each household. Then, I run a non-parametric regression of the welfare effects as a function of household per capita expenditure, I distinguish here between different type of goods. These relationships are reported in Figure 4. No wonder that all households lose when there is an increase in the prices of agricultural commodities. From Figure 4 we have that on the consumption side households at the lowest end of the income distribution are the ones that are most affected through the increase in prices of food and beverages, while for non-food and beverages goods the opposite result arises. A similar pattern emerges when distinguishing between traded and non-traded goods. Also, it emerges that the negative impact works more through food and traded goods, than through non-food and non-traded goods respectively. In the aggregate, are the poorer households the ones most affected by the increase in agricultural commodity prices, with the looses ranging between 15% and 12% of the household initial expenditure.

To obtain the income labor effect I use the wage elasticities reported in Table 4. Then, using the income share of each member of the household, and once again assuming a 100% increase in the price of agricultural commodities, I calculate the welfare effect coming through changes in wages. As it is shown in Figure 5, there is a positive effect working through the increase in labor income, with this effect increasing with the level of household consumption. However, the increase in labor income is not enough to compensate for the welfare loss that works through the consumption of goods.

Once we add the effects that work through consumption and the labor income, poorest households are the most affected. However, all households lose with the increase of agricultural commodity prices, the loses range from a little more than 11% to around a 7% of the initial expenditure. The distribution of losses along the per capita expenditure of households is, a priori, in line with what could a priori be expected, an increase in the price of agricultural commodities hurting more to poorer households due to the higher weight of food and beverages into household consumption, which are goods intensive in the use of agricultural commodities.

V.1. Some simulated policy responses

As mentioned previously in the Introduction, in response to the important devaluation of the local currency in the year 2002 with the simultaneous increase in the world prices of agricultural commodities, the Federal Government implemented a scheme of export duties, specially for primary commodities. Table 2 shows the evolution of export duties for the main agricultural commodities. Among the different reasons behind this policy, in addition to be an important and easily collected source of revenues, was the intension of reducing the inflationary pressures, specially on the food-basket goods.

From equations (3) and (4) we have the price and wage elasticities with respect to export duties. Using these elasticities I now simulate the welfare effects of a 20% export duty. Once these welfare effects are obtained I run a non-parametric regression as a function of household per capita expenditure. The results of this simulation are reported in Figure 7. The first thing that emerges clearly from the simulation is the small positive impact that export duties have on household welfare, especially considering the incentive distortions that this policy introduces to the economy through changes in relative prices. The positive effects of an export duty on agricultural commodities is channelized through the reduction in consumption prices, and not surprising by a reduction in labor income, however this last effect is smaller than the previous ones. Overall, the positive effect range between 0.23% of initial per capita expenditure for those with the lowest per capita expenditure to around 0.28% for the ones with the middle-low household per capita expenditure.

Using the previous result I simulate an alternative scenario in which export duties are eliminated, and then ask how much would be needed to make transfers to each household so they are in the same position as before the increase in the price of

agricultural commodities. Figure 8 reports the outcome from this scenario, which as we can appreciate involves rather modest transfers, specially for households with low per capita expenditures.

A final scenario evaluates an alternative policy measure that has been long asked for by part of the political and social forces, the elimination of the Value Added Tax (VAT) on the consumption of food and beverages. In Argentina, the general VAT rate is at 21%, which means an incidence around a 17% of the price paid by the consumers. Let us assume that the VAT is eliminated on all consumption of food and beverages, and that in response to this, consumer prices fall 12%, the difference is captured by the producers and sellers in the form of higher profits. To keep things simple, we do not consider any price effect on other goods than food and beverage. The result of this scenario is reported in Figure 9. Not surprisingly, due to the higher incidence of food and beverages on the expenditure of the poorer households, the elimination of the VAT means a greater benefit for these households. Comparing with Figures 6 and 7, the elimination of VAT on food and beverages would compensate for about half of the negative effect of the increase in the world prices of agricultural commodities and the elimination of export duties. Needless to say, this option would mean an important loss of resources for the Federal Government, which under no circumstance is an issue to be taken slightly at the moment of evaluate their feasibility.

VI. Summary and conclusions

The increase in the price of agricultural commodities benefited greatly to Argentina, especially in a period when the country was almost completely excluded from international financial markets. On the other hand, with a large share of the population with low and medium-low incomes, the increase in agricultural commodities prices has the potential to hurt an important part of the population through a raise in the price of goods that explain an important share of households expenditures, especially those that constitute the food-basket. The evidence shows that this has been the case. A less obvious channel works through changes in factor incomes. In the case of labor income, this effect was more beneficial to the poorer households.

As a response to the increase in the price of agricultural commodities, and also the important devaluation that the local currency experienced in the year 2002, the government imposed very high export duties. Our simulations shows that this measure has limited effectiveness, especially considering the incentive distortions it introduces to the whole economy. Finally, an elimination of the VAT on the consumption of food and beverages would be large enough to compensate for most of the negative effects derived from the increase in the world price of agricultural commodities and the potential elimination of export duties.

