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Assessment of Poverty Impacts of Trade Liberalization by Integration of Household Analysis in CGE Models: Possibilities and Perspectives

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Abstract: In recent years, poverty reduction has become a topic of increasing concern in trade negotiations lead mainly by the World Trade Organization (WTO) and the World Bank. The linkages between trade liberalization and poverty analysis are a growing economic research area, which is reflected in the broad diversity of approaches developed for this study.

Generally, the effect of liberalization on price changes is considered an important pathway to understanding how liberalization affects the poor. One of the methods currently applied for measuring the impact of trade liberalization on poverty alleviation is Computable General Equilibrium (CGE) modelling coupled with household modelling. CGE modelling simulates the international economic environment that produces the change in national prices, and household modelling assesses the effects of prices changes at the household level.

The theoretical approach of this study aims to describe the household structure and the main features to be considered in analyzing the effects of trade liberalization on households. Current household analysis approaches are reviewed as well.

The empirical approach of this research is to analyze simulations for Mexico obtained with a GTAP Model extension. The extended GTAP version developed in this contribution splits the private household system of GTAP into several different Mexican household types, according to expenditure behavior.

Keywords: Trade liberalization, developing countries, poverty alleviation, GTAP macro-micro analysis.

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1. Introduction.

In recent years, poverty reduction has become a main topic of discussion in trade negotiations. At the 2001 Doha conference of the World Trade Organization (WTO), poverty alleviation tied to trade liberalization was identified as a major objective for future multilateral trade agreements with developing countries. Several other international conventions, such as the Globkom conference of 2000 in Stockholm, and the last World Bank Conference in 2003 on scaling up poverty reduction, also included poverty measurement as a central point of their agendas.

This paper pursues two main objectives. The first objective is