Argentina

Welfare impact of wheat export restrictions in Argentina: Non-parametric analysis on urban households

Paula Andrea Calvo *

Abstract

The Argentine wheat value chain was subject to considerable policy interventions during the last decade. The measures adopted by the government included export duties from 2002 onward, quantitative wheat export restrictions since 2006, and domestic price ceilings and subsidies introduced in 2007. These policy instruments aimed to limit the increase in domestic prices of cereals during a period of high international prices and to keep an adequate provision of grains in the domestic market. Export restrictions implicitly intended to avoid an increase in the prices of basic consumption goods derived from wheat. However, these non-tariff measures could also distort farmers' incentives to produce. Using non-parametric techniques, this study contributes to the policy discussion of the effects of non-tariff measures in the cereals market by evaluating the welfare impact of wheat export restrictions on Argentine urban households. Focusing on the effects of changes in prices of final consumption goods during 2006–2011, the study finds that prices of wheat derivatives would be only 1 per cent higher in the absence of quantitative restrictions, with negligible welfare effects on consumers. If both export restrictions and subsidies to millers were removed, prices would be 6.4 per cent higher. This would imply modest welfare losses ranging from zero to 1.5 per cent, mainly affecting the poorest households.

* The author would like to thank Raúl Auger from the National Senate of Argentina and Roberto Bisang from Universidad de Buenos Aires for their support in the preparation of this study.

1 Introduction

In 2006, the Argentine government initiated a succession of temporal export prohibitions and quotas on exports of wheat and corn, which were added to high export duties applied since 2002. These non-tariff measures (NTMs) became one of the most important trade policies of the incumbent government. Moreover, a broad set of complementary measures, including ceiling prices and subsidies, were put into practice, aiming to influence the price of cereals and their derivatives in the domestic market. The result was a complex system of interventions in the value chain of wheat, potentially distorting prices and incentives in different stages of production.[1]

These policy measures generated an intense debate between those in favour and those against them. Supporters argued that export restrictions limited the increase in domestic prices of grains by shielding domestic prices from high levels prevailing in international markets. According to the World Bank Commodities Price Data,[2] prices of agricultural commodities increased by 137 per cent in nominal terms between 2002 and 2012. Food prices increased more than did raw materials (152 per cent versus 116 per cent). In particular, nominal prices of wheat increased by 112 per cent during this period.[3]

Final products – such as bakery products and pasta – that use wheat as an input in production are an important component of the basic food basket of the typical Argentine household.[4] Consequently, the policies

[1] Many countries implemented policies to restrict food exports as a response to the price spikes of 2007–2008. This led to a further increase in commodity prices in international markets. As a result, export restrictions were placed on the agenda of multilateral negotiations in an attempt to address high and volatile food prices (Sharma, 2011).

[2] The Commodities Price Data (also known as "Pink Sheet") are a monthly collection of commodity prices and indices published by the World Bank. See *http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21574907~menuPK:7859231~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html.*

[3] Key reasons behind the spike in commodity prices during the last decade have been extensively discussed in the literature. Possible explanations can be found in the growth of the world economy until 2008, followed by an increase in demand (especially in the People's Republic of China and India), the increasing role of commodities in financial portfolios, and depreciation of the dollar. Also, the higher use of food commodities in biodiesel industries and climatic factors could have contributed to the price boom (Gayá and Michalczewsky, 2011; Gilbert, 2010; Abbott *et al.*, 2011; Cooke and Robles, 2009; Mitchell, 2008). The increasing role of commodities in financial portfolios has made commodity prices more responsive to financial conditions. As suggested by UNCTAD (2012), financialization is the root cause of commodity price volatility. This would help explain the impressive growth in commodity prices until 2008, the collapse during the 2009 crisis and the subsequent recovery of prices.

explicitly aimed to limit price increases in a setting of high inflation rates in Argentina. Moreover, they aimed to keep an adequate supply of grains in the domestic market in a setting of growing international demand and weather-induced national shortages. Thus, although these measures could hurt producers, export restriction could benefit consumers.[5]

Opponents of these policies argued that grains only play a small role in price formation of final goods compared to other components such as wages, utilities, taxes, freights, etc. Controls on cereal prices would thus not be sufficient to limit inflation. Additionally, export restrictions could potentially affect producer incentives, thus reducing the supply of cereals in the domestic market. For example, restrictions on wheat exports could motivate producers to divert land to more profitable crops, such as barley or sorghum. By exporting these grains, producers could circumvent the restrictive policies imposed by the government and take advantage of the favourable external conditions. If that were the case, the potential positive effect of policies on consumers could become negligible, as a lower supply would have the opposite effect on domestic prices. The evidence suggests some trends in this direction. According to data from the Ministry of Agriculture, between 2006 and 2012, the wheat-sown area indeed decreased by 44.3 per cent. Also, in September 2013, domestic wheat prices were 50 per cent higher than international prices.[6]

This study aims to contribute to the current discussion on the impacts of interventions in the wheat market through the application of NTMs. Following Deaton (1989a, 1989b) and Benjamin and Deaton (1993), it uses non-parametric techniques to capture the effect of export restrictions on wheat on household welfare. The analysis focuses on welfare changes operating through changes in prices of final goods that use wheat as a production input and represent an important component of the basic consumption basket. Estimations of welfare gains or losses of the policies are based on a comparison of consumer welfare under the real scenario against several counterfactual scenarios. The analysis focuses on the "post-intervention" period 2006–2011 when NTMs were implemented. The "pre-intervention"

---

[4] Derivatives of wheat have an important share in official consumer price index (CPI) calculations. For CPI 1999=100, the group Food and Beverages had a share of 31.28 per cent of CPI, whereas the subgroup Bread, Cereals and Pasta had a weight of 4.54 per cent. Currently, in CPI 2008=100, Food and Beverages have a share of 37.8 per cent and Bread, Cereals and Pasta have a weight of 7.14 per cent.

[5] See Ministry of Economy and Production, Resolution 9/2007.

[6] Data from the Buenos Aires Futures Exchange Market and the World Bank Commodities Price data indicate that the average price in the domestic market was USD 463 and the international price USD 307 per metric ton.

period 1994–2005 is used as a benchmark.[7] The construction of different frameworks will provide a baseline for policy evaluation.

The analysis aims to evaluate first-order effects on consumption of urban households in main Argentine cities, generated by export restrictions. In the case of Argentina, the budget share of food for the poorest households is large and about twice as high as for the richest households, confirming the predictions of Engel's Law. Therefore, any potential effect of the interventions in the wheat market is expected to have a larger impact on lower-income households. If export restrictions prevent the increase in prices of basic goods, interventions in this market could have a pro-poor bias. Unfortunately, the lack of data precludes the analysis of the effects of the policy on wheat producers. However, even if producer effects are not analysed, assessing the existence or not of a positive effect on the consumer side will be a good benchmark for evaluating the results of government policies in the wheat market.

A study of the impact of cereal export restrictions in Argentina is important for two additional reasons. First, cereals play a key role in the export basket. Between 1998 and 2011, primary products represented, on average, 21.5 per cent of total exports. Wheat and maize alone accounted for 7.5 per cent of total Argentine exports.[8] Second, if most of the production were oriented towards the domestic market, an analysis of export restrictions would not be so relevant. However, during 1998–2006, 66 per cent of the total wheat production in Argentina was sold in the international market, while the remaining 34 per cent was destined to the domestic market (IERAL, 2011).

Overall, the results obtained in this study have relevant policy implications and contribute to the current discussion regarding trade restrictions. So far, no other work in Argentina has attempted to evaluate the impact of the recent non-tariff measures and complementary measures in the cereals market on the welfare of households. The study finds that prices of wheat derivatives would be only 1 per cent higher in the absence of quantitative restrictions, with negligible welfare effects on consumers. If both export restrictions and subsidies to millers were removed, prices of final goods would be 6.4 per cent higher, with welfare effects ranging from zero to 1.5 per cent, mainly affecting the poorest households. These results are

[7] The post-intervention period excludes 2012 because of additional complications, such as exchange rate controls, which would make it even more difficult to isolate the impact of quantitative restrictions on exports.

[8] Author's calculations, based on data from UN COMTRADE.

indicative of the failure of the policies to achieve welfare goals, and might help direct the design and implementation of future policies.

The study is organized as follows. Section 2 describes in detail the broad set of policies implemented in the wheat market during the last years and discusses the role of wheat in the Argentine economy. Section 3 summarizes the literature associated with the use of non-parametric techniques to address welfare effects of commodity prices on poverty. Data and methodology are presented in Section 4. Section 5 discusses the main results, and Section 6 concludes.

2 Wheat: Value chain and intervention policies

This section describes the general situation and the policies implemented in Argentina's wheat market. It also briefly discusses the implications of the recent policy interventions for the value chain of wheat.

In 1999, Argentina entered a recession that triggered a decline of gross domestic product (GDP), investment and consumption in real terms. The situation worsened during 2001, culminating in one of the worst crises in Argentina's history. Between 1998 and 2002, GDP at constant prices fell by 18 per cent. In January 2002, the Convertibility Law was abolished, with a consequent nominal devaluation of the Argentine peso (ARS) by 140 per cent during the first quarter of 2002. Social indicators were also strongly affected by the crisis: in 2002, the poverty rate peaked at 23 per cent[9] while the unemployment rate rose to 21.5 per cent in the first half of that year. Favourable external conditions helped to overcome the crisis and drove the improved performance of the economy in the following years. The increase in commodity prices, coupled with real exchange rate depreciation, fostered agricultural exports. At the same time, the government had an urgent need to raise funds to address the widespread social crisis.[10] In February 2002, export duties on cereals, oil seeds and their derivatives were introduced – the first of a large set of policy measures applied to cereals and oil seeds during the last decade.

To better understand the impact of the measures that were implemented, it is important to understand the organization of the value chain of wheat. The chain consists of three stages: (a) primary production (sowing and

[9] This figure is based on World Bank data on a poverty headcount ratio of USD 2 a day, adjusted by purchasing power parity (PPP), at 2005 international prices.

[10] See Ministry of Economy, Resolution 11/2002.

harvesting of the grain); (b) first processing stage during which the milling industry transforms wheat into wheat flour as the main output; and (c) second processing stage during which the industry uses wheat outputs processed in the first stage as main inputs. The outputs of this third stage are mainly bakery products (especially bread), cookies, biscuits and pasta. The wheat value chain has been frequently targeted by government interventions, partly because of the importance of wheat-based products in Argentine household consumption, and partly because of the traditional competing role of the agricultural sector and the manufacturing industry in the design of Argentina's trade policy.[11]

During the 1980s, the cereals market was a target of several policies, such as high export duties and exchange rate control, which affected grain producer incentives due to domestic prices being well below international prices. During the 1990s, the wheat market was deregulated, reducing the gap between national and international prices of grain (Ghezán *et al.*, 2001). However, as discussed above, the government re-intervened in the wheat market in the early 2000s, affecting supply and prices in the domestic market.

The text that follows summarizes the most important policies implemented in the wheat value chain during the last decade.

Tariff measures

Export duties were first implemented in February 2002, at 10 per cent for wheat, 5 per cent for wheat flour and other mixes for bakery, and 5 per cent for bakery products, cookies and pasta.[12] The implementation of export duties was motivated by fiscal reasons, in an attempt to raise funds to finance the government budget. The rates were changed several times before reaching, in January 2009, their current values of 23 per cent for wheat, 13 per cent for wheat flour and 5 per cent for second processing stage products (IERAL, 2011; Peri, 2009).[13]

[11] Brambilla *et al.* (2010) highlight the role of distributional conflict as a key determinant of trade policy in Argentina. In particular, there is a natural tension between the sector with a comparative advantage (agriculture), represented by landowners, and the industry, which is the domain of workers. In this scenario, a free trade policy, other things being equal, worsens the distribution of income in Argentina.

[12] See Ministry of Economy, Resolution 11/2002.

[13] In March 2008, Resolution 125 of the Ministry of Economy tied export duties of wheat, corn, soybean and sunflower to free on board (FOB) prices of grains and oil seeds to adjust rates automatically as international prices increased. This law was derogated in July 2008 after a conflict between the government and rural workers and organizations, which included lock-outs and suspension of grain commercialization for more than 120 days.