Table 1
Decomposition of Argentina's export growth

		1992-2002	2002-2012
All sectors	Value	110%	217%
	Price	-9%	100%
	Quantity	130%	58%
Agricultural primary products	Value	51%	271%
	Price	-9%	139%
	Quantity	66%	55%
Manufactures of agricultural origin	Value	69%	238%
	Price	-19%	154%
	Quantity	107%	33%
Manufactures of industrial origin	Value	169%	264%
	Price	-12%	48%
	Quantity	207%	146%
Fuel and energy	Value	329%	41%
	Price	18%	350%
	Quantity	262%	-69%
Terms of trade		8%	42%

Source: own based on National Institute of Statistics and Census

Table 2
Main export duties (%) on Agricultural commodities

	Wheat	Maize	Soybeans (seeds)		Soybeans (meal)		Soybeans (oil)				Sunflower (seeds)	Sunflower (oil)	Exports weighted average
	1001.10.90	1005.90.10	1201.00.10	1201.00.90	2304.00.10	2304.00.90	1507.10.00	1507.90.11	1507.90.19	2306.30.10	1206.00.90	1512.11.00	
1992	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	N/A
1993	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.5
1994	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.6
1995	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.5
1996	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.4
1997	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.1
1998	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.4
1999	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.4
2000	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.4
2001	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.5
2002	20.0	20.0	20.0	27.0	20.0	5.0	20.0	20.0	20.0	20.0	27.0	20.0	19.6
2003	20.0	20.0	20.0	27.0	20.0	5.0	20.0	20.0	20.0	20.0	27.0	20.0	19.8
2004	20.0	20.0	20.0	27.0	20.0	5.0	20.0	20.0	20.0	20.0	27.0	20.0	19.6
2005	20.0	20.0	20.0	27.0	20.0	5.0	20.0	20.0	20.0	20.0	27.0	20.0	19.9
2006	20.0	20.0	20.0	27.0	20.0	5.0	20.0	20.0	20.0	20.0	27.0	20.0	19.4
2007	20.0	20.0	20.0	27.5	24.0	9.0	24.0	24.0	24.0	20.0	27.0	20.0	22.4
2008	28.0	25.0	20.0	35.0	32.0	9.0	32.0	32.0	32.0	30.0	32.0	30.0	28.7
2009	23.0	20.0	20.0	35.0	32.0	9.0	32.0	32.0	32.0	30.0	32.0	30.0	27.7
2010	23.0	20.0	20.0	35.0	32.0	9.0	32.0	32.0	32.0	30.0	32.0	30.0	27.8
2011	23.0	20.0	20.0	35.0	32.0	9.0	32.0	32.0	32.0	30.0	32.0	30.0	27.6
2012	23.0	20.0	20.0	35.0	32.0	9.0	32.0	32.0	32.0	30.0	32.0	30.0	N/A

Source: own based on Rosario Stock Exchange

Table 3
Results Equation (4)

Explanatory variables	Dependent variable								
	$\ln (P^d_{FB})$	$\ln (P^d_{CLO})$	$\ln (P^d_{HOU})$	$\ln (P^d_{EQU})$	$\ln (P^d_{HLT})$	$\ln (P^d_{TC})$	$\ln (P^d_{LEI})$	$\ln (P^d_{EDU})$	$\ln (P^d_{OTH})$
$\ln (E_t)$	0.0603***	0.0681***	-0.0012	0.0685***	0.0342***	0.0526***	0.0622***	-0.0022	0.0514***
	(0.007)	(0.008)	(0.004)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.004)
$\ln (P^*_{FUEL,t})$	0.0234	0.0359	-0.0341*	0.0168	-0.0405**	-0.0169	-0.0179	-0.1106***	0.0583***
	(0.031)	(0.032)	(0.021)	(0.023)	(0.018)	(0.018)	(0.026)	(0.027)	(0.018)
$\ln (P^*_{FOOD,t})$	0.2033***	0.1892***	0.0752***	0.1191***	0.0826***	0.0447*	0.1153***	0.0028	0.1175***
	(0.046)	(0.048)	(0.025)	(0.034)	(0.025)	(0.026)	(0.038)	(0.029)	(0.023)
$\ln (P^*_{METAL,t})$	-0.0711**	-0.0024	0.0128	-0.0390*	0.0074	0.0088	0.0332	0.0789***	-0.0430**
	(0.032)	(0.032)	(0.021)	(0.024)	(0.021)	(0.019)	(0.026)	(0.029)	(0.017)
$\ln (P^*_{ARM,t})$	0.2476***	0.1328***	0.3595***	0.1991***	0.3338***	0.1096***	0.1952***	0.4180***	0.0951***
	(0.056)	(0.051)	(0.055)	(0.044)	(0.045)	(0.038)	(0.042)	(0.075)	(0.031)
$\ln (XD_{A,t})$	-0.0201**	-0.0238**	0.0018	-0.0135*	-0.0053	-0.0282***	-0.0134	-0.0008	-0.0107*
	(0.010)	(0.010)	(0.005)	(0.008)	(0.006)	(0.006)	(0.008)	(0.005)	(0.006)
Observations	168	168	168	168	168	168	168	168	168
R-squared	0.724	0.772	0.448	0.813	0.710	0.685	0.758	0.374	0.816

