International Market Access and Poverty in Argentina

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This paper examines the impact of access to international agro-manufacture markets on poverty in Argentina. Estimates from the literature suggest that expanded market access would cause the international price of Argentine exports of agro-manufactures to increase by between 8.7 and 15.9 percent. I explore two poverty effects caused by these price changes: on food expenditure and on wages. Using a household budget survey, I estimate the impact of higher food prices on the Argentine poverty line. Using a labor force survey, I estimate the responses of wages to changes in export prices. My main finding is that market access would cause poverty to decline in Argentina. From a national head count of 29.26 percent, the poverty rate would decline to between 28.28 and 28.80 percent. This means that between 131,000 and 343,000 Argentines would be moved out of poverty.

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1 Introduction

This paper investigates the poverty impacts, in developing countries, of agricultural trade reforms in the developed world. The reforms that I explore here are related to the ongoing discussion at the Doha Round that seeks to eliminate agricultural protection in international markets. Specifically, developed countries are expected to reduce subsidies, tariffs and non-tariff barriers on cereals and agricultural manufactures (dairy products, beef, oils). As a result, the international prices of these goods are expected to increase. In a typical developing country, there will be two measurable poverty effects: on the poverty line, through changes in the prices of consumption goods, and on household income, through changes in factor prices. On the expenditure side, foreign trade policies affect international and domestic prices of agricultural and agro-manufactured goods and thus the expenditure needed to purchase the poverty bundle (particularly in food). On the income side, the price changes faced by producers cause changes in relative factor demands and in relative factor prices and thus in household labor income. In the end, poverty is affected. Some households may be moved out of poverty and some others may be moved into poverty depending upon the induced changes in wages and the induced changes in food prices. Different developing countries will be affected in different ways: while net food importers will likely be hurt by lower protection in agriculture, net producers will be benefited. In this paper, I illustrate the nature of these poverty impacts in Argentina, a country with a clear comparative advantage in agriculture. This case study is thus relevant because if any positive effects from the Doha Development Agenda are expected, they are bound to show up in countries like Argentina.

My estimation of the poverty impacts of the enhanced agricultural export markets comprises three steps. Since the main consequence of trade liberalization is greater international market
access for Argentine products, in the first step I calculate the changes in the prices of agro-manufactured exports caused by foreign trade reforms in the developed world. In the second step, I assess the change in the real income of the average Argentine worker. To do this, I estimate wage price-elasticities (measuring the responses of wages to price changes) and update the poverty line. Finally, in the third step, I use the policy-induced price changes, the estimated wage price-elasticities and the shift in the poverty line to predict the real income that would hypothetically be earned by each Argentine household after the trade reforms. To study the poverty impacts, I compute pre- and post-policy head-count ratios (i.e., the proportion of the population with an income lower than the poverty line).

The main finding of this paper is that agricultural market access would cause poverty to decline in Argentina. Based on estimates reported in the related literature, I establish that agricultural trade liberalization is indeed associated with increases in the prices of agro-manufactured Argentine exports. This leads to a higher poverty line, which tends to increase poverty, and to higher wages and household income, which tends to decrease poverty. In Argentina, the impacts on wages and income are larger than the impacts on consumption prices. As a result, the net effect of trade liberalization is poverty-reducing. From a national head count of 29.26 percent in 1998, the poverty rate would decline to between 28.28 and 28.80 percent. Poverty would drop nationwide, with larger declines observed in initially poorer regions.
2 Poverty in Argentina

The poverty measure used in this paper is the head count ratio, $HC$, defined as the fraction of the population with an income below the poverty line $z$. Letting $HC$ stand for the head count, I define $HC = \frac{1}{N} \sum_{i} 1_{\ln(y_i) < \ln(z)g}$, where $N$ is total population, $y_i$ is income, and $1_{fg}$ is an indicator function that takes the value of one if the argument within brackets is true. The poverty line $z$ is the level of income needed to purchase the poverty consumption basket, which includes food items that satisfy a minimum caloric and energetic intake, and non-food essential items (clothing, housing, health and education). The poverty line is measured so as to account for the different caloric requirements of individuals with different characteristics, such as sex and age. This means that $z$ and individual income, $y_i$, are measured in per equivalent adult units (Deaton, 1997). In Argentina, the National Institute of Statistics and Census (INDEC) constructs poverty lines and per equivalent adult scales (INDEC 2002).