Non-tariff measures

These measures consist of quantitative restrictions (export quotas) on wheat exports. They were first implemented in May 2006, with temporary halts of grain export.[14] They were then strengthened in May 2008 through the Register of Export Operations (ROE) for agricultural products (called the "Green ROE"), a system of non-automatic export licences administered by the National Office of Control of Agricultural Trade (ONCCA).[15] The system of restrictions was based on the calculation of an exportable surplus, defined as a function of the total availability of grains and the needs of the domestic industry, adjusted by a factor meant to cover potential contingencies. If the exportable surplus were zero, exports would be prohibited.[16] Calculations of quotas and requirements of the domestic market were modified several times, creating uncertainty for producers and exporters and affecting their decision-making process. Each November, the ONCCA determined domestic market requirements and the amount that each firm could export, as a function of the firm's performance in the previous year. In addition, several complementary administrative procedures were introduced, potentially hindering commercialization. Among them was a reduction of the time period during which exporters could sell the product in the external market after receiving approval.[17] Also, exporters had to pay export duties in advance.[18]

Compensation regime for the wheat milling industry and producers

In 2007, export restrictions were complemented with a compensation scheme consisting of ceiling prices and subsidies for the wheat milling industry and producers. These measures intended to control prices of wheat derivatives in the domestic market. The compensation regime established an "internal supply price" that millers should pay in the domestic market, with the aim of controlling the price of bread and bakery products. In cases where the prices paid by millers in the domestic market exceeded the internal supply price, which was set at an artificially low level, the

[14] Quantitative export restrictions were imposed only on the export of grains and did not affect the export of wheat-based products (such as flour and cookies).

[15] ONCCA stands for *Oficina Nacional de Control Comercial Agropecuario.*

[16] See ONCCA, Resolution 543/2008.

[17] These time periods, ranging from 45 days to one year, were also modified several times.

[18] See ONCCA, Resolutions 2846/2008, 2/2009 and 5556/2009; AFIP (*Administración Federal de Ingresos Públicos* – the Federal Administration of Public Revenue), Resolution 2636.

law provided a subsidy covering the price differential.[19] The policy also included a compensation scheme for grain producers to guarantee that they would benefit from the increase in prices in international markets. The amount of the subsidy was calculated as the difference between the theoretical free alongside ship (FAS)[20] price and the sales price in the domestic market. The subsidy to producers applied to 85 per cent of declared internal sales.[21]

Figure 1 illustrates the effects of the compensation scheme. The system generated a double price gap in the wheat market to be covered by subsidies. The lower gap in Figure 1 shows the difference between the domestic wheat price and the internal supply price, which was covered by subsidies to the milling industry. This gap was large during most of the analysed period, imposing a heavy burden on the government budget. The upper gap shows the difference between the theoretical FAS price and the domestic price of wheat. In theory, this difference should have been covered by subsidies to producers. In practice, however, subsidies to producers were mostly not paid or were disbursed with several months of delay. This upper gap represents a loss for producers who were not able to take advantage of favourable external conditions (even after adjusting prices by export duties).

Figure 1 Double price gap in the wheat market, 2007–2011 (USD per metric ton)

Source: Author's calculations, based on data from Rosario's Exchange Market, Buenos Aires Futures Exchange Market, Ministry of Agriculture, Ministry of Economy, and Central Bank of Argentina.
Note: Prices are expressed in nominal terms. Prices expressed in ARS are converted into USD using the monthly nominal exchange rate published by the Central Bank of Argentina.

Overall, the interventions in the wheat market consisted of an intricate set of rules that were not easy to implement. Constant modifications to these rules made it difficult for those involved to make decisions. The application of export restrictions widened the gap between domestic and international prices, favouring industrial producers at the detriment of agricultural producers. Additionally, the compensation regime represented a large financial burden for the government, as illustrated by the double gap in Figure 1. A study from the Center of Implementation of Public Policies for Equity and Growth estimated that between the second quarter of 2007 and the first quarter of 2010, subsidies to wheat millers and producers amounted to ARS 3.34 billion, i.e. approximately USD 1 billion (Dequino, 2010), which is equivalent to 15.5 per cent of Argentine exports of wheat between 2007 and 2010. Exporters were also affected by the measures, but those who managed to obtain licences derived large benefits from buying cereals at lower domestic prices and selling them at higher international prices. Consequently, these measures likely generated a large transfer of resources from producers and the government to millers and exporters. Moreover, export restrictions could have led to a loss of international buyers who may have found other suppliers, given the uncertainty related to the quantities and time periods for exports from Argentina.

Although the lack of data makes it difficult to undertake a detailed analysis of the effect of the above measures on producers, several trends provide indicative information on this issue. Figure 2 shows the evolution of the land allocated to wheat production for 1990–2013. During 2006–2012, this area shrank by 44 per cent. Although preliminary, official figures for the 2012–2013 season show a further reduction of the wheat-sown area of more than 30 per cent compared with the previous season. During the same season, production levels also dropped by 40 per cent, to an expected output close to 8.5 million metric tons.

Given that planting decisions reflect producer incentives, the decrease in land sown during the last years could be a potential response to the government's interventions in the wheat market. During the harvests of 2008–2009, 2009–2010 and 2012–2013, production levels were at their lowest in

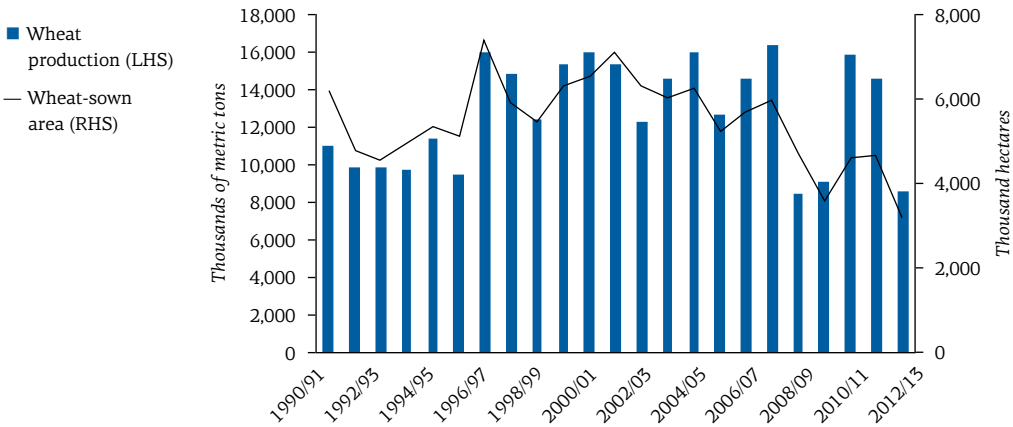
[19] The internal supply price was initially fixed at ARS 370 (USD 119) per metric ton in January 2007. In March 2009, it was increased to ARS 420 (then equivalent to USD 114). See Ministry of Economy and Production, Resolutions 9/2007 and 19/2007; Ministry of Economy and Public Finances, Resolution 83/2009; ONCCA, Resolutions 378/2007, 674/2007 and 2242/2009.

[20] The FAS price was published daily by the Ministry of Agriculture and was calculated as the FOB price minus export duties and other expenses associated with the exporting activity.

[21] See ONCCA, Resolution 11/2007.

the past two decades.[22] The drop in international prices as a consequence of the global crisis and adverse climatic factors (such as the 2008 droughts) may have contributed to these outstandingly low levels. However, the existence of NTMs that prevented producers from benefiting from international prices of wheat may have been an additional element of the bad performance of the wheat sector in Argentina. Reflecting the low production levels and the effects of the global crisis, the exports of wheat fell drastically in 2009 and stayed at low levels for two subsequent years.

Figure 2 Wheat production and sown area, 1990–2013



Source: Author's calculations, based on the Integrated System of Agricultural Information (Sistema Integrado de Información Agropecuaria) and Ministry of Agriculture, Livestock and Fisheries.
Note: LHS stands for left-hand scale, RHS for right-hand scale.

Most of the wheat exported by Argentina is sent abroad unprocessed (i.e. direct export of grains). For this reason, it is important to provide incentives to producers to process wheat domestically, promoting national value added and employment.[23] In this regard, export restrictions on wheat could foster further processing of the grain. To analyse these effects is beyond the scope of this study; however, some aggregate data suggest that the policies implemented might have benefited actors involved in the

[22] These production levels were comparable only with production levels reached during the 1980s when policies negatively affected agricultural activities through high export duties and exchange rate controls (Ghezán *et al.*, 2001).

[23] According to local estimates, the processing of wheat to flour generates an increase of 13 per cent in the FOB price for a metric ton of wheat compared with wheat that is exported unprocessed. When pasta and cookies are exported, this increase amounts to 154 and 578 per cent, respectively (IERAL, 2011).

processing stages of the wheat value chain by lowering the price of key inputs. In particular, between 2005 and 2011, the number of private firms in the milling industry increased by 15 per cent, and those producing bakery products and pasta by 26 and 29 per cent, respectively. These figures exceeded the growth in the overall number of firms in the economy (13 per cent) and in the food industry (15 per cent). Similar results were obtained in terms of employment, with an increase in the number of formal workers in the bakery and pasta industry of 45 and 33 per cent, respectively, exceeding that in the food industry (24 per cent) and the economy as a whole (34 per cent). These numbers could be indicative of the positive role of the implemented policies in promoting industrialization. However, this evidence is not conclusive as it could also have been driven by factors other than export restrictions on wheat. Unfortunately, the lack of data precludes a more comprehensive analysis of this issue.

3 Related literature

There is a large body of literature that studies the impact of the recent increase in commodity prices on welfare, especially on the poorest households. Estrades and Terra (2012) use a general equilibrium (GE) model to analyse the effect of the spike in commodity prices in 2006–2008 on Uruguay. They find that the increase in food prices affected the already poor population, making them even poorer. However, because Uruguay is an agriculture export-oriented country, the increase in commodity prices had an overall positive effect on the economy. Warr (2008) also uses a GE model to study the effect of higher food prices in Thailand. He finds that despite many poor farmers benefiting from the increase in staple prices, poverty has worsened. Ivanic and Martin (2008) find that short-term impacts of higher food prices on poverty differ strongly by country and commodity. However, they find that cases of poverty increase are more frequent than those of poverty reduction. Ivanic *et al.* (2012) find that the global increase in prices in 2010 generated an increase in poverty in both low- and middle-income countries. Valero-Gil and Valero (2008) study the effect on poverty from the increase in food prices in Mexico in 2006–2008. Using consumption data, they find an increase in poverty and extreme poverty rates. Yu *et al.* (2011) document the effects of trade policy changes on several importing and exporting countries, as a response to the pressures exerted by rising commodity prices in the domestic markets as a consequence of the worldwide increase in agricultural prices in 2007–2008. They find that trade policy measures were inefficient and worsened inflation. Also, net importing countries that did not adopt trade policies suffered welfare losses as a consequence of the policies implemented by their major trading partners.

Non-parametric techniques are also increasingly used in the literature on trade and poverty to evaluate household welfare effects and distributional consequences of price changes. Deaton (1989a) developed a theoretical approach for the use of household microdata to analyse the welfare impact of trade policies that generate price changes in developing countries. Using similar techniques, different case studies have been conducted. For example, Deaton (1989b) assessed the impact of changes in the price of rice on the welfare of households in Thailand. Benjamin and Deaton (1993) studied the welfare effect of the reduction of producer prices of cocoa and coffee in Côte d'Ivoire. Barrett and Dorosh (1996) evaluated the welfare impact of rice price changes on households in Madagascar.

This study differs from the above works in two aspects. First, the authors of the papers above take into account the role of households both as consumers and producers of commodities, because in developing countries most households are engaged in agricultural activities. A main limitation of the analysis in this study however is that, in spite of the importance of agricultural production in Argentina, data from rural areas are not available in household surveys. Due to this drawback, the analysis therefore focuses on urban households in Argentina's main cities, on the assumption that these households are not engaged in agricultural production. A second difference is related to the role of commodity prices in household welfare. Some food commodities, such as coffee and rice, have a direct impact on consumption, whereas wheat only has an indirect impact on consumption as an input in final goods (such as flour, bakery products and pasta). For this reason, it is necessary to estimate the pass-through from commodity prices to final goods prices, an approach that is not used in the papers reviewed above.

In this context, this study aims to contribute to the large body of literature that tries to assess the impact on households of the price spikes during 2006–2011. According to the review of recent literature, there is no previous work that has tried to evaluate the impact of commodity price increases in Argentina, and in particular, the effect of NTMs on welfare. The analysis uses non-parametric techniques to assess the welfare effect on households in Argentina resulting from the change in prices generated by the trade policies affecting the wheat market.

[24] ENGH stands for *Encuesta Nacional de Gasto de los Hogares.*
[25] INDEC stands for *Instituto Nacional de Estadísticas y Censos.*
[26] Questionnaires, databases and methodological information related to the ENGH are available at: *http://www.indec.gov.ar.*

4 Data and methodology

This section describes the data used in the study and the methodology employed.