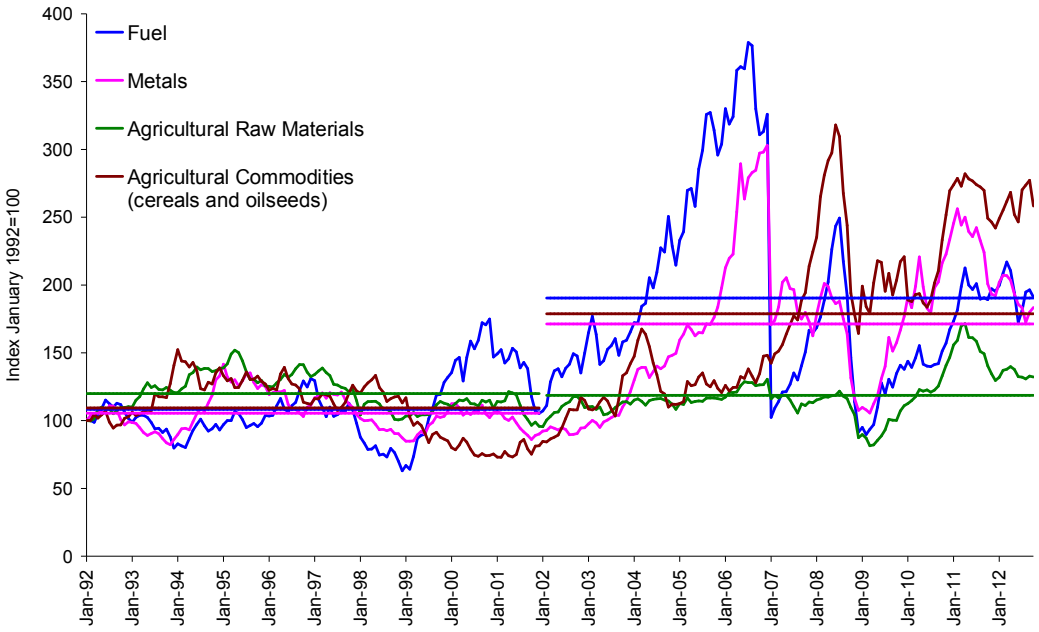
*** p<0.01, ** p<0.05, * p<0.1. All regressions include monthly dummies. All variables are in differences with respect to the same month of the previous year.

Table 4
Results Equation (5)

Explanatory variables	Sector		
	Primary	**Manufactures**	**Services**
ln (E_t)	0.0192	-0.0007	-0.0336**
	(0.012)	(0.014)	(0.015)
ln ($P^*_{FUEL,t}$)	-0.0217	0.0163	-0.0209
	(0.015)	(0.018)	(0.021)
ln ($P^*_{FOOD,t}$)	0.0806***	0.1123***	0.0769***
	(0.017)	(0.019)	(0.018)
ln ($P^*_{METAL,t}$)	0.1448***	0.1572***	0.1489***
	(0.021)	(0.033)	(0.033)
ln ($P^*_{ARM,t}$)	-0.0578	-0.0771	0.0466
	(0.043)	(0.054)	(0.057)
ln ($XD_{A,t}$)	0.0011	-0.0019	-0.0014
	(0.003)	(0.004)	(0.005)
Observations	138	138	138
R-squared	0.883	0.804	0.783