At the national level, the poverty rate in Argentina in 1998 was 29.26 percent. There are substantial regional differences in the country, both in the poverty rate and in the distribution of income. The head count was 23.3 percent in Greater Buenos Aires, 27.3 percent in Pampa, 36.4 percent in Northeast, 40.6 percent in Northwest, 27.5 percent in Cuyo, and 18.3 percent in Patagonia.

3 Theory: Poverty Impacts

The poverty analysis requires a comparison of the proportion of individuals in poverty before and after the simulated foreign policy reform. Given a poverty line $z$, the head count ratio is given by $F(z)$, where $F(\cdot)$ is the observed cumulative distribution function of income before
the trade reform. Let \( F(\cdot) \) be the cumulative distribution function of the post-reform income and let \( z \) be the updated poverty line. The post policy head count ratio is therefore \( F(z) \).

Accordingly, a trade reform lowers poverty if \( F(z) < F(\cdot) \).

To see the different channels through which trade affects poverty, it is convenient to define the head count as

\[
HC = \int_0^Z f(y) \, dy,
\]

where \( f(\cdot) \) is the density of per equivalent adult income associated with \( F(\cdot) \). Let \( I \) be the policy parameter that represents the level of protection on agro-manufactured products in developed countries. Differentiating \( HC \) with respect to \( I \), I get

\[
\frac{\partial}{\partial I} HC = f(z) \frac{\partial z}{\partial I} + \int_0^Z \frac{\partial}{\partial I} f(y) \, dy.
\]

A change in trade policy has two effects on poverty: a change in the poverty line and a shift in the distribution of income. Details follow.

3.1 Changes in the Poverty Line

The first term on the right hand side of (1) measures the impact of a foreign trade reform on the poverty line: a change in \( I \) affects consumer prices and therefore the cost of purchasing the poverty bundle. Assuming the poverty line \( z \) increases by \( \frac{\partial z}{\partial I} \), \( f(z) \) is a measure of the increase in the head count ratio (conditional on a given density). For a trade reform that increases Argentine export prices, this effect will be positive (i.e., poverty-increasing).

In general, the poverty bundle comprises both food and nonfood items. The identification of a bundle of food items that would allow different individuals to achieve a minimum caloric intake defines the indigence line (or extreme poverty line). This is the amount of money needed
to purchase these minimum calories. To determine the poverty line, expenses on basic non-food items, such as clothing, health, education, etc., are added. The poverty line can thus be defined as

\[ z = \sum_g p_g q_g \]

where \( p_g \) is the price of good \( g \), and \( q_g \) is the quantity determined in the construction of the poverty line. Holding the required quantities constant, the change in the (log) poverty line caused by a change in the price of good \( g \) is given by

\[ \ln z = \sum_g \ln p_g q_g \]

where \( g \) is the weight attached to good \( g \). In deriving these changes in the poverty line, I made two implicit assumptions. First, I kept the quantities consumed constant. This corresponds to a first order approximation to the true change in welfare, as in Deaton (1997). Second, I do not allow changes in the prices of non-tradable goods to adjust (See Porto, 2006).

### 3.2 Shifts in the Distribution of Income

The second poverty impact of a change in foreign trade policy is given by the shift in the distribution of income. To see this, let the total income of household \( h \) be

\[ Y^h = \sum_m w^h_m + k^h \]

where \( w^h_m \) is the wage earned by household member \( m \) (head and non-head), and \( k^h \) is non-labor income, including profits, returns to specific factors and transfers.