4.1 Data

Microdata at the household level were taken from the National Survey of Household (ENGH).[24] This survey is conducted by the National Institute of Statistics and Census of Argentina (INDEC)[25] – the Argentine official statistical agency – in cooperation with provincial statistical agencies.[26] The ENGH provides detailed data on household expenditure and income, as well as other relevant demographic and socio-economic variables relating to the households and their members. The latest ENGH was carried out between October 2004 and December 2005. Data were collected during a "survey week", when ordinary expenses (such as food and beverages, transport expenditure, etc.) were self-registered by household members. For non-ordinary expenditure and income, data were obtained through direct interviews with household members. All variables related to expenditure and incomes were converted to monthly statistics and expressed in ARS.

The main advantage of this survey is that it includes disaggregated expenditure data (including quantities and prices) at the household level. This study uses in particular information obtained from households on wheat-based products (including bread, cereals and pasta). Although this group of products contains some goods that are not direct derivatives of wheat (such as rice and other cereals), the whole group is considered because price information is available only at this level of aggregation.

As already mentioned, the main drawback of the ENGH is the limited rural coverage[27] and the lack of disaggregated data on income sources in rural areas. For this reason, the scope of this study was reduced to first-order consumption effects on urban areas of the most important Argentine provinces (City of Buenos Aires, Buenos Aires Metropolitan Area, Santa Fe, Córdoba, and Mendoza). The importance of these provinces was established in terms of the total population.[28] [29]

[27] Of the 29,111 households that reported expenses, only 7.45 per cent are from rural areas.

[28] Urban households located in main cities account for 39 per cent of the observations of the sample.

[29] Another possibility would have been to divide the country into geographic areas to study differences in the welfare effects on households between areas. This analysis is not included in the current work and will be left for future research.

Following Deaton (1989a, 1989b) and Benjamin and Deaton (1993), the logarithm of consumption expenditure per capita, m, will be used as a proxy for household welfare.[30] This variable was constructed with the following caveats. First, positive consumption expenditure rather than net expenditure was considered.[31] This means that household incomes from sales and non-consumption expenditure were excluded.[32] Second, per capita expenditure is based on equivalent adults estimations available from the ENGH.[33] In addition, shares of food and wheat-based product expenditure, $\frac{p_i q_i}{m}$, were calculated as a share of total consumption expenditure. Henceforth, p stands for prices, q for consumed amounts, m for nominal total consumption expenditure of the household and i for the different groups of products considered.

Table 1 shows summary statistics of household income per capita and expenditure per capita for different regions of the country in 2004–2005 (when the survey was conducted), and the share of total consumption allocated to food and wheat-based products. Urban households are richer than rural ones and spend a lower share of total expenses on food and wheat-based products. Households in the main cities have higher income and expenditure per capita than the national average and allocate a lower share of income to those goods. However, these differences do not seem large. When the City of Buenos Aires is excluded from the group of other main cities (last column), statistics for these cities are similar to national statistics. This fact unmasks large differences between the City of Buenos Aires and the remaining main cities. On average, households from the City of Buenos Aires have 2.2 times higher income and expenditure than households in other main cities, and they spend a lower share of total expenditure on covering basic needs.

[30] There are several reasons in favour of using consumption instead of income as a proxy for well-being. The main advantage is that, generally, self-reported expenditure presents less measurement bias than self-reported income (Cameron and Trivedi, 2005; Gasparini *et al.*, 2013). In addition, households tend to smooth consumption over time.

[31] Consumption expenditure is classified into nine different categories: Food and Beverages; Clothing and Footwear; Properties, Fuels and Utilities; Equipment and Maintenance of the Household; Health Expenditure; Transport and Communications; Recreation; Education; and Other Goods and Services.

Table 1 Summary statistics for different regions, 2004–2005

	Total country	Urban areas	Rural areas	Main cities	City of Buenos Aires	Other main cities
Expenditure per capita	587	603	364	706	1,254	577
Income per capita	660	672	492	757	1,373	623
Share of food in total expenditure	39.1	38.6	47.4	37.5	30.5	38.5
Share of wheat-based products in total expenditure	6.3	6.2	8.5	5.5	3.6	5.9
Share of bread in food expenditure	16.0	15.8	17.9	14.6	11.7	15.3
Average number of equivalent adults	2.73	2.71	3.09	2.6	2.08	2.72
Number of households in the sample	28,758	26,645	2,113	11,227	2,819	8,408

Source: Author's calculations, based on the 2004–2005 ENGH.
Note: Summary statistics are calculated at the household level. Expenditure per capita and income per capita are expressed in ARS. Shares are expressed in per cent.

[32] Non-consumption expenditure includes expenses such as taxes, transfers, donations and loss of money; asset accumulation such as estate purchases, machinery and equipment for economic activities, jewellery and artworks; and other uses of resources, such as purchases of bonds or other public securities, private purchases of stocks, foreign currency and loans to non-household members, among others.

[33] The number of equivalent adults is obtained using the criteria of nutritional requirements, according to the sex and age of the household member. A table of equivalences is included in the methodological report of the ENGH and the report describing the structure of the data, available at: *http://www.indec.mecon.ar/eah/engho200405_metodologico.pdf* and *http://www.indec.mecon.ar/eah/ENGHo200405_archivosdedatos.pdf*.

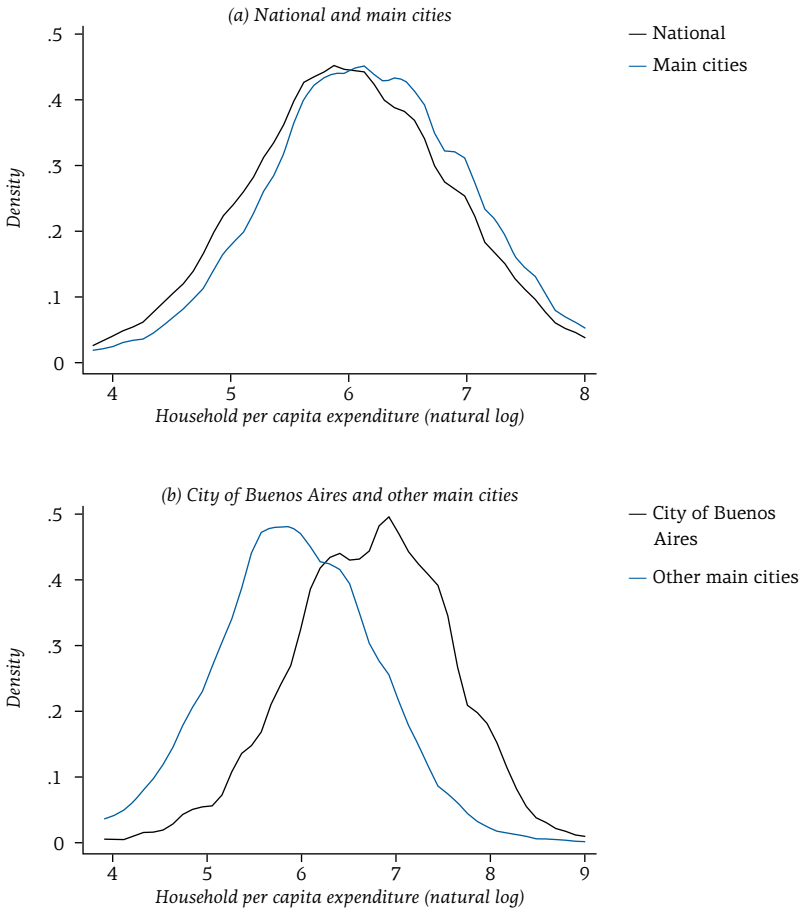
Similar results are shown in Figure 3, which presents the density functions of the distribution of the logarithm of per capita expenditure of households by kernel smoothing. These functions are represented by $g(x)$, where x is the logarithm of per capital total expenditure of households. Figure 3, panel (a), presents the distribution of well-being of the entire population of Argentina (including rural areas) and of the urban households located in the main cities.[34] Households in the main cities are, on average, better off than households at the national level, as reflected by the shift to the right of the distribution. However, Figure 3, panel (a), shows that the shape of the distribution of the logarithm of per capita total expenditure of households is similar in both cases, in line with the results in Table 1. Differences are even smaller when only urban areas are compared with the main cities.[35] Figure 3, panel (b), reveals disparities within the main provinces. The shift to the right of the distribution of per capita expenditure of the City of Buenos Aires reflects that, on average, households located there enjoy higher welfare than households in the other main cities. Large differences do not appear when any other pair of main cities is compared. For this reason, from now on, the analysis will be conducted separately for the City of Buenos Aires and the other main cities.

Table A1.1 in Annex 1 presents descriptive statistics at the national level (including rural areas) for the City of Buenos Aires and the other main cities (excluding rural areas), for each quintile of the per capita income distribution in each region. At the national level, total consumption per capita of the richest households is 7.6 times the total consumption per capita of the poorest households. Although these differences are lower in the City of Buenos Aires (5.3 times) and other main cities (5.6 times), they are still large. In line with Engel's Law, the share of food in total expenditure decreases with higher income. While the lowest quintile of the country spends more than half of its budget on food and 11 per cent on wheat-based products, for the richest households, these shares fall to 29.1 per cent and 3.3 per cent, respectively.

[34] To avoid confounding consumer and producer effects, urban households that have at least one member whose principal occupation is in the agricultural sector have been dropped from the estimates when urban households are considered.

[35] Unreported kernel density estimations of the distribution of per capita expenditure confirm that households in rural areas are on average poorer than households in urban areas.

Figure 3 Density estimation of per capita expenditure



Source: Author's estimations, based on the 2004–2005 ENGH.
Note: Epanechnikov kernel, bandwidth 0.06 (panel (a)) and 0.08 (panel (b)).

The second type of data used in this study is related to prices of cereals and final goods. International prices of wheat were taken from the World Bank Commodities Price Data series.[36] The construction of the series of domestic prices involved merging data from different sources. For the period until June 2009, spot prices from Rosario's Exchange Market (*Bolsa de Comercio de Rosario*) – the main physical market for grains in Argentina

[36] International prices of wheat correspond to prices of the variety of wheat Hard Red Winter (HRW) with ordinary protein, delivered at the United States Gulf port for prompt or 30-day shipment.

in terms of operations and volume – were used. These prices are reported voluntarily by buyers and sellers; their use is not compulsory but indicative. However, due to interventions in the wheat market, publication of these prices was interrupted in June 2009. From July 2009 onward, first position prices (for prompt delivery) in the Futures Exchange Market of Buenos Aires were therefore used.[37] Prices expressed in USD were converted into ARS using the monthly nominal exchange rate published by the Central Bank of Argentina.

Finally, the series of the consumer price index was built by merging data from two sources. Disaggregated data from INDEC were used for the period January 1994 to December 2006.[38] From January 2007 onward, the CPI series was extrapolated using the monthly inflation rate calculated by the provincial Institute of Statistics of Santa Fe for each category of products.[39] Data on money supply were obtained from the Central Bank of Argentina, and data on wage and employment from the Observatory of Employment and Entrepreneurship Dynamics and the Ministry of Labour, Employment and Social Security.

4.2 Methodology

The methodology contains three steps. The first step is to run non-parametric regressions of the share of wheat-based products on the logarithm of expenditure per capita. In the second step, a counterfactual scenario of domestic prices that would prevail in the absence of restrictions is constructed. This scenario is based on the key assumption of perfect pass-through from international prices (adjusted by export duties) to domestic prices in the absence of restrictions. Data on the pre-intervention period were used to test the accuracy of this assumption. The third step is to estimate the pass-through from prices of grain to prices of its derivatives as wheat is not directly consumed by households. Coefficients were obtained for 1994–2005 when export restrictions and price controls were not yet in

[37] As the interest lies in the price level and not only in price variations, current prices in the Buenos Aires Futures Exchange Market from July 2009 to December 2011 were used to continue the series. Rosario's Exchange Market price series using the growth rate of prices on the Futures Market from July 2009 onward have not been extrapolated. To test the validity of this procedure, both series have been plotted together for 1995–2009. Except for a short period between 2002 and 2003, both markets exhibit an equal trend and levels.

[38] There was a methodological change in the computation of the CPI in October 2000, which changed the base year from 1988=100 to 1999=100 and modified some criteria for the calculation.

[39] This approach was adopted due to controversies that aroused in 2007 regarding data published by INDEC. In particular, there has been a debate about the official figures used to measure inflation rates during the last six years.

place. Using the results of these regressions, different frameworks were built, comparing the real scenario with the counterfactual one. The assessment of these frameworks may provide a benchmark for policy evaluation, through the calculation of welfare gains or losses for consumers generated by the interventions.