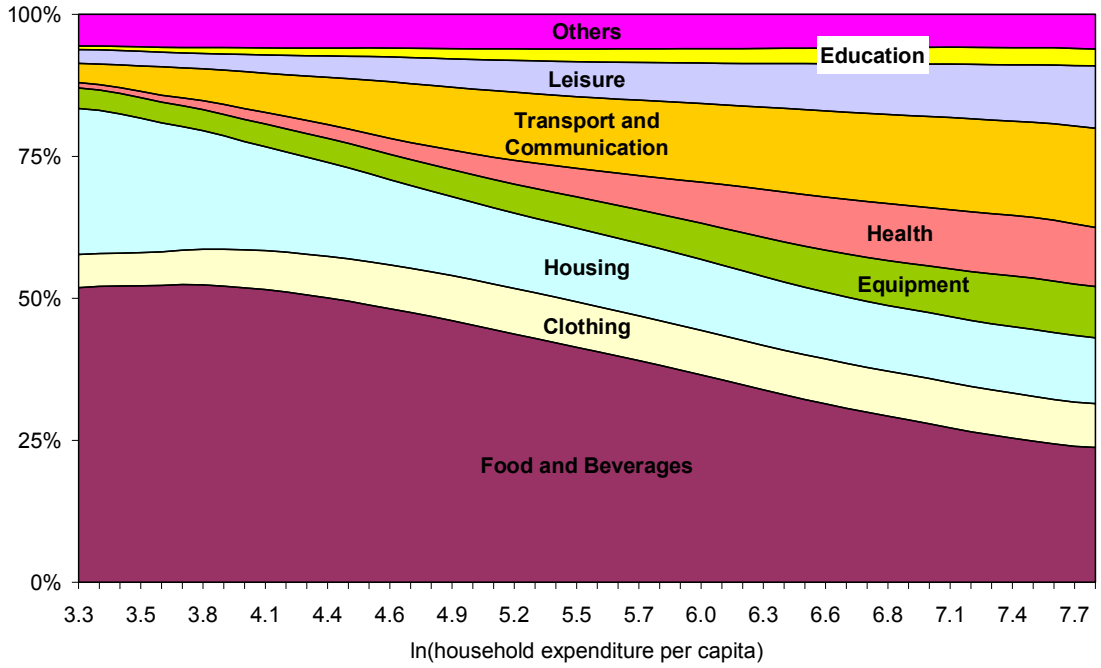
*** p<0.01, ** p<0.05, * p<0.1. All regressions include monthly dummies. All variables are in differences with respect to the same month of the previous year.

Figure 1
Evolution of main primary commodity prices



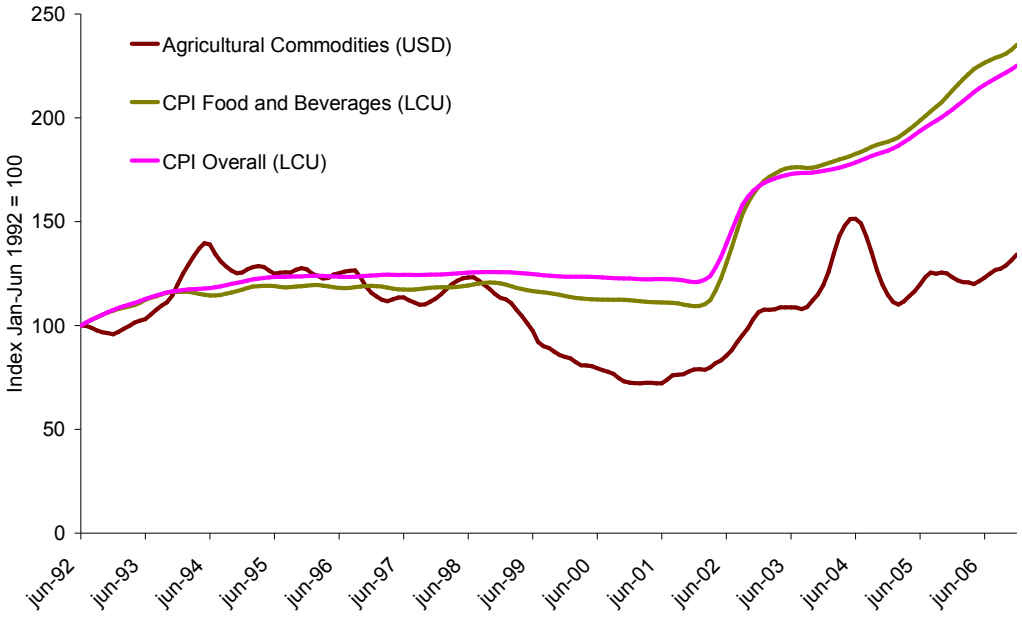
Source: own based on WITS and www.indexmundi.com (retrieved on November 12, 2012)

Figure 2
Expenditure shares and household expenditure (*)