Argentina is a highly urbanized country (over 85 percent of the population lives in urban areas). Further, the survey data that I use in the empirical section captures employment in urban areas only. For these reasons, in the rest of the paper, I focus on the effects of trade on wages \( w^h_m \). In particular, I am not able to study impacts in rural areas, return to land or farm profits. In addition, I do not consider the role of \( k^h \) because non-labor income is very badly
measured in the data. The proportional changes in the total income of household \( h \) is given by

\[
\frac{dY^h}{Y^h} = \frac{X}{\ln p_a} \sum_{m} w_{hm} \frac{\partial \ln p_a}{\partial \ln p_a} \; ;
\]

where \( w_{hm} \) is the elasticity of the wage earned by member \( m \) in household \( h \) with respect to the price \( p_a \), and \( h_m \) is the share of the labor income of the member \( m \) in total household income.\(^2\)

In a small open economy, there is a theoretical general equilibrium relationship between traded good prices and factor prices. In a two-good, two-factor model, this relationship is established in the Stolper-Samuelson theorem: an increase in the relative price of a traded good causes a more than proportional increase in the price of the factor intensively used in its production. For multidimensional models, it is only possible to predict correlations between movements in factor prices and movements in product prices (Dixit and Norman, 1980). Similar caveats apply when factor supplies are endogenous (Dixit and Norman, 1980). Learning the signs and magnitudes of these correlations becomes an empirical question and I deal with this in section 4 below.

For a policy change from \( e \) to \( e \), the change in the income of household \( h \) can be estimated with

\[
b_y^h = Y^h \sum_{m} h_m b_{w_{hm}} b \ln p_a( \; ; e ) ;
\]

where \( b \ln p_a( \; ; e ) \) is the predicted change in the price of agro-manufactured exports that is caused by the change in policy, and \( b_{w_{hm}} \) is the estimated wage price-elasticity.
4 Estimation

Conceptually, there are three links in the methodology that I use in this paper. The initial step is a trade shock, i.e., a foreign trade reform, which causes a change in the domestic prices of agro-manufactured exports in Argentina. The second step is the response of the labor income of Argentine households and the updating of the poverty line. The third step comprises the poverty impacts (comparing before and after head count ratios).

4.1 Changes in the Prices of Agro-Manufactured Exports

I begin with the changes in the international prices of typical agro-manufactured exports of Argentina, such as dairy, beef, oils and fats, and mills products. I assume that Argentina is a small open economy that faces exogenously given prices for these goods. Thus, the domestic price of agro-manufactured exports is \( p_a = p_a(\text{t}) \), where \( p_a \) is the international price of these goods. The trade policy parameter is determined by the level of tari and non-tari protection, production support and export subsidies in large developed economies. By any standards, is high. Indeed, Argentina has always faced highly distorted markets for agro-manufactured products. For most of these goods, trade intervention takes the form of a tari rate quota, which is a two-tier tari structure. Argentina is assigned a quota and imports of goods within this quota pay a relatively low tari. Out of quota imports are subject to much higher and often times prohibitive tari s. There are also a number of non-tari barriers, such as standards, technical barriers, as well as subsidies to domestic production and exports. All these policies cause international prices to decline and restrict the market access of Argentine products.

To provide some evidence on the value of , I use the OECD (2000) methodology that
produces the tari equivalent of ad-valorem taris on in-quota imports, of taris on out-of-quota imports, and of specific taris. In 1999, for example, the average tari on agro-manufactured goods was 6.4 percent in the United States, 18.1 percent in Canada and 21.3 percent in the European Union. The extensive subsidies to production and exports in many developed countries produce even larger distortions.

What magnitudes of price changes can be expected after episodes of trade liberalization (both tari and subsidy cuts) in the developed world? Instead of setting up an empirical model of price changes (which would be beyond the scope of this paper), I use estimates from the available literature. There are essentially two polar approaches that can be used to estimate price changes: to recover demand and supply elasticities from the data, or to calibrate CGE models. The elasticity methodology is based on the econometric estimation of structural parameters and it is very data intensive. The CGE modeling, in contrast, relies more on modeling assumptions but allows for a more thorough computation of economic responses. For my purposes, I use empirical findings on these two strands of literature to define a lower and an upper bound for the price changes.