Step 1: Non-parametric estimations of the share of wheat-based products in per capita household expenditure

Figure 4, panels (a) and (b), show the results of the first step of the methodological approach. Following Deaton (1989a, 1989b) and Benjamin and Deaton (1993), non-parametric regressions of the budget shares spent both on food and wheat-based products along the distribution of total per capita expenditure of households were estimated. This was intended to assess the importance of wheat derivatives in total expenditure. The main advantage of the use of non-parametric techniques is that it eliminates the need to formulate further assumptions about the data-generating process. These regressions represent a weighted average of the values of the food shares along the expenditure distribution and can be expressed as follows:

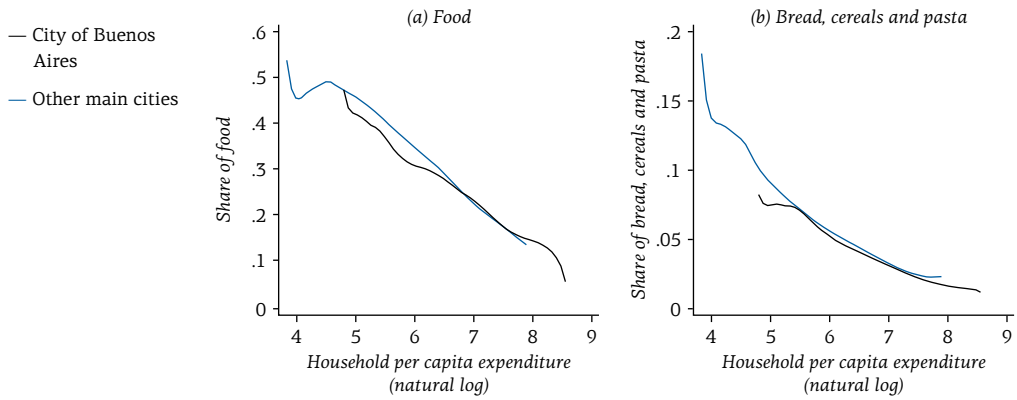
$$E\left[\frac{p_i q_i}{m}\middle| x\right] \qquad (1)$$

Variables in equation (1) are defined as in Section 4.1. Since the last wave of the ENGH was conducted in 2004–2005, it is assumed that budget shares calculated from this source remained largely unchanged for the period of analysis (2006–2011).[40]

[40] The validity of this assumption relies on several considerations. The first consideration is the absence of changes in the distribution of per capita expenditure between 2004 and 2005 and the period of analysis, 2006–2011. The second is that this assumption is more likely to hold if both the inflation rate between different groups of products and real income are constant. The third consideration is that it relies on the non-existence of changes in preferences of households. The lack of data on the per capita expenditure distribution and household preferences precludes a complete assessment. One proxy would be to analyse changes in the per capita income distribution of households. A comparison of the ratio of the income share between the highest and the lowest deciles between 2005 and 2011 is indicative of changes in the income distribution, biased towards a reduction in inequality. According to the Permanent Household Survey (*Encuesta Permanente de Hogares*) conducted by INDEC, this ratio was 11.4:1 in the second quarter of 2005 and 7.2:1 in the fourth quarter of 2011. Also, from December 2005 to December 2011, the accumulated inflation in Food and Beverages (196 per cent) was lower than in Bread, Cereals and Pasta (206 per cent), which could have generated a substitution of products within the Food and Beverages group, especially among the poorest households, which are more budget constrained. Both elements suggest that budget shares of the poorest households dedicated to wheat-based products could have been reduced between 2004–2005 and 2006–2011. If this were the case, results of the policies would be less pro-poor biased, reinforcing the results of this study associated with the inefficiency of policies to avoid welfare losses for households.

As shown in Figure 4, non-parametric regressions confirm that the poorest households spend a large share of total expenditure on food, and particularly basic goods such as bread and pasta, the demand for which is more inelastic to variations in prices. Therefore, changes in prices of consumption goods have a greater impact on the poorest households. Some differences between the City of Buenos Aires and other main cities appear in Figure 4, panel (a). When the expenditure distributions overlap, the poorest households in the City of Buenos Aires spend a lower share of total expenditure on food than households with the same level of per capita total expenditure located in other main cities. However, these differences disappear as we move to the right of the distribution. Figure 4, panel (b), shows a different pattern than panel (a). For those segments for which the expenditure per capita distribution overlaps, the share of total expenditure spent on wheat derivatives is similar for the City of Buenos Aires and for the other main cities.

Figure 4 Share of food and wheat-based products in total household expenditure



Source: Author's estimations, based on the 2004–2005 ENGH.
Note: Epanechnikov kernel, bandwidth 0.02, degree 1.

Step 2: Counterfactual scenario for domestic wheat prices

The construction of the counterfactual scenario accounts for the price variation of cereal prices that would prevail in the domestic market in the absence of quantitative export restrictions. If NTMs were not in place, domestic prices should follow the evolution of international prices adjusted by export duties, calculated as *IntPrice* * *(1 – export duties)*. The main assumption is that without quantitative export restrictions in the wheat market, there would be a perfect pass-through from international prices (adjusted by export duties) to domestic prices. Consequently, changes in

adjusted international prices would be a good proxy for changes in domestic prices in the absence of NTMs.[41] To test this assumption, ordinary least squares (OLS) regressions of the logarithm of domestic prices on the logarithm of adjusted international prices were run.

The estimation of the elasticity of domestic wheat prices to adjusted international prices for the pre-intervention period (1994–2005) and the post-intervention period (2006–2011) is based on equation (2).[42] In this equation, the dependent variable is $ln\ (DPW)_{my}$, the logarithm of the domestic price of wheat. $ln\ (AdjIntPW)_{my}$ is the logarithm of international prices adjusted by export duties. Prices are expressed in ARS, on a monthly basis. δ captures yearly-fixed effects to take into account any year-specific factor that could affect the pass-through. Monthly-fixed effects expressed by γ capture any seasonal effect affecting this market across the year.

$$\ln\ (DPW)_{my} = \beta_o + \beta_1 \ln\ (AdjIntPW)_{my} + \delta_y + \gamma_m + \mu_{my} \qquad (2)$$

Before presenting the results of the regression, supportive evidence for the assumption of perfect pass-through in the absence of export restrictions is discussed in Table 2 and Figure 5. This evidence also confirms that the relationship between international and domestic prices changes after the implementation of quantitative restrictions, testifying to the efficiency of the policy in reaching its main goal of disconnecting domestic wheat prices from international prices. The fulfillment of this goal is fundamental to justify the construction of a counterfactual scenario.

Panel (a) in Table 2 shows the share of international prices received by wheat producers, calculated as the ratio of domestic prices to international prices.[43] Panel (b) shows the share of international prices adjusted by export duties received by domestic wheat producers, computed as the ratio of domestic prices to international prices adjusted by export duties. For

[41] In 1995–2011, Argentine wheat FOB prices were at 98.2 per cent of international prices. This supports the hypothesis of international prices being a good proxy for domestic prices when tariff measures and non-tariff measures are not in place.

[42] See Annex 2 for a discussion related to the consistency of the OLS estimators presented in Table 3.

[43] Ghezán *et al.* (2001) made a similar analysis comparing the decade of the 1990s with the decade of the 1980s. During 1994–1996, the share of international prices received by producers was 94 per cent and 93 per cent for wheat and corn, respectively. However, these shares had been only 66 per cent and 72 per cent during 1983–1985. This was explained both by the export duties applied to these cereals during the 1980s and by the difference between the official exchange rate and the actual prevailing exchange rate. Both measures were removed in the 1990s, which could explain the reduction in the gap between national and international prices at that time.

1994–2001, when neither quantitative restrictions nor export duties were implemented, the share of international prices received by wheat producers averaged 90 per cent. The implementation of export duties in 2002 reduced the share received by producers to an average of 71 per cent for 2002–2005. However, once international prices are adjusted by export duties, these shares do not differ considerably from 1994–2001 (88 per cent in panel (b)). This suggests that the implementation of these duties reduced domestic prices only by the amount of the export duties, without generating additional distortions. The share of adjusted international prices received by producers declined sharply during 2006–2011 (to 59 per cent in panel (a) and 77 per cent in panel (b)).[44] Quantitative export restrictions reduced competition between millers and exporters, forcing producers to sell cereals at low prices to domestic mills. Hence, the implementation of quantitative restrictions could explain the emergence of additional distortions besides export duties in the cereals market, stemming from increased market power of domestic millers that allowed them to push domestic wheat prices down.[45]

Table 2 Share of international prices received by domestic producers (per cent)

(a) International prices		
	Wheat	Corn
1994–2001	90	95
2002–2005	71	74
2006–2011	59	65
(b) Adjusted international prices		
	Wheat	Corn
1994–2001	90	95
2002–2005	88	91
2006–2011	77	83

Source: Author's calculations, based on data from the World Bank, Rosario's Exchange Market and the Buenos Aires Futures Exchange Market.

[44] The gap between international and domestic prices of wheat was particularly high in the years 2008 and 2011, when the share of adjusted international prices received by producers averaged 71 per cent.

[45] Competition between millers and exporters was reduced because exporters were not able to sell abroad unless they managed to get an export licence. Exporters also offered low prices to domestic producers, arguing that they were compelled to store the grain until they could manage to get an export licence and that they could not anticipate the evolution of international prices. Producers could not actually know whether exporters had a licence and were forced to sell at low prices. In many cases, they were not able to store the grain and wait for convenient prices as they had to reimburse credits related to the current harvest.

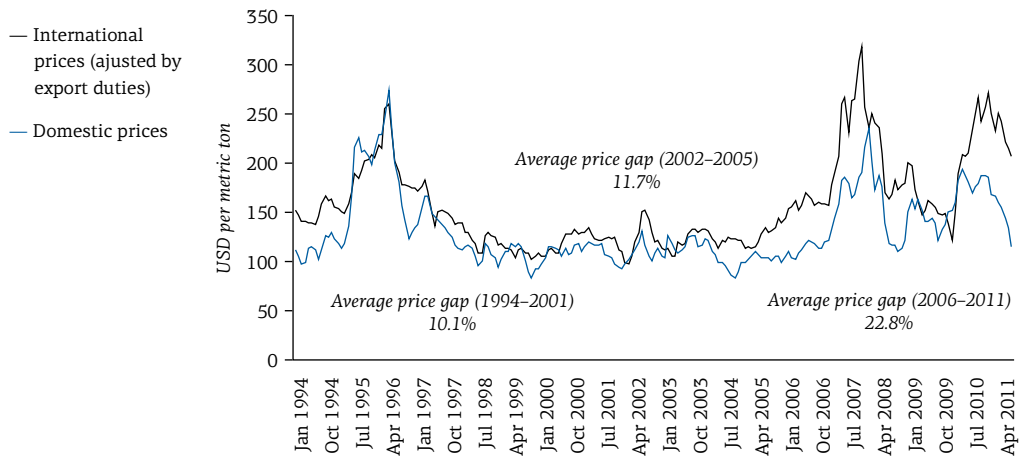
During the same period, corn also faced quantitative export restrictions that were timed similarly to wheat export restrictions. The share of international prices received by corn producers is also reported in Table 2, suggesting that both markets showed similar patterns in the share of international prices received by domestic producers. This helps to rule out the possibility that changes in the share of international prices received by wheat producers during 2006–2011 were associated with other circumstances particularly affecting the wheat market rather than with export restrictions.

Figure 5 shows monthly prices of wheat in the international and domestic markets (adjusted by export duties)[46] for 1994–2011. As can be seen, the evolution of domestic prices is in line with the evolution of international prices for the pre-intervention period. Even after the implementation of export duties (period 2002–2005), the price gap *((AdjIntPrice – DomesticPrice)/AdjIntPrice)* is similar to 1994–2001 and lower than for the post-intervention period 2006–2011.[47] In line with results presented in Table 2, Figure 5 shows that the gap between international and domestic prices increased during 2006–2011, even after controlling for export duties. This suggests that the existing price gap is measuring distortions associated with the implementation of quantitative export restrictions implemented in 2006–2011, which allowed domestic millers and exporters to exercise market power and reduce domestic prices.

[46] Figure A1.1 in Annex 1 presents the evolution of international prices and domestic prices not adjusted for export duties. These results reaffirm evidence from Figure A1.1 and Table 2. For 2002–2005, the price gap *((IntPrice – DomesticPrice)/IntPrice)* is lower than for the post-intervention period 2006–2011.

[47] Similar results are obtained using the first position prices (for prompt delivery) of wheat in the futures exchange markets of Chicago and Argentina.