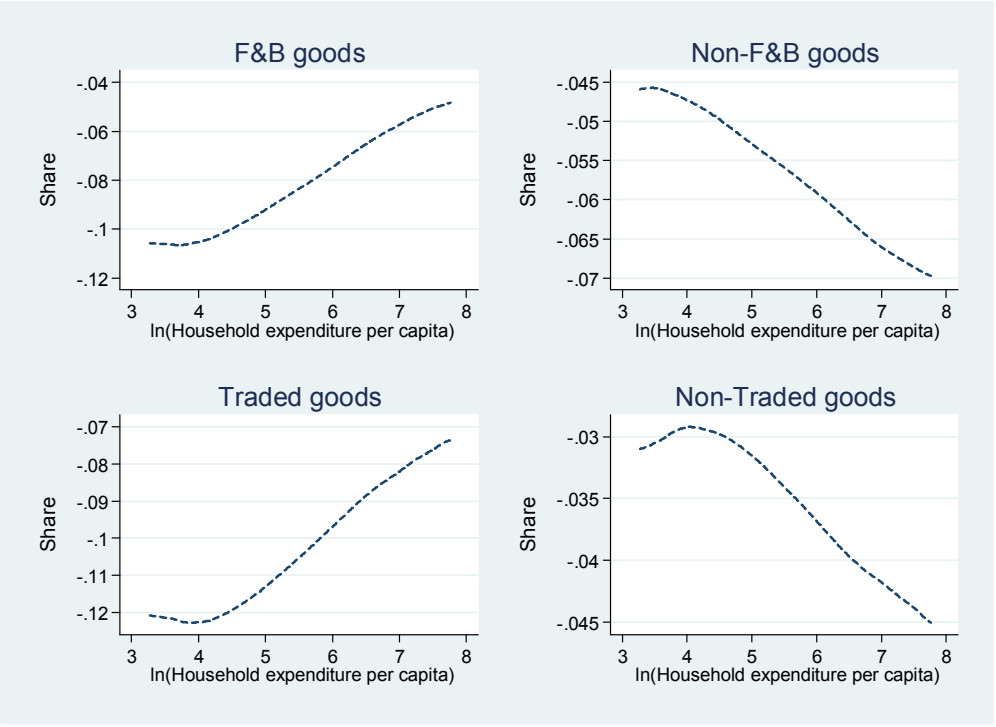
(*) The relationships between expenditure shares and expenditure per capita were obtained by non-parametric regressions.
Source: own based on ENGHo 2004/2005.

Figure 3
Agricultural commodity and consumer prices
(six-month moving average)



Source: own based on WITS, National Institute of Statistics and Census and www.indexmundi.com (retrieved on November 12, 2012)

Figure 4
Consumption effect of a 100% increase in world agricultural commodity prices



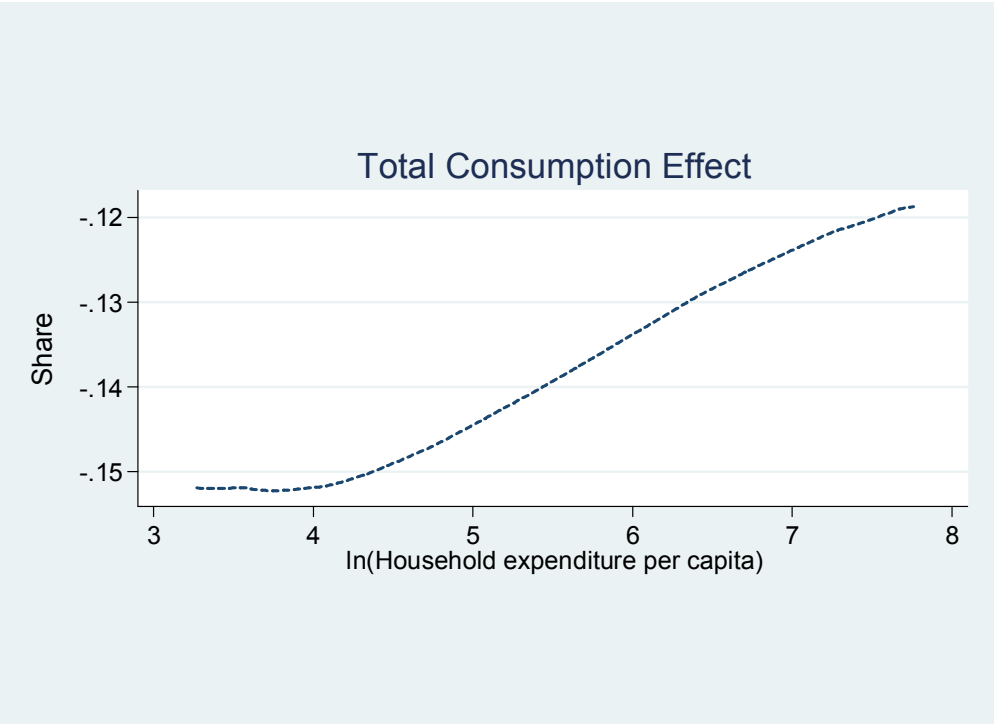


Figure 5
Labor income effect of a 100% increase in world agricultural commodity prices