One recent paper that estimates the responses of equilibrium prices of agricultural products in international markets is Hoekman, Ng, and Olarrea (2004). The authors estimate the parameters of import demands and export supplies for different goods in different countries and use these parameters to solve for the equilibrium prices. To calculate the price responses of key exports of agro-manufactured products in Argentina, I combine the estimates from Hoekman et al. with changes in that capture the elimination of tari protection and domestic support (export and production subsidies) in developed countries. The first column of Table 1 reports these price responses. The largest price increases are observed in Dairy Products (17.8
percent), Mills Products (17.4 percent), Beef (17.3 percent) and Oils and Fats (8.7 percent).

Averaging these individual price changes (weighted by Argentine exports), I get an estimate of the aggregate price change for agricultural manufactured products of 15.9 percent. This defines the upper bound.

Beghin et al. (2002), on the other hand, perform a CGE study of the responses of the international prices of agro-manufactured goods to a foreign trade reform that, as Hoekman et al., includes the elimination of both trade protection and domestic support. The second column of Table 1 reports the increase in prices: 10.4 percent in Beef, 9 percent in Sugar, 8.3 percent in Dairy Products, and 2.2 percent in Oils and Fats. The average price change (weighted by Argentine exports) is estimated at 8.7 percent. This defines the lower bound.

4.2 Updating the Poverty Line

To estimate the change in the poverty lines induced by the above price changes, I need to estimate equation (2). Let \( b \ln p_i(\cdot) \) be the price changes of agro-manufactured product \( i \) arising from the foreign trade reforms. The poverty line \( z \) can be updated as

\[
(5) \quad b \ln z = \sum_{i=1}^{2} a_i b \ln p_i(\cdot);
\]

To estimate the weights, \( b_i \), I use budget shares. Since the pattern of consumption varies greatly by level of income, rather than using averages across all households, budget shares of households in a neighborhood of the poverty line are needed. Due to small sample problems, however, it is generally necessary to define a "reference" group, a set of households with relatively low
income but that are yet not poor. In practice, I estimate \( b_i \) with the average budget share spent on different agro-manufactures (as in Table 1) by households in the second quintile of the distribution. To account for regional differences in consumption, I do this separately for each of the six Argentine regions, the Greater Buenos Aires, Pampa, Northeast, Northwest, Cuyo, and Patagonia.

The changes in the regional poverty lines are reported in Table 2. As expected, the induced increase in the export price of agro-manufactured goods causes the poverty line to increase. In the lower bound, the highest increases in the poverty lines occur in Northwest and Northeast (3.8 and 3.6 percent, respectively) and the lowest increase is observed in the Greater Buenos Aires (2.8 percent). In the upper bound, the highest increase of 6.8 percent is observed in Northwest and the lowest, 5 percent, in the Greater Buenos Aires.

INSERT Table 2 Here

4.3 The Wage Price-Elasticities

In order to derive the wage price-elasticities, I begin by laying out a simple model that illustrates how factor prices are determined in general equilibrium (see Porto, 2003). Equilibrium wages result from the behavior of workers and firms: Workers supply labor and firms demand labor and the equilibrium wages result from equating the supply and demand wage functions. In a model with constant returns to scale, perfect competition and as many traded goods as factors, wages are fully determined by the prices of the traded goods, which are exogenous (See Dixit and Norman, 1980, for details). Under these assumptions, I can write

\[
(6) \quad w^j = w^j(p; \ ; );
\]
where \( p \) is a vector of prices, \( x \) is a vector of expenditure shifters (such as individual characteristics) and \( \eta \) is a vector of profit shifters (variables that affect the decisions of firms and technical change). This relationship, which defines the wage price-elasticities (that is, the response of wages to price changes), can be estimated with data on wages, prices of traded goods, individual characteristics and controls for technical change.

The approach followed here attempts to recover the wage price-elasticities using household surveys as a source of data on individual labor income. In Argentina, the necessary data are available in the Permanent Household Survey (Encuesta Permanente de Hogares, EPH). The EPHs are labor market surveys with information on wages, employment, hours worked, and individual and household characteristics.