Figure 5 Evolution of international and domestic prices of wheat, 1994–2011 (USD per metric ton)



Source: Author's calculations, based on data from the World Bank, Rosario's Exchange Market, Buenos Aires Futures Exchange Market, and Central Bank of Argentina.
Note: Prices are expressed in nominal terms. International prices of wheat are adjusted by export duties.

Results of the estimations of equation (2) are presented in Table 3. These results show how changes in international prices are transmitted to domestic prices and hence how sensitive producers are to international prices. Pre-intervention elasticity (columns 1–3) is higher than the post-intervention elasticity (columns 4–6), as expected. These results may be reflecting the implementation of export restrictions that force producers to sell in the domestic market at low prices, making it impossible for them to take full advantage of price increases in the international market. These results hold when *Export Duties* W_{my} are included in the estimations (see Table A1.2 in Annex 1).

Table 3 Pass-through from international to domestic prices during pre- and post-intervention periods

	(1)	(2)	(3)	(4)	(5)	(6)
	lnDPW - PRE	lnDPW - PRE	lnDPW - PRE	lnDPW - POST	lnDPW - POST	lnDPW - POST
ln(AdjIntPW)	0.99***	1.03***	1.09***	0.84***	0.72***	0.70***
	(0.02)	(0.07)	(0.05)	(0.06)	(0.08)	(0.07)
Constant	–0.05	–0.34	–0.72**	0.76*	1.53***	1.61***
	(0.10)	(0.41)	(0.32)	(0.39)	(0.57)	(0.50)

	(1)	(2)	(3)	(4)	(5)	(6)
	lnDPW - PRE	lnDPW - PRE	lnDPW - PRE	lnDPW - POST	lnDPW - POST	lnDPW - POST
Observations	144	144	144	72	72	72
Year FE	No	Yes	Yes	No	Yes	Yes
Month FE	No	No	Yes	No	No	Yes
R-squared	0.94	0.96	0.98	0.69	0.85	0.89

Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market and Buenos Aires Futures Exchange Market.
*Note: Robust standard errors in parentheses. Dependent variable: logarithm of domestic prices of wheat; *** p < 0.01, ** p < 0.05, * p < 0.1. FE stands for fixed effects.*

The evidence presented above confirms the hypothesis that adjusted international prices are a good proxy for domestic prices in the absence of quantitative restrictions. In particular, the results support the assumption of perfect pass-through from international to domestic prices. Therefore, the price variation in international prices of wheat is used to construct the counterfactual scenario. Moreover, regressions in Table 3 reinforce the hypothesis of changes in the relationship between international and domestic prices after the implementation of NTMs to exports. The hypothesis of equal trends and intercepts between the pre-intervention and post-intervention period can be rejected at 1 per cent confidence level.

Step 3: Pass-through estimations from wheat prices to final goods prices

Wheat plays only an indirect role in influencing consumer welfare through changes in the prices of its derivatives. The third methodological step consists of the estimation of the pass-through from wheat prices to prices of wheat-based products. Results of the estimations are used to calculate the share of the total variation in cereal prices that is actually perceived by consumers through changes of prices of basic consumption goods. Estimations are based on equation (3). $ln\ (CPIBCP)_{my}$ is the logarithm of the monthly CPI of Bread, Cereals and Pasta, $ln\ (DPW)_{my}$ stands for the logarithm of monthly average domestic prices of wheat expressed in ARS and X_{my} is a set of controls that includes different ways of capturing inflation. Among them, the logarithm of the CPI of other groups of products is included,[48] as well as the logarithm of the monetary base or money supply and the average wage of formal workers in different activities.[49] The nominal exchange rate, the

[48] The selection criterion was to choose sectors that seem less likely to be the target of government interventions aiming to contain inflation or implemented due to social reasons, such as Apparel and Recreation.

[49] These activities include food production, milling industry, production of bakery products and pasta, according to the International Standard Industrial Classification at 4 digits.

annual GDP at constant prices and a dummy variable *POST*, which equals 1 after January 2002, are included in different specifications. As in equation (2), yearly- (δ_y) and monthly-fixed effects (γ_m) are used:

$$\ln (CPIBCP)_{my} = \beta_1 \ln (DPW)_{my} + X_{my} + \delta_y + \gamma_m + \mu_{my} \quad (3)$$

Table 4 presents OLS estimations for different specifications of equation (3) for the pre-intervention period (1994–2005). The coefficient of interest, β_1, reflects the relationship between the logarithm of wheat price in the domestic market and the logarithm of wheat-based products CPI, the dependent variable. As additional controls, column (1) includes the logarithm of CPI of other groups of products to capture inflation, the logarithm of annual GDP and the nominal exchange rate. β_1 is positive and significant at 1 per cent confidence level. Specification (2) adds yearly- and monthly-fixed effects.[50] As additional controls, column (3) includes the logarithm of money supply *(M3)* and the logarithm of wages of formal workers in the bakery industry.[51] Neither of those variables enters significantly in regression (3). Specification (4) adds the money supply and the wages of formal workers lagged one and two periods. Only wages lagged two periods are positive and significant at 5 per cent. In all cases, the sign and significance of β_1 remain constant,[52] although smaller in magnitude. As a robustness check, column (5) replicates column (3) for the fresh bread CPI. The coefficient associated with the wheat price is still positive and significant at 1 per cent and with a higher magnitude than in previous specifications.

[50] Yearly-fixed effects are included to account for potential factors such as weather conditions, changes in the labour market or any other year-specific factors affecting the pass-through from wheat to Bread, Cereals and Pasta in a particular year. Monthly-fixed effects are included to account for potential seasonality in the relationship between variables.

[51] Data on this variable are only available from January 1995.

[52] This result is robust to multiple specifications not reported in Table 5, such as using lagged values of the logarithm of domestic prices of wheat or using a single measure of inflation (excluding either Recreation or Apparel CPI). Also, the effect of wheat prices on Bread, Cereals and Pasta CPI holds when different variables to measure wages, different monetary variables (as *M2* or monetary base) or lagged values of these variables are included. Results are robust to the change of the time period to 1994–2001. Finally, results do not change when regressions are run without a constant (see Table A1.4 in Annex 1).

Table 4 Price formation of final goods (OLS regressions)

	(1)	(2)	(3)	(4)	(5)
	ln(CPIBCP)	ln(CPIBCP)	ln(CPIBCP)	ln(CPIBCP)	ln(CPIBread)
$\ln(DPW)_t$	0.13***	0.07***	0.08***	0.06***	0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
$\ln(CPIRecreation)_t$	0.27***	0.23***	0.28***	0.24***	0.37***
	(0.03)	(0.05)	(0.06)	(0.06)	(0.12)
$\ln(CPIApparel)_t$	0.10***	0.12**	0.11*	0.06	0.19**
	(0.02)	(0.05)	(0.06)	(0.06)	(0.09)
$ExchangeRate_t$	0.05***	0.07***	0.06***	0.10***	-0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
$\ln(GDP)_t$	0.26***				
	(0.03)				
POST	0.01		0.01		0.13**
	(0.02)		(0.03)		(0.06)
$\ln(M3)_t$			–0.04	0.10	–0.11**
			(0.02)	(0.09)	(0.05)
$\ln(M3)_{t-1}$				–0.09	
				(0.11)	
$\ln(M3)_{t-2}$				–0.04	
				(0.08)	
$\ln(WagesBakery)_t$			0.02	0.02	–0.05
			(0.04)	(0.04)	(0.07)
$\ln(WagesBakery)_{t-1}$				–0.04	
				(0.04)	
$\ln(WagesBakery)_{t-2}$				0.11**	
				(0.04)	
Constant	–0.94***	2.54***	3.00***	2.84***	3.54***
	(0.34)	(0.21)	(0.39)	(0.36)	(0.92)
Observations	144	144	132	130	132
Year FE	No	Yes	Yes	Yes	Yes
Month FE	No	Yes	Yes	Yes	Yes
d-statistic	0.62	0.88	0.89	0.93	0.52
R-squared	0.99	1.00	1.00	1.00	0.98

Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market, Central Bank of Argentina, National Institute of Statistics and Census, and Observatory of Employment and Entrepreneurship Dynamics.
*Note: Robust standard errors in parentheses; dependent variable: logarithm of wheat-based products CPI; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Coefficients from Table 4, reflecting the pass-through from wheat prices to consumer prices, are far below 1. Because cereals represent only a small share of bread production costs, this result should not be surprising. Different studies presented by the Argentine Rural Confederation (CRA) in their monthly seminars titled "From land to the table"[53] highlight a lower incidence of producer prices of wheat on consumer prices of derivative goods in Argentina, compared with those in other countries such as the United States or New Zealand. According to CRA estimations, the share of wheat in bread price is only about 8 per cent. The remaining share of bread price is explained by other cost elements such as utilities, freights, wages, rents and taxes. Beibe *et al.* (2010) find that wheat explains only about 12 per cent of bread prices. Results in Table 4 are coherent with these findings and relevant in economic terms. An increase of 10 per cent in the price of wheat is associated with an increase ranging from 0.6 to 1.3 per cent in the price of derivatives. The incidence on consumer prices of changes in the wheat price is proportional to the share of the final good price that is explained by the primary input.[54]

When the different specifications of equation (3) are run for the post-intervention period (not reported), the coefficient of interest appears negative and not statistically different from zero. This could be reflecting a change in the elasticity of wheat-based product prices to wheat prices during the post-intervention period. If that were the case, then using the coefficients from Table 4 to calculate the price increase of final goods that could be attributed to wheat during the post-intervention period could be misleading. However, the change in magnitude and significance of β_1 could be better explained by the interventions in the wheat market. As already mentioned, the price of wheat effectively paid by the mill that ultimately affects consumers is the internal supply price set by law in 2007 and kept at an artificially low level during 2007–2011. The large gap between the internal supply price and the domestic price (see Figure 1) explains why domestic prices are not statistically significantly related to the CPI of wheat-based products for the post-intervention period.

To sum up, the share of wheat-based products in household expenditure and the estimation of price elasticity from wheat prices to final goods prices were presented in this section. These results will be used to estimate the welfare effect on households of wheat export restrictions compared with a

[53] In Spanish, *"De la tierra a la mesa"*.

[54] The analysis based on the unit root test and co-integration confirms the validity of the coefficients (see Annex 2). A pass-through of 8 per cent will be assumed in the welfare analysis presented in the next section.

counterfactual scenario in which restrictions are not in place. Table 3 supports the assumption of perfect pass-through from international prices to domestic prices prior to wheat market restrictions, which will make it possible to use the variation in international prices as a proxy for what prices in the domestic market would be in the absence of restrictions. Table 4 shows how much of the increase in wheat prices is transmitted onto consumers through changes in prices of final goods. Main results are presented in the following section.

5 Results

This section presents welfare effects on households arising as a result of the implementation of quantitative restrictions. Counterfactual scenarios are constructed assuming that from 2006 onward, the monthly growth rate of wheat prices that would prevail in the absence of quantitative restrictions is given by the monthly variation in international prices adjusted by export duties. Due to the partial pass-through from wheat to wheat-based products shown in Table 4, the difference in changes in final goods prices between the actual and counterfactual scenario is computed as follows:

$$\%\Delta PriceBCP = \frac{Counterfactual\ Wheat_t - Actual\ Wheat_t}{ActualWheat_t} * Elasticity_{BCP,\ Wheat} \quad (4)$$

In equation (4), *BCP* stands for Bread, Cereals and Pasta, the relevant group of products considered throughout the analysis. Once the change in prices of final goods attributed to changes in wheat prices is obtained from equation (4), the welfare impact on households can be calculated using equation (5):

$$Household\ Welfare\ Effects = \%\Delta PriceBCP * ShareBCP \quad (5)$$

In equation (5), *ShareBCP* is the share of total household expenditure spent on wheat-based products, as explained in Section 4.

Equation (4) is evaluated under two scenarios and estimates are presented in Table 5 as framework 1 and framework 2.[55]

[55] Prices for Table 5, frameworks 1 and 2, are expressed in USD, but the effects are the same when denominated in ARS.

Table 5 Estimations of price variation of wheat-based products

	Actual	Counterfactual
Framework 1	**Domestic wheat prices**	
2005	100.1	100.1
2011	164.0	184.4
Growth (2005-2011)	64%	84%
Difference in wheat prices	12.4%	
%ΔPriceBCP	1.0%	
Framework 2	**Internal supply prices**	
2005	100.1	100.1
2011	102.3	184.4
Growth (2005-2011)	2%	84%
Difference in wheat prices	80.2%	
%ΔPriceBCP	6.4%	

Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market, Buenos Aires Futures Exchange Market, Central Bank of Argentina, INDEC, and Statistics Institute of Santa Fe.
Note: Domestic and internal supply prices are calculated as annual averages.