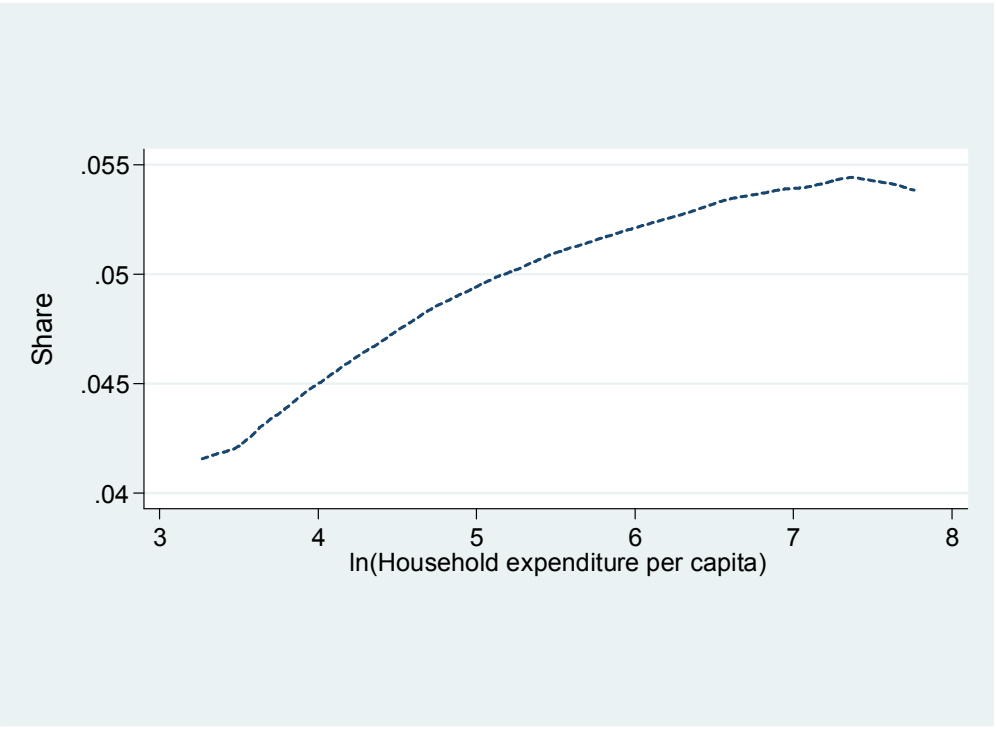


Figure 6
Total welfare effect of a 100% increase in world agricultural commodity prices