The main problem with using survey data to estimate the wage price-elasticities is the lack of price data at the level of the household. To deal with this, I exploit the time variation in prices and surveys. In fact, the EPH surveys are gathered in May and October every year, so that sixteen surveys from 1992 to 1999 (two per year) can be used to identify the elasticities. This method adapts techniques generally used in demand analysis (Porto, 2006). Wolak (1996), for instance, estimates a system of demand elasticities using the time variation in CPS surveys in the United States. Similarly, Deaton (1997) develops methods to estimate demand elasticities using regional variation in unit values. On wages, Ravallion (1990) estimates wage responses to food prices in Bangladesh, while Goldberg and Tracy (2003) use CPS wage data and industry specific exchange rates to estimate the factor income effects of exchange rate movements.

The relationship between wages and prices in (6) is possibly different for different types of labor because the response of wages to the same price may depend, in principle, on skill intensities. I define three labor factors: unskilled labor (comprising individuals with only
primary education), semiskilled labor (comprising individuals having completed secondary education), and skilled labor (comprising workers holding college degrees). Let $E^j$ be the $1\times 3$ $j$th row of a matrix $E$ of dummy variables for the three educational categories of labor. I capture the differential impact of prices on the wages of individuals with different skills with the following model

$$\ln w^j = E^j \ln p^a + E^j + z^{10} + \varepsilon^j;$$

where the variable $\ln p^a$ is the logarithm of the international price of agro-manufactured exports published by the Argentine Institute of Statistics and Census. In (7), $E^j$ is the vector of wage-price elasticities, one for each of the three educational categories. The regression model includes the educational categories separately, with parameter vector $\alpha$ (the returns to schooling), and a vector $z^j$ of individual characteristics like age (and age squared), gender and marital status. The model also controls for the prices of non-agricultural exports and of imports of consumption and capital goods. In a given time period, all households face the same prices. The index $j$ attached to the prices in (7) captures the fact that I work with different surveys in time periods with different prices. The estimated wage-price elasticity for individual $j$ with respect to price $p_a$ is given by $E^j \beta$. The error term is $\varepsilon^j$. Since all households in a given survey sample face the same prices, I correct the estimated standard errors for clustering effects (Kloek, 1981).

In the model specified in (7), equilibrium wages are determined by individual characteristics (to account for the heterogeneity of labor supply) and by a vector of export and import prices (to account for labor demand). In addition, I include time trends in the regressions, interacted
with the educational dummies, that capture technical change that may affect wages differently by skill levels.

Table 3 reports the wage price-elasticities obtained from the estimation of (7). To allow for more flexibility in the model, I estimate a different wage equation for each of the six regions of the country. Overall, I find that the prices of exportable agricultural manufactures impact positively on wages for workers of every skill and in every region. In addition, notice that the estimated elasticities do not vary much by skill levels or by regions. For unskilled labor, wages respond by between 0.69 to 0.71 percent in all regions, except in Northeast, where the elasticity is slightly higher, 0.85. For the case of semiskilled labor, the elasticities vary from 0.57 in Great Buenos Aires to 0.81 in Northeast. Finally, the wages of skilled workers react by a minimum elasticity of 0.41 in Patagonia, to 0.82-0.84 in Great Buenos Aires and Pampa. The finding that the wages of skilled and unskilled workers react in the same direction to these trade liberalization episodes is perfectly consistent with the theoretical correlations between factor prices and product prices since I do not restrict the model to display Stolper-Samuelson effects.

INSERT Table 3 Here

The bottom panel of Table 3 reports the coefficients of the time trends, interacted with the educational dummies (so as to measure different types of technical change). The trend coefficients are positive and increasing in the skill level. These controls thus capture the increasing inequality in the functional distribution of income, a characteristic feature of the Argentine economy during the 1990s.
5 Poverty Impacts

The poverty analysis follows from a simple simulation: I compare the fraction of the population that lived in poverty in 1998 with the fraction of the population that would be poor after the trade reforms in the developed world. The head count ratio before the reform is simply $F(z)$. The head count ratio after the foreign trade reforms, $F(z^*)$, is the proportion of individuals with a simulated per equivalent adult income below the updated poverty line $z^*$. There are two such ratios, one for each of the lower and upper bounds for the price changes of agro-manufactured exports. For each bound, I predict the hypothetical income of the household by multiplying the estimated wage price-elasticities (Table 3) with the changes in prices (Table 1), taking into account the share of income derived from wages as in equation (4). I then compare this predicted income with the poverty line $z^*$.