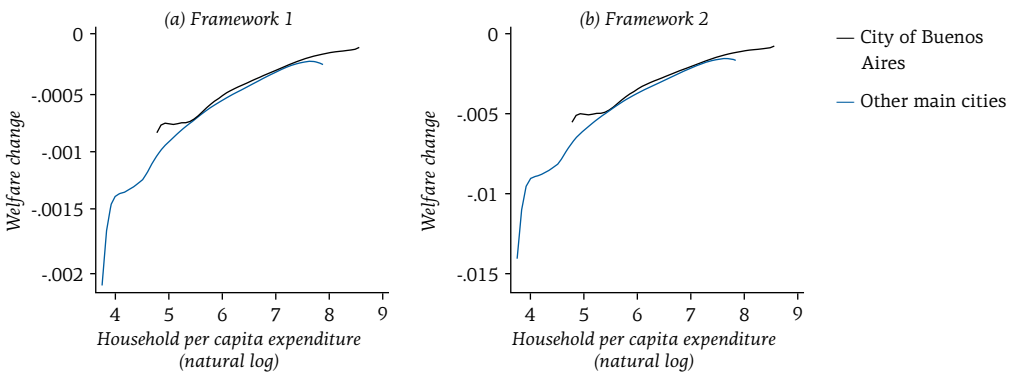
Framework 1 evaluates the effect of quantitative restrictions on prices of wheat-based products. It compares actual prices of wheat in the domestic market with counterfactual prices,[56] which are built under the assumption that in the absence of restrictions, the price variation in international markets is a good proxy for price changes in the domestic market. Counterfactual price data are built from January 2006. While domestic wheat prices increased by 64 per cent from 2005 to 2011, counterfactual prices would have increased by 84 per cent for the same period, thus making the average price of wheat 12.4 per cent higher in 2011. According to the estimations in Table 4, only about 8 per cent of the change in wheat prices is actually transmitted to final goods and thus has an effect on consumers. So, as per equation (4), in the absence of quantitative restrictions, the increase in prices of wheat-based products generated by changes in wheat prices would be 1 per cent higher than in the real scenario. Figure 6, panel (a) shows that consumer welfare effects generated under framework 1 are negligible. The sole adoption of quantitative export restrictions was not enough to produce a quantifiable effect on the welfare of urban households. If the restrictions were removed, for the City of Buenos Aires,

[56] Counterfactual scenarios in Table 5 were constructed extrapolating domestic prices of wheat since January 2006, using the variations in international prices adjusted by export taxes, as was previously explained. Alternative scenarios reported in Annex 3 rely on alternative assumptions to build counterfactual scenarios. Results do not differ systematically from the case presented in the main body of the study.

all households would suffer welfare losses lower than 0.1 per cent. For other main cities, only the poorest decile of the per capita distribution would experience welfare losses higher than 0.1 per cent, but not exceeding 0.2 per cent in any case.

Framework 2 jointly evaluates the effect of quantitative bans and ceiling prices artificially set at lower levels than domestic prices. To take account of the effects of both policies, framework 2 uses internal supply prices as a measure of actual prices of wheat. This assumption is justifiable because it is the internal supply price that ultimately determines the prices of final goods and hence affects consumers. Framework 2 in Table 5 shows that, in this case, prices of wheat-based products would be 6.4 per cent higher in the counterfactual scenario than in the real scenario. Non-parametric estimations of welfare effects of framework 2 are shown in Figure 6, panel (b). If neither export restrictions nor internal supply prices were implemented, urban households in the main cities would suffer welfare losses ranging from zero to almost 1.5 per cent compared with the real scenario. These effects are very modest for most households, even though the poorest households are the most affected, reflecting the pro-poor bias of the measures. For main cities other than the City of Buenos Aires, only the lowest quartile of the logarithm of the expenditure per capita distribution would suffer welfare losses higher than 0.5 per cent if the policies were removed. Welfare losses would be higher than 1 per cent only for the lowest percentile of the distribution. These effects would be even more modest for households located in the City of Buenos Aires, where welfare losses never exceed 0.5 per cent and are actually close to zero for the richest households.

Figure 6 Potential welfare effects on urban households



Source: Author's estimations, based on the 2004–2005 ENGH.
Note: Epanechnikov kernel, bandwidth 0.2, degree 1.

Together, results from frameworks 1 and 2 indicate that the implementation of wheat export restrictions alone does not seem to have generated quantifiable effects on consumers. When combined with ceiling prices and subsidies to the milling industry, welfare effects on households do appear, but are small in magnitude.

5.1 Effects of the macroeconomic context on final goods prices

Were the policies implemented in the wheat market sufficient to curb inflation in basic goods? What would be the evolution of prices of wheat-based products in the absence of interventions? It would be expected that lower actual domestic prices of wheat compared to counterfactual prices (see Table 5) would result in lower prices of final goods. High inflation in wheat-based products during 2006–2011 could have been even higher with counterfactual prices of wheat.

To address this concern, the coefficients from Table 4, column (2), are used to linearly predict the prices of wheat-based products that would prevail in the domestic market with counterfactual prices of wheat (i.e. in the absence of interventions in the wheat market). Counterfactual prices of wheat used for these linear predictions are the same as those used for the construction of frameworks 1 and 2. It is important to remember that coefficients in Table 4 were obtained for 1994–2005, and when using them to predict prices for 2006–2011, it should be assumed that price formation mechanisms were kept constant between periods.

Actual consumer price indices in Table 6 are the average CPI of the Bread, Cereals and Pasta group for 2005 and 2011. The counterfactual CPI for 2011 is obtained from the linear prediction explained in the paragraph above.[57]

Table 6 Consumer price index of wheat-based products

	Actual	Counterfactual
2005	154.5	154.5
2011	440.2	261.1
Growth CPI (2005–2011)	185%	69%
Difference in CPI		–40.70%

Source: Author's estimations, based on data from INDEC and Statistics Institute of Santa Fe, and author's calculations presented in Table 4.
Note: Actual and counterfactual CPI of Bread, Cereals and Pasta for 2005 and 2011 are constructed as annual averages.

The counterfactual estimation in Table 6 does not allow for disentangling the effect of export restrictions from the remaining policies and macroeconomic conditions affecting Argentina in the last years. If the boom of international commodity prices were the main source behind domestic food inflation, it should be expected that predicted prices of wheat derivatives, estimated with counterfactual wheat prices (higher than domestics prices), would be higher than actual prices. However, while actual inflation in wheat-based products was 185 per cent between 2005 and 2011, inflation in the counterfactual scenario would only have been 69 per cent during the same period. According to the estimations in Table 6, prices of final goods would be 40.7 per cent lower with counterfactual prices of wheat.

The inefficiency of lower wheat prices in restraining inflation can be related to the minor role that wheat plays in the price formation of wheat-based products, as already discussed. Potential explanations for the increase in prices of wheat derivatives during 2006–2011 should be sought beyond the increase in wheat prices in international markets. Moreover, these results could reflect a change in the price formation mechanism of final goods.[58] Other causes might have spurred inflation in 2006–2011, or even the same cause might have played a different role. In this case, coefficients obtained in Table 4 for the pre-intervention period may not be a good fit to predict prices of final goods in the post-intervention period.

To sum up, the frameworks presented in Table 5 shed light on the idea that export restrictions by themselves were not enough to generate quantifiable welfare effects on consumers. Framework 1 shows that in the absence of export restrictions, domestic prices of wheat would only be 12.4 per cent higher than in the real scenario, causing a negligible impact on consumer welfare. Also, when ceiling prices and subsidies to millers are considered, a small impact on household welfare appears, as can be concluded based on framework 2. In this framework, counterfactual prices of wheat would be 80 per cent higher than real prices, making wheat-based product prices 6.4 per cent higher than in the real scenario. Because the share of wheat in final goods prices is about 8 per cent in estimations in Table 4, and the share of wheat-based products in total household expenditure is never higher than 20 per cent, the intervention in the wheat market does not seem to have generated a measurable effect on household welfare.

[57] The counterfactual CPI for 2005 is the same as the actual CPI, since the counterfactual scenario were only estimated from 2006 onward.

[58] For example, in the post-intervention period, the inflationary environment may have played a higher role in pushing the prices of wheat-based products up than in the pre-intervention period. Between 2005 and 2011, the accumulated general inflation was 156 per cent, while in the pre-intervention period (1994–2005) the accumulated inflation was 78 per cent, supporting the idea of changes in the inflationary environment.

Evidence obtained so far supports the idea that policies applied to the wheat market fell short of the expected goals of the government. As suggested above, the increase in prices of final goods may have been even higher in the absence of interventions. However, high prices of wheat in international markets should not be blamed for the price spike in domestic prices of wheat-based products. Even if export restrictions helped to reduce the share of the price increase of final goods attributable to wheat prices, most of the increase in wheat-based product prices was not avoidable. Other price components of wheat-based products may have played a major role.

6 Conclusions

Studies addressing the effects of non-tariff measures are far from abundant. In this sense, this study presents one of the first attempts to evaluate the largely unexplored effects of this kind of trade policy in Argentina.

The implementation of quantitative export restrictions on cereals triggered an intense debate in Argentina between supporters and opponents of these measures. For supporters, the justification behind the implementation of export restrictions was twofold. First, in a situation characterized by high international prices of commodities, this policy intended to detach domestic from international prices and thus avoid a large increase in domestic prices. Since derivatives of wheat are an important component of the basic food basket of the typical Argentine household, export restrictions aimed to limit inflation. Second, the policy also aimed to keep an adequate provision of grains in the domestic market. Opponents of export restrictions emphasize the minor role that wheat plays in the price formation of final goods. If other components of final goods prices are not targeted, controlling the prices of primary inputs would not be enough to curb inflation.

Additionally, in the medium term, export restrictions could potentially affect incentives on the production side, reduce the supply of cereals in the domestic market and thus increase domestic prices. Debates around wheat export restrictions intensified in the early months of 2013, due to the spike in prices of wheat, flour and bread in the Argentine domestic market (Bertello, 2013; Koop, 2013). This recent increase in prices can be associated with a shortage of wheat for use in local industry, which led to the adoption of additional measures in this market.[59]

[59] See Bureau of Domestic Trade, Resolution 67/2013.

A main assumption of this study is that, in the absence of interventions, domestic wheat prices would move together with international prices. Evidence supporting this assumption allowed for constructing a counterfactual scenario in which the growth rate of domestic wheat prices would equal the variation in international prices adjusted by export duties. Also, the pass-through from wheat prices to prices of final goods was estimated. Combining both results, a calculation was made of the difference in the increase in final goods prices which can be attributed to the difference in the increase in wheat prices between the real and the counterfactual scenario. The share of household budget spent on wheat derivatives allowed an assessment of the welfare effect of export restrictions on urban households, through the evaluation of two different frameworks.

Main results suggest that non-tariff measures by themselves were not enough to generate a large welfare effect on households. In the absence of export restrictions, the price increase of wheat-based products attributable to wheat would only be 1 per cent higher than in the real scenario, with negligible welfare effects on urban consumers. If both export restrictions and subsidies to the milling industry were removed, prices of final goods would be 6.4 per cent higher in the counterfactual scenario. Welfare losses would be modest, ranging from zero to 1.5 per cent, mainly affecting the poorest households. For main cities other than the City of Buenos Aires, only the lowest quartile of the distribution would suffer welfare losses higher than 0.5 per cent. Welfare losses higher than 1 per cent would be limited to the poorest percentile of the per capita distribution. These results testify to the inefficiency of the set of policies (quantitative export restrictions, ceiling prices and subsidies) to curb inflation and generate quantifiable welfare effects on households, compared with a non-intervention scenario. It was only possible to limit the increase in food prices partially and at the cost of a large financial burden for the government in terms of subsidies. Additionally, export restrictions reduced the amounts collected by the government in the form of export duties, generating additional costs from the intervention.

To analyse the causes of food inflation does not fall under the scope of this study. However, results suggest that key causes of inflation in wheat-based products may be sought beyond the international boom in wheat prices. The design of policies aiming to control increases in food prices should therefore go beyond targeting commodity prices in the domestic market, as other price components seem to play a more important role in pushing the prices up.

As was previously discussed, a comprehensive analysis should incorporate the effects of NTMs on other actors involved in the wheat value chain than consumers. In particular, producer welfare effects should be addressed, but the lack of available data precludes this analysis. However, some general phenomena such as the high volatility in domestic wheat prices in 2013[60] and the reduction of wheat-sown areas could be indicative of the distortion of the incentives faced by wheat producers as a consequence of the policies implemented in the wheat sector. In addition, interventions may also have generated large gains for a limited group of millers and exporters receiving subsidies and export authorizations, while placing a large financial burden on the government.