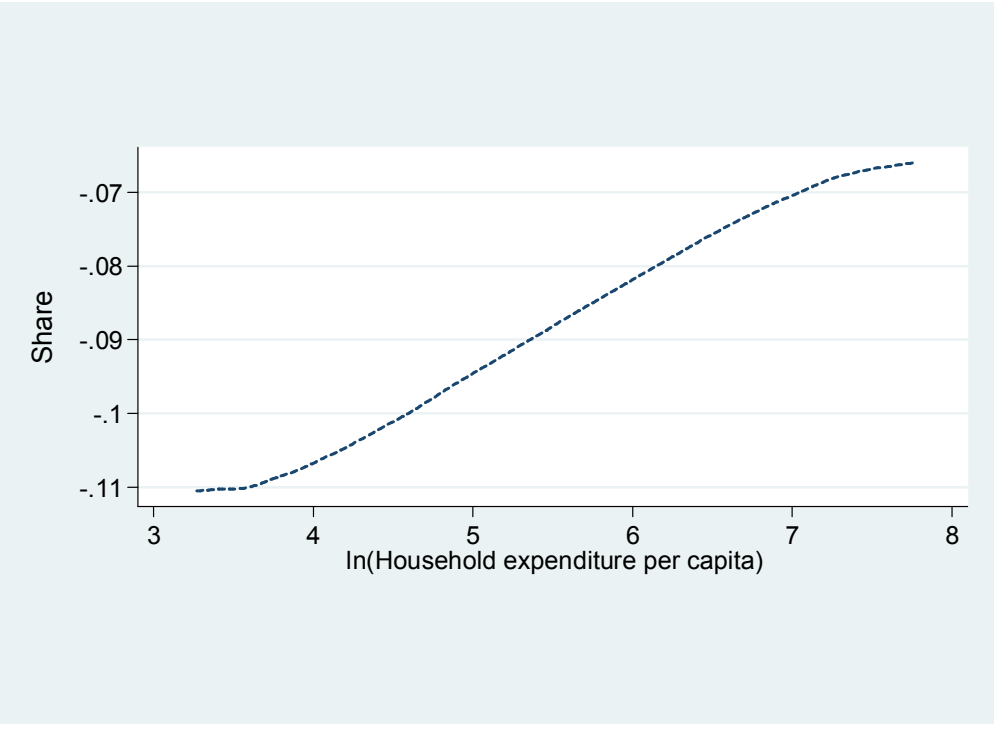


Figure 7
Welfare effect of a 20% export duties on agricultural commodities

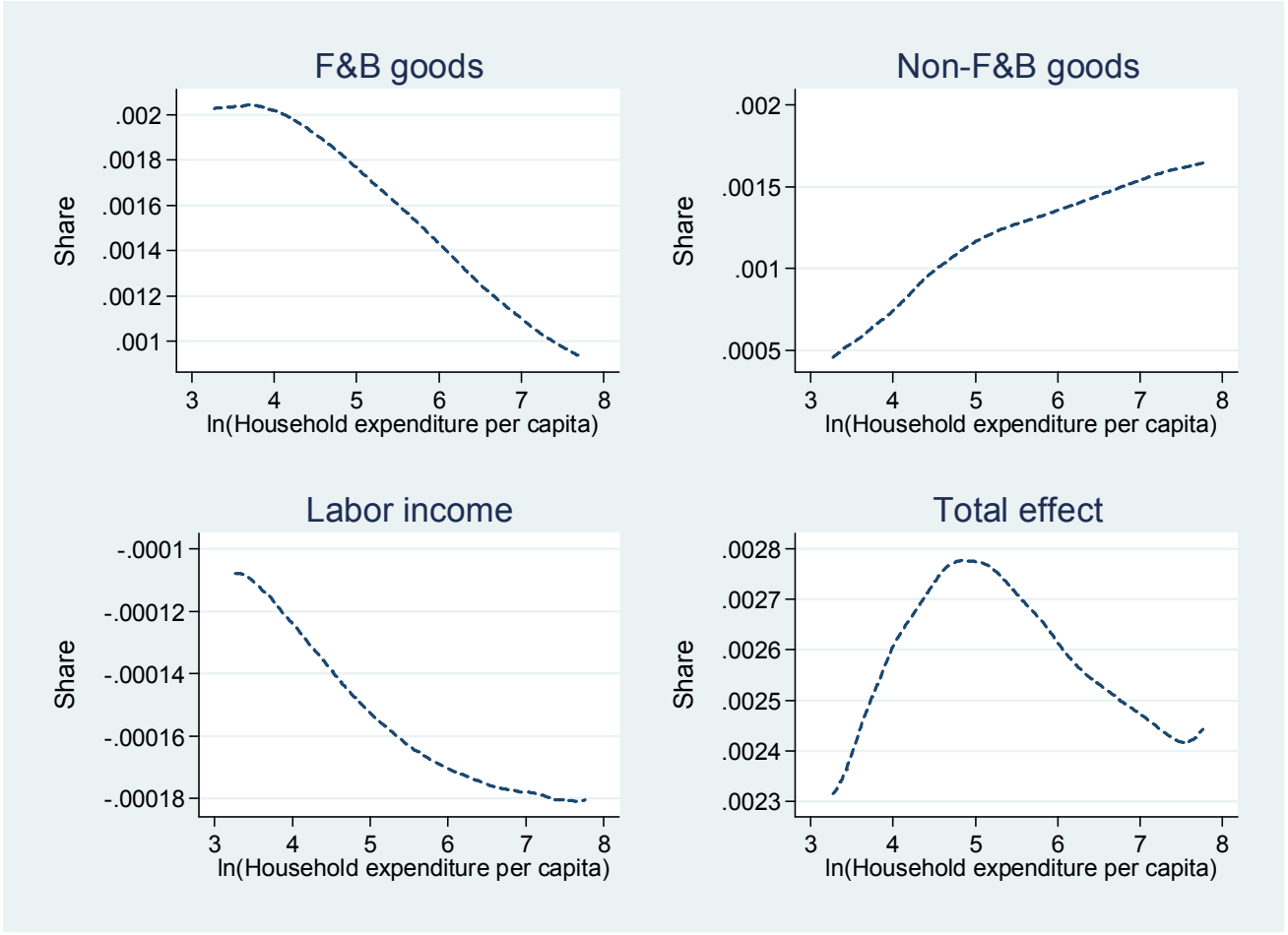


Figure 8
Required monthly transfers to compensate for a 100% increase in world agricultural commodity prices and after the elimination of export duties