Results are listed in Table 4. Panel A displays the poverty simulations under the lower bound for the price changes and Panel B, under the upper bound. The main finding on the paper is that agricultural market access would cause poverty to decline in Argentina (see columns 1 and 4| and 5| in Table 4). From a national head count of 29.26 percent, the poverty rate would decline to 28.80 percent in the lower bound or to 28.28 percent in the upper bound. This means that between 0.46 and 0.98 percent of the population would be moved out of poverty by a set of foreign trade reforms that raises agro-manufactured export prices. The actual number of individuals affected is non-trivial: from 161 thousand, in the lower bound, to 343 thousand Argentines, in the upper bound, would abandon poverty as a result of higher market access.

Table 4 reports a decomposition of these aggregate poverty changes into the two main
impacts described in section 3: the right shift in the poverty line and the right shift in the
distribution of income. The trade reforms generated in the developed world imply higher prices
of consumption goods and thus lead to a higher poverty line and to higher poverty (column
2). Instead, higher prices of agro-manufactured export goods cause wages to increase and thus
lead to higher income and lower poverty (column 3). In the case of Argentina, a country with a
clear comparative advantage in agro-manufactures, poverty would decline in the end (column 4).
Notice, however, that results may be different in countries that are net importers of these goods
(so that the adjustment of the poverty line would produce larger impacts than the adjustment
of nominal wage income).

Poverty would decline in all regions. The largest poverty declines would be observed in
Northeast and Cuyo: in the lower bound for price changes, the head count would decrease by
0.70-0.86 percentage points; in the upper bound, the reductions in the head count would be of
1.62 and 1.23 percentage points, respectively. In Pampa, Northwest, and Greater Buenos Aires,
the decline in poverty would be mild, around 0.30 percentage points in the lower bound, and
between 0.63 and 0.93 in the upper bound. Poverty alleviation would be lowest in Patagonia,
the regions with the lowest initial head counts.

The intuition for these results is straightforward. On average, labor income would react
more than consumer prices. As a result, the real income of households near the poverty lines
would increase and the head count would decrease. To understand the regional pattern of
changes in the poverty count, notice that, first, there are only small differences in the changed
in the regional poverty lines, but, second, that unskilled labor is more abundant in regions like
Northeast, Northwest and Cuyo. Since unskilled workers are more likely to be poor in the first
place, poverty alleviation is expected to take place more prominently among these households.
6 Conclusions

This paper has examined the poverty impacts of increased agricultural market access for Argentine exports. Market access could be secured by a set of foreign agricultural trade policies, such as the elimination of agricultural subsidies, trade tariffs, and non-tariff barriers. In this paper, market access is measured by estimating the response of the international price of agro-manufactured exports to such trade reforms.

Based on estimates from the available literature, a lower and an upper bound for the price responses have been adopted. These price changes have two measurable effects on Argentine households: an effect on consumer prices of food items, and an effect on wages. Higher prices of agro-manufactured exports would make the food basket more expensive, which works towards increases in poverty, but would boost labor demand and wages, which works towards poverty alleviation. In the end, I have found that the labor income effect is higher than the poverty line effect, and poverty would decrease as a result (by between 0.46 and 0.98 percentage points).

It is often been argued that market access to international agricultural market would improve living conditions in developing countries. One lesson from this paper is that this argument is not necessarily true since higher household income can be outweighed by higher consumer prices. This finding is consistent with the claim that, in the presence of agricultural trade liberalization, net food exporters like Argentina stand to win, while net food importers lose. In Argentina, a country with a clear comparative advantage in agriculture, I have found that the poverty impacts are important but perhaps not as large as a priori expected.
References


Notes

1. The baseline period to carry out the poverty simulations is October 1998. This choice allows me to abstract from the impacts of the 2001 crisis. My analysis is not about poverty and the recent financial crisis in Argentina; see McKenzie (2004) and his references for studies on this topic. My objective is to simulate a trade policy reform along the lines of the WTO Doha Round negotiations.

2. To simplify the analysis, I assume that there is no change in unemployment and I do not measure the impacts of changes in fiscal revenue via trade taxes.