New policies implemented after 2011, such as the creation of a trust in May 2013 to refund export duties to wheat producers, were intended to promote wheat production, with the aim to counterbalance the negative incentives emanating from the implementation of export restrictions. However, effects of these measures will only appear in the medium term and cannot be assessed at the moment.

Also, export restrictions may have had an impact on fostering the first and second processing stages. By providing a higher level of effective protection, NTMs might have promoted national value added and employment. Figures presented in Section 2 of the study support this idea; however, evidence is far from being conclusive.

Overall, although limited to first-order consumption effects on urban households, this study contributes to providing a benchmark to evaluate the effects of the policies in motion. These policies did not seem sufficient to generate large welfare effects on consumers compared with a potential counterfactual scenario. In addition, the implementation of export restrictions in the wheat market was not sufficient to contain inflation in wheat derivatives in Argentina from 2007 onward. These results are highly relevant in terms of policymaking because they seem indicative of the failure of NTMs to achieve the intended objectives. It is possible that, in the absence of interventions, the increase in prices of final goods would be even higher than it actually was. Still, it is not clear whether these welfare losses would be quantitatively larger than in the real scenario, provided that in both cases, households would suffer due to increases in wheat-based product prices.

[60] In October 2013, international wheat prices averaged USD 325 per metric ton (World Bank Commodities Price Data). In the same month, domestic wheat prices were almost double, averaging USD 617 per metric ton (Buenos Aires Futures Exchange Market). Higher domestic prices thus reversed any potential positive effect of export restrictions on consumers.

Moreover, changes in domestic wheat prices could even have generated negative welfare effects on the supply side. If this had been the case, negative welfare effects on producers could have offset the modest positive welfare effects on consumers. Therefore, it is possible that an alternative allocation of resources would be more beneficial from a social point of view.

To sum up, results obtained so far raise doubts about the effectiveness of export restrictions in achieving welfare goals. Future research on this topic should try to incorporate the supply side in the analysis, provided that microdata on producers are available. This could help assess the impact of these policies in a broader context. In addition, future analysis should assess medium- and long-term effects of export restrictions and other policies implemented in the wheat market. It would also be relevant to study the effects of export restrictions on other cereals, such as corn. Such analysis would help to estimate the overall impact that export-related NTMs have had on the welfare of households in Argentina as well as to better understand the effects of this type of policies. Finally, the effectiveness of export duties as a policy intended to curb inflation and generate welfare effects on households should also be discussed. Although the implementation of export duties was driven by fiscal considerations, it also had an effect on the prices of wheat derivatives. Also, by reducing the share of international prices received by producers, incentives and choices on the supply side were distorted. However, welfare effects associated with the removal of export duties were not studied here and will be left for future research.

Annexes

Annex 1

Table A1.1 Summary statistics by quintile of the income distribution, 2004–2005

	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
National					
Total per capita expenditure	169	288	420	614	1,291
Share of food in expenditure	50.9%	44.4%	39.1%	36.0%	29.1%
Share of wheat-based products in expenditure	11.0%	7.8%	6.0%	5.0%	3.3%
Equivalent adults per household	3.8	3.2	2.8	2.3	1.9
City of Buenos Aires					
Total per capita expenditure	477	701	984	1,435	2,530
Share of food in expenditure	37.6%	34.4%	30.7%	27.0%	24.2%
Share of wheat-based products in expenditure	5.6%	4.4%	3.7%	2.7%	1.9%
Equivalent adults per household	2.8	2.2	2	1.8	1.6
Other main cities					
Total per capita expenditure	210	331	457	628	1,167
Share of food in expenditure	47.8%	42.4%	38.8%	36.3%	29.8%
Share of wheat-based products in expenditure	9.7%	6.9%	5.7%	4.7%	3.4%
Equivalent adults per household	3.6	3	2.7	2.4	2

Source: Author's estimations, based on the 2004–2005 ENGH.
Note: Summary statistics are calculated at the household level. Total per capita expenditure is expressed in ARS.

Table A1.2 Pass-through from international to domestic prices of wheat – Export duties as control

	(1)	(2)	(3)	(4)	(5)	(6)
	lnDPW -PRE	lnDPW -PRE	lnDPW -PRE	lnDPW -POST	lnDPW -POST	lnDPW -POST
ln(AdjIntPW)	0.98***	0.95***	1.14***	0.77***	0.69***	0.66***
	(0.06)	(0.10)	(0.10)	(0.06)	(0.09)	(0.07)
ExportDutiesW	0.00	0.01	-0.01	0.02**	0.01	0.01**
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	–0.01	0.13	–0.85*	0.85**	1.46***	1.55***
	(0.28)	(0.50)	(0.48)	(0.37)	(0.55)	(0.45)
Observations	144	144	144	72	72	72
Year FE	No	Yes	Yes	No	Yes	Yes
Month FE	No	No	Yes	No	No	Yes
R-squared	0.94	0.96	0.98	0.71	0.85	0.89

Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market and Buenos Aires Futures Exchange Market.
*Note: Robust standard errors in parentheses. Dependent variable: logarithm of domestic wheat prices; *** p < 0.01, ** p < 0.05, * p < 0.1.*

Table A1.3 Pass-through from international to domestic prices of wheat – Estimations of first differences

	(1)	(2)	(3)	(4)	(5)	(6)
	lnDPW -PRE	lnDPW -PRE	lnDPW -PRE	lnDPW -POST	lnDPW -POST	lnDPW -POST
D.ln(AdjIntPW)	0.80***	0.72***	0.80***	0.31**	0.30**	0.30**
	(0.08)	(0.10)	(0.11)	(0.13)	(0.13)	(0.11)
ExportDutiesW	–0.00	–0.00	0.00	–0.00	–0.01	–0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Constant	0.00	0.02	–0.01	0.11	0.18	0.07
	(0.01)	(0.07)	(0.07)	(0.09)	(0.18)	(0.17)
Observations	143	143	143	72	72	72
Year FE	No	Yes	Yes	No	Yes	Yes
Month FE	No	No	Yes	No	No	Yes
R-squared	0.44	0.47	0.63	0.16	0.20	0.47

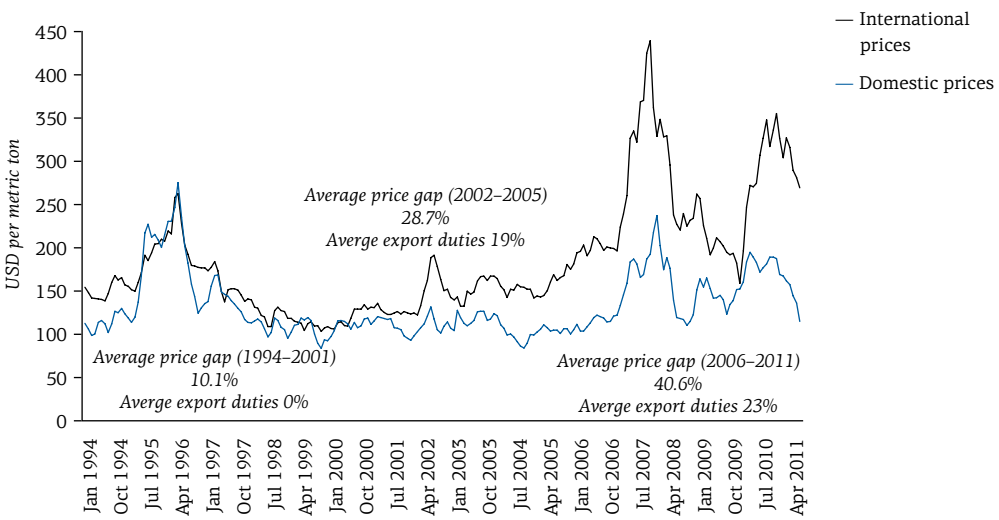
Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market and Buenos Aires Futures Exchange Market.
*Note: Robust standard errors in parentheses. Dependent variable: logarithm of domestic wheat prices; *** p < 0.01, ** p < 0.05, * p < 0.1.*

Table A1.4 Price formation of final good – Estimations without constant (OLS regressions)

	(1)	(2)	(3)	(4)	(5)
	ln(CPIBCP)	ln(CPIBCP)	ln(CPIBCP)	ln(CPIBCP)	ln(CPIBread)
ln(DPW)t	0.12***	0.07***	0.08***	0.06***	0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
ln(CPIRecreation)t	0.33***	0.23***	0.28***	0.24***	0.37***
	(0.03)	(0.05)	(0.06)	(0.06)	(0.12)
ln(CPIApparel)t	0.09***	0.12**	0.11*	0.06	0.19**
	(0.02)	(0.05)	(0.06)	(0.06)	(0.09)
ln(GDP)t	0.16***	0.21***	0.24***	0.22***	0.30***
	(0.01)	(0.02)	(0.03)	(0.03)	(0.08)
ExchangeRatet	0.05***	0.07***	0.06***	0.10***	-0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
POST	–0.01	–0.01			
	(0.02)	(0.02)			
$ln(M3)_t$			–0.04	0.10	–0.11**
			(0.02)	(0.09)	(0.05)
$ln(M3)_{t-1}$				–0.09	
				(0.11)	
$ln(M3)_{t-2}$				–0.04	
				(0.08)	
$ln(WagesBakery)_t$			0.02	0.02	–0.05
			(0.04)	(0.04)	(0.07)
$ln(WagesBakery)_{t-1}$				–0.04	
				(0.04)	
$ln(WagesBakery)_{t-2}$				0.11**	
				(0.04)	
Observations	144	144	132	130	132
Year FE	No	Yes	Yes	Yes	Yes
Month FE	No	Yes	Yes	Yes	Yes
R-Squared	1.00	1.00	1.00	1.00	1.00
d-statistic	0.59	0.88	0.89	0.93	0.52

Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market, Central Bank of Argentina, National Institute of Statistics and Census, and Observatory of Employment and Entrepreneurship Dynamics.
*Note: Robust standard errors in parentheses; dependent variable: logarithm of wheat-based products CPI; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Figure A1.1 Evolution of international and domestic prices of wheat, 1994–2011 (USD per metric ton)



Source: Author's estimations, based on World Bank, Rosario's Exchange Market, Buenos Aires Futures Exchange Market and Central Bank of Argentina.
Note: Prices are expressed in nominal terms. International prices are not adjusted by export duties.

Annex 2

When working with time series, the consistency of OLS estimators is not guaranteed. To address the issue of potential spurious regressions, the existence of unit roots in the time series of interest is tested. For 1994–2005, the augmented Dickey-Fuller test does not reject the null hypothesis of the existence of a unit root for the logarithm of domestic and adjusted international prices.[61] However, different specifications of both the Johansen and the Engle and Granger tests reject the null hypothesis of no co-integration at 1 per cent for the pre-intervention period. These results support the existence of long-term equilibrium between variables and dissipate concerns about the consistency of OLS estimators in Table 3. For the post-intervention period, the unit-root hypothesis for the logarithm of domestic and adjusted international prices can be rejected at 5 or 10 per cent, when

[61] For domestic prices, when the specification includes a drift, the null hypothesis of the unit root could be rejected at 5 per cent with one lag and at 10 per cent with two lags. However, these results are not robust to the inclusion of a trend, or other number of lags.

the Dickey-Fuller test is performed, including a drift. These results are robust to the inclusion of different numbers of lags. Thus, results of Table 3 are also consistent for the post-intervention period.[62]

There is also concern regarding results in Table 4 reflecting spurious regressions, as evidenced by low values of Durbin-Watson statistics and high R-squared. For the pre-intervention period, all the relevant series[63] were found to be I(1), at standard levels of significance, including a drift and different number of lags. The hypothesis of no co-integration cannot be rejected when only *lnCPIBCP* and *lnDPW* are included in a Johansen test. However, the inclusion of a third variable such as GDP or a proxy for inflation (as Apparel or Recreation CPI) allows rejecting the hypothesis of no co-integration, supporting the existence of a stable long-term relationship between variables. Performing the Johansen co-integration test for the whole set of relevant variables *(lnCPIBCP, lnDPW, lnCPIRecreation, lnCPIApparel, lnGDP, ExchangeRate, lnM3* and *lnBakeryWages)* allows for the rejection of the no co-integration hypothesis. Results are robust to the inclusion of different number of lags and different combinations of variables. These results mitigate the concern regarding results in Table 4 being driven by spurious relations between variables.