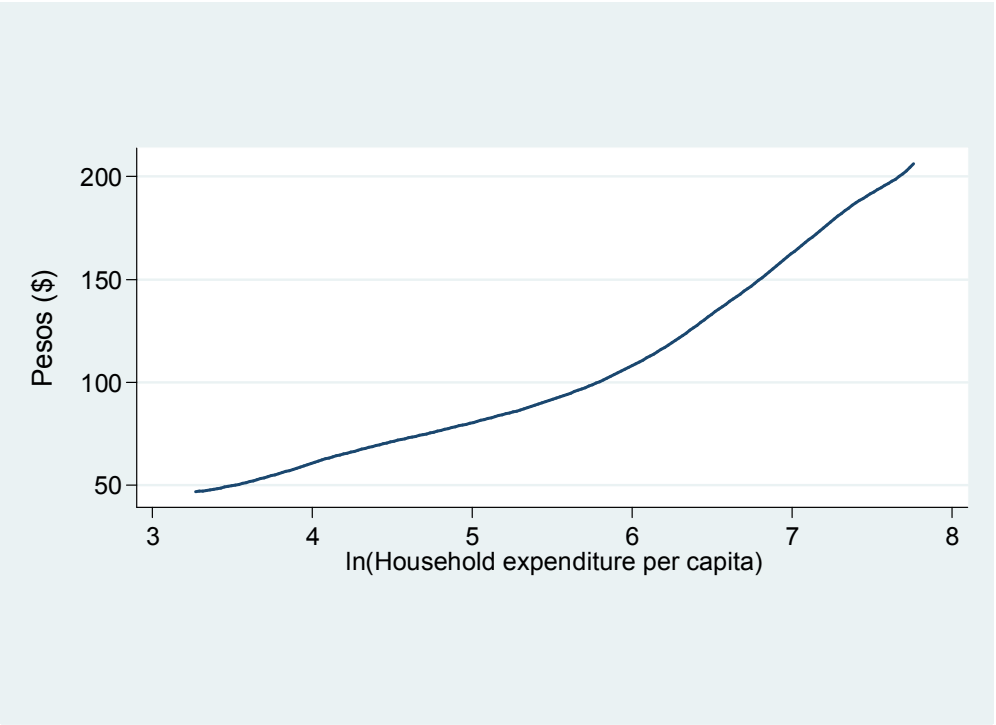
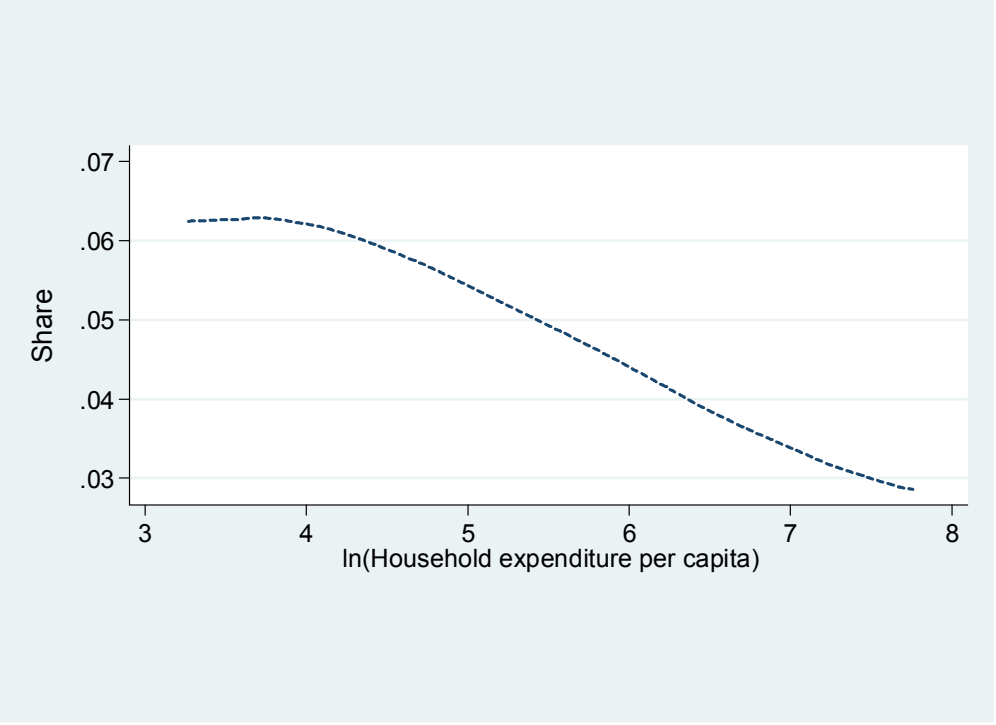


Figure 9
Welfare effect of the elimination of the VAT on Food and Beverages



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Appendix: data sources

Nominal Exchange Rate	Banco Central de la República Argentina
Export Duties	Rosario Stock Exchange
Exports	WITS (World Integrated Trade Solution) of World Bank
Agricultural Commodity Index: weighted average of the prices of Maize, Soybeans, Wheat, Soybean Oil, and Sunflower Oil. Argentina's exports are used as weights	Own based on www.indexmundi.com and WITS
Soybeans: U.S. soybeans, Chicago Soybean futures contract (first contract forward) No. 2 yellow and par, US Dollars per Metric Ton	www.indexmundi.com (retrieved on November 12, 2012)
Soybean Meal: Chicago Soybean Meal Futures (first contract forward) Minimum 48 percent protein, US Dollars per Metric Ton	
Soybean Oil: Chicago Soybean Oil Futures (first contract forward) exchange approved grades, US Dollars per Metric Ton	
Maize (corn): U.S. No.2 Yellow, FOB Gulf of Mexico, U.S. price, US Dollars per Metric Ton	
Sunflower Oil: US export price from Gulf of Mexico, US Dollars per Metric Ton	
Wheat, No.1 Hard Red Winter, ordinary protein, FOB Gulf of Mexico, US Dollars per Metric Ton	
Commodity Fuel index:includes Crude oil (petroleum), Natural Gas, and Coal Price Indices	
Metals Price Index: includes Copper, Aluminum, Iron Ore, Tin, Nickel, Zinc, Lead, and Uranium Price Indices	
Agricultural Raw Materials Index: includes Timber, Cotton, Wool, Rubber, and Hides Price Indices	
Consumer Price Indices	Instituto Nacional de Estadísticas y Censos
Household Expenditure Survey (Encuesta Nacional de Gastos de los Hogares) 2004/2005	
Wages	Ministerio de Economía