3. Since Argentina has a clear comparative advantage in primary products and in agro-manufactures, I focus on export prices rather than on import prices. The share of agro-manufactures in total exports is around 17 percent in the 2000s; the share of food imports is instead close to 3 percent. See Brambilla, Galiani, and Porto (2009).

4. The average tariff on Meat is low in the United States, around 2.7 percent, but it is high in Canada and the European Union, around 23.5 percent and 55.9 percent, respectively. Dairy Products (chapter 4) face an average tariff of 8.3 percent in the U.S., 190.3 percent in Canada, and 55.2 percent in the E.U. Imports of Oils and Fats (chapter 15) are subject to an average tariff of 4.9 percent in the U.S., 10.2 percent in Canada and 15.5 percent in the E.U.

5. In this paper, I assume that the change in international prices is fully transmitted to the domestic economy. See Nicita (2009) for an attempt to introduce imperfect pass-through in measuring the welfare impacts of trade liberalization.

6. The CGE literature on price changes from agricultural liberalization is large. I adopt the price changes in Beghin et al. (2002) because they deal with global comprehensive agricultural reforms rather than the more limited reforms of the recent Doha Development Agenda (see Hertel and Winters, 2007; Anderson and Martin, 2006).
<table>
<thead>
<tr>
<th></th>
<th>Econometric Estimation</th>
<th>CGE</th>
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<tbody>
<tr>
<td>Oils and Fats</td>
<td>8.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Beef</td>
<td>17.3</td>
<td>10.4</td>
</tr>
<tr>
<td>Dairy Products</td>
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<td>8.3</td>
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<tr>
<td>Beverages</td>
<td>14.7</td>
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<tr>
<td>Mills Products</td>
<td>17.4</td>
<td>-</td>
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<tr>
<td>Sugar</td>
<td>16.4</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>15.9</strong></td>
<td><strong>8.7</strong></td>
</tr>
</tbody>
</table>

Notes: percentage change in international prices caused by a reform that eliminates all tariff protection and all domestic support on agriculture in developed countries. (1) Hoekman et al. (2004); (2) Beghin et al. (2002).

Table 1. Estimated Changes in International Prices of Agricultural Products
### Table 2. Changes in the Poverty Lines

<table>
<thead>
<tr>
<th>Region</th>
<th>before (1)</th>
<th>lower bound (2)</th>
<th>increase (%)</th>
<th>upper bound (3)</th>
<th>increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Buenos Aires</td>
<td>5.083</td>
<td>5.111</td>
<td>2.8</td>
<td>5.133</td>
<td>5.0</td>
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<td>5.015</td>
<td>3.2</td>
<td>5.039</td>
<td>5.6</td>
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<td>5.022</td>
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<td>3.8</td>
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</tr>
<tr>
<td>Cuyo</td>
<td>4.946</td>
<td>4.977</td>
<td>3.1</td>
<td>5.000</td>
<td>5.4</td>
</tr>
<tr>
<td>Patagonia</td>
<td>5.031</td>
<td>5.061</td>
<td>3.0</td>
<td>5.083</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Notes: (1): average budget of households in the second quintile (Household Expenditure Survey).  
(3): updated poverty lines (in logs) induced by the lower bound price change.  
(4): updated poverty lines (in logs) induced by the upper bound price change.
<table>
<thead>
<tr>
<th></th>
<th>Great Buenos Aires</th>
<th>Pampa</th>
<th>Northeast</th>
<th>Northwest &amp; Cuyo</th>
<th>Patagonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unskilled</td>
<td>0.71</td>
<td>0.71</td>
<td>0.85</td>
<td>0.69</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.10)</td>
<td>(0.11)</td>
<td>(0.14)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>SemiSkilled</td>
<td>0.57</td>
<td>0.73</td>
<td>0.81</td>
<td>0.74</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.10)</td>
<td>(0.15)</td>
<td>(0.18)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>Skilled</td>
<td>0.82</td>
<td>0.84</td>
<td>0.58</td>
<td>0.74</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.16)</td>
<td>(0.19)</td>
<td>(0.21)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>Trends Unskilled</td>
<td>0.009</td>
<td>0.022</td>
<td>0.027</td>
<td>0.015</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.006)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>Trends Semiskilled</td>
<td>0.026</td>
<td>0.031</td>
<td>0.032</td>
<td>0.024</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.007)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Trends Skilled</td>
<td>0.038</td>
<td>0.041</td>
<td>0.047</td>
<td>0.036</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.008)</td>
<td>(0.007)</td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
</tbody>
</table>

Notes: cluster-corrected standard errors within parenthesis. Significance levels: *, 10 percent; **, 5 percent, ***, 1 percent. The log of wages is regressed on the log of the prices of agricultural exports. The regression includes also a trend interacted with education dummies (to capture technological change), educational dummies, import prices, and individual controls such as age, age squared, marital status and gender dummies.

Table 3. Wage Price-Elasticities. Agricultural Export Price
<table>
<thead>
<tr>
<th></th>
<th>Initial Poverty Rate (1)</th>
<th>Ex-Post Poverty Rates Adjusting Poverty line (2)</th>
<th>Adjusting Income (3)</th>
<th>Total (4)</th>
<th>Total Poverty Changes (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A) Lower Bound for Price Change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>29.26</td>
<td>30.46</td>
<td>27.56</td>
<td>28.80</td>
<td>-0.46</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>23.32</td>
<td>24.09</td>
<td>22.31</td>
<td>23.02</td>
<td>-0.30</td>
</tr>
<tr>
<td>Pampa</td>
<td>27.30</td>
<td>28.23</td>
<td>25.71</td>
<td>26.98</td>
<td>-0.32</td>
</tr>
<tr>
<td>Northeast</td>
<td>36.36</td>
<td>37.77</td>
<td>34.00</td>
<td>35.50</td>
<td>-0.86</td>
</tr>
<tr>
<td>Northwest</td>
<td>40.55</td>
<td>42.48</td>
<td>38.70</td>
<td>40.24</td>
<td>-0.31</td>
</tr>
<tr>
<td>Cuyo</td>
<td>27.48</td>
<td>28.95</td>
<td>25.53</td>
<td>26.78</td>
<td>-0.70</td>
</tr>
<tr>
<td>Patagonia</td>
<td>18.28</td>
<td>19.11</td>
<td>17.38</td>
<td>18.06</td>
<td>-0.22</td>
</tr>
<tr>
<td><strong>B) Upper Bound for Price Change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>29.26</td>
<td>31.30</td>
<td>26.38</td>
<td>28.28</td>
<td>-0.98</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>23.32</td>
<td>24.58</td>
<td>21.58</td>
<td>22.56</td>
<td>-0.76</td>
</tr>
<tr>
<td>Pampa</td>
<td>27.30</td>
<td>29.01</td>
<td>24.77</td>
<td>26.37</td>
<td>-0.93</td>
</tr>
<tr>
<td>Northeast</td>
<td>36.36</td>
<td>38.88</td>
<td>32.07</td>
<td>34.74</td>
<td>-1.62</td>
</tr>
<tr>
<td>Northwest</td>
<td>40.55</td>
<td>43.62</td>
<td>37.25</td>
<td>39.92</td>
<td>-0.63</td>
</tr>
<tr>
<td>Cuyo</td>
<td>27.48</td>
<td>29.89</td>
<td>24.32</td>
<td>26.25</td>
<td>-1.23</td>
</tr>
<tr>
<td>Patagonia</td>
<td>18.28</td>
<td>19.60</td>
<td>16.36</td>
<td>17.84</td>
<td>-0.44</td>
</tr>
</tbody>
</table>

Notes: Poverty impacts of trade liberalization in the developed world. The lower bound for the price change of Argentine exports of agro-manufactures is 7.5 percent; the upper bound is 15.4 percent.
Column (2): Ex-post poverty rate of allowing adjustments in the poverty line while keeping nominal income constant.
Column (3): Ex-post poverty rate of allowing adjustments in nominal wage while keeping the poverty line constant.
Column (4): Ex-post poverty rate of allowing adjustments in the poverty line and in nominal household income.
Column (5): Overall poverty changes (4)-(1).

Table 4. Changes in Poverty following Agricultural Liberalization
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