Annex 3

In Section 5, different frameworks of welfare effects on urban households in the City of Buenos Aires and other main cities were reported. The counterfactual scenario assumed in that case was constructed considering that, from January 2006 onward, the growth rate of domestic wheat prices would be equal to the growth rate of international prices adjusted by export duties. Tables A3.1 and A3.2 in this Annex present the same frameworks as those found in Table 5 of Section 5, but consider different assumptions in the construction of counterfactual scenarios.

Frameworks 1A and 2A assume that in the absence of quantitative restrictions counterfactual prices would be the international prices adjusted by

[62] To avoid additional concern about the potential spurious regressions in Table 3, Table A1.3 presents the same regressions as Table 3 but with variables expressed in first differences. Because variables are found to be I(1), first differences of these variables are stationary. Results are supportive of a higher impact of international prices on domestic prices for the pre-intervention period.

[63] These series are the logarithm of Bread, Cereals and Pasta CPI, the logarithm of Recreation and Apparel CPI, the logarithm of the monetary base and money supply and the logarithm of wages in the bakery and milling industries.

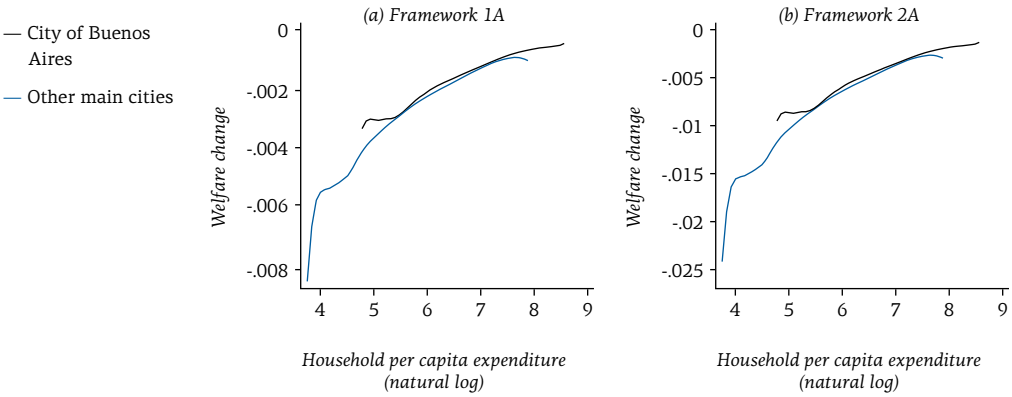
export duties. Table A3.1 reports the corresponding prices and growth rates. If only quantitative restrictions were considered, prices of wheat in the counterfactual scenario would be 48.5 per cent higher than in the real scenario. Wheat-based product prices, ascribable to wheat, would be 3.9 per cent higher in the counterfactual scenario. If internal supply prices were also considered, price variation in wheat-based products attributable to wheat would reach 11 per cent. As can be seen in Figure A3.1, if this counterfactual scenario were assumed, interventions would avoid larger welfare losses than those estimated in the frameworks presented in Table 5. Even though, without the implementation of internal supply prices, export restrictions by themselves would not seem to generate quantifiable welfare effects, as shown in Figure A3.1, panel (a).

Table A3.1 Estimations of price variation of wheat-based products – Alternative counterfactual scenarios A

	Actual	Counterfactual
Framework 1	**Domestic wheat prices**	
2005	100.1	100.1
2011	164.0	243.5
Growth (2005-2011)	64%	143%
Difference in wheat prices	48.5%	
%ΔPriceBCP	3.9%	
Framework 2	**Internal supply prices**	
2005	100.1	100.1
2011	102.3	243.5
Growth (2005-2011)	2%	143%
Difference in wheat prices	138%	
%ΔPriceBCP	11%	

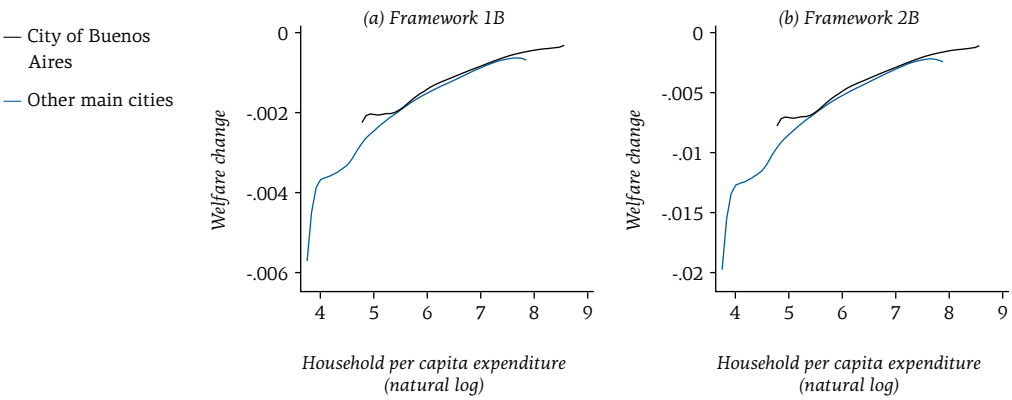
Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market, Buenos Aires Futures Exchange Market, Central Bank of Argentina, INDEC, and Statistics Institute of Santa Fe.
*Note: Domestic and internal supply prices are calculated as annual averages. Counterfactual prices of wheat are calculated as international prices adjusted by export duties (international prices * (1 – export duties)).*

Figure A3.1 Potential welfare effects – Frameworks 1A and 2A



Source: Author's estimations, based on the 2004-2005 ENGH.
Note: Epanechnikov kernel, bandwidth 0.2, degree 1.

Figure A3.2 Potential welfare effects – Frameworks 1B and 2B



Source: Author's estimations, based on the 2004–2005 ENGH.
Note: Epanechnikov kernel, bandwidth 0.2, degree 1.

Table A3.2 replicates Table A3.1 but assumes that prices that would prevail in the domestic wheat market in the absence of interventions would be equal to 90 per cent of international prices adjusted by export duties (0.90 * *AdjIntPrice*). This share mimics the average corresponding to 1994–2005. Results under this assumption are an intermediate case between those presented in Table 5 and Table A3.1. Non-parametric estimations under these frameworks are presented in Figure A3.2.

Table A3.2 Estimations of price variation of wheat-based products – Alternative counterfactual scenarios B

	Actual	Counterfactual
Framework 1	**Domestic wheat prices**	
2005	100.1	100.1
2011	164.0	217.7
Growth (2005–2011)	64%	117%
Difference in wheat prices	32.7%	
%ΔPriceBCP	2.7%	
Framework 2	**Internal supply prices**	
2005	100.1	100.1
2011	102.3	217.7
Growth (2005–2011)	2%	117%
Difference in wheat prices	112.8%	
%ΔPriceBCP	9%	

Source: Author's estimations, based on data from the World Bank, Rosario's Exchange Market, Buenos Aires Futures Exchange Market, Central Bank of Argentina, INDEC, and Statistics Institute of Santa Fe.
*Note: Domestic and internal supply prices are calculated as annual averages. Counterfactual prices of wheat are calculated as 0.9 * international prices * (1 – export duties).*

References

Abbott, P., Hurt, C. and Tyner, W. (2011). "What's Driving Food Prices in 2011?" *Issue Report 2011*. Farm Foundation.

Barrett, C. and Dorosh, P. (1996). "Farmers' Welfare and Changing Food Prices: Nonparametric Evidence from Rice in Madagascar." *American Journal of Agricultural Economics*, 78 (3): 656–669.

Beibe, A., Bondolich, C., Fernández Rotelli, M.L., O'Connor, E., Rodríguez, A. and Roggero, M. (2010). "El maíz y el trigo como motores del desarrollo argentino." *Propuesta de Política Pública*. Fundación Agropecuaria para el Desarrollo de Argentina.

Benjamin, D. and Deaton, A. (1993). "Household Welfare and the Pricing of Cocoa and Coffee in Côte d'Ivoire: Lessons from the Living Standard Surveys." *The World Bank Economic Review*, 7 (3): 293–318.

Bertello, A. (2013). "Frenan la exportación de harina por el aumento en el precio y las quejas de faltantes." *La Nación*, 25 June.

Brambilla, I., Galiani, S. and Porto, G. (2010). "Argentine trade policies in the XX century: 60 years of solitude." In: Glaeser, E. and Di Tella, R. Eds. *Forthcoming in Argentine Exceptionalism*. Harvard University, Cambridge MA.

Cameron, A. and Trivedi, P. (2005). *Microeconometrics: methods and applications*. Cambridge: Cambridge University Press.

Cooke, B. and Robles, M. (2009). "Recent Food Prices Movements: A Time Series Analysis." IFPRI Discussion Paper No. 00942. International Food Policy Research Institute, Washington DC.

Deaton, A. (1989a). "Household Survey Data and Pricing Policies in Developing Countries." *The World Bank Economic Review*, 3 (2): 183–210.

Deaton, A. (1989b). "Rice Prices and Income Distribution in Thailand: A Non-Parametric Analysis." *The Economic Journal*, 99 (395): 1–37.

Dequino, D. (2010). "Diagnóstico sobre la transparencia en los subsidios al sector agroalimentario, gas y transporte." Proyecto Promoviendo Transparencia en la Asignación de Subsidios. Center of Implementation of Public Policies for Equity and Growth, Buenos Aires.

Estrades, C. and Terra, M.I. (2012). "Commodity prices, trade, and poverty in Uruguay." *Food Policy*, 37 (1): 58–66.

Gasparini, L., Cicowiez, M. and Sosa Escudero, W. (2013). *Pobreza y desigualdad en América Latina. Conceptos, herramientas y aplicaciones*. First Edition. Centro de Estudios Distributivos, Laborales y Sociales, Universidad Nacional de La Plata (CEDLAS–UNLP). Buenos Aires: Temas.

Gayá, R. and Michalczewsky, K. (2011). "El salto exportador del MERCOSUR en 2003– 2008. Más allá del boom de las materias primas." Institute for the Integration of Latin America and the Caribbean, Inter-American Development Bank, Washington DC.

Ghezán, G., Mateos, M. and Elverdín, J. (2001). "Impacto de las políticas de ajuste estructural del sector agropecuario y agroindustrial: el caso de Argentina." Red de Desarrollo Agropecuario. United Nations Economic Commission for Latin America and the Caribbean, Santiago de Chile.

Gilbert, C. (2010). "How to understand high food prices." *Journal of Agricultural Economics*, 61 (2): 398–425.

IERAL (2011). "Cadena de trigo y sus productos derivados." Documento de Trabajo. Year 17, No. 111. Fundación Mediterránea. Instituto de Estudios sobre la Realidad Argentina y Latinoeamericana (Institute for Studies of Argentine and Latin American Reality), Cordoba.

INDEC (2007). Encuesta Nacional de Gastos de los Hogares. Base de datos gastos de consumo e ingresos. Resumen Metodológico. Instituto Nacional de Estadísticas y Censos (The National Institute of Statistics and Census), Buenos Aires.

Ivanic, M. and Martin, W. (2008). "Implications of higher global food prices for poverty in low-income countries." *Agricultural Economics*, 39 (s1): 405–416.

Ivanic, M., Martin, W. and Zaman, H. (2012). "Estimating the Short-Run Poverty Impacts of the 2010-11 Surge in Food Prices." *World Development*, 40 (11): 2302–2317.

Koop, F. (2013). "Shortage of wheat affecting price of wheat." *Buenos Aires Herald*, 26 June.

Mitchell, D. (2008). "A Note on Rising Food Prices." Policy Research Working Paper No. 4682. World Bank, Washington DC.

Peri, G. (2009). "Cadenas de producción. Análisis de protección efectiva." Final Report. Programa de Inserción Agrícola.

Sharma, R. (2011). "Food Export Restrictions: Review of the 2007–2010 Experience and Considerations for Disciplining Restrictive Measures." FAO Commodity and Trade Policy Research Working Paper No. 32. Food and Agriculture Organization of the United Nations, Rome.

UNCTAD (2012). "Don't blame the physical markets: financialization is the root cause of oil and commodity price volatility." UNCTAD Policy Brief No. 25. September. Geneva.

Valero-Gil, J. and Valero, M. (2008). "The effects of rising food prices on poverty in Mexico." *Agricultural Economics*, 39 (s1): 485–496.

Warr, P. (2008). "World food prices and poverty incidence in a food exporting country: a multihousehold general equilibrium analysis for Thailand." *Agricultural Economics*, 39 (s1): 525–537.

Yu, T.-H.E., Tokgoz, S., Wailes, E. and Chavez, E. (2011). "A quantitative analysis of trade policy responses to higher world agricultural commodity prices." *Food Policy*, 36 (5): 545–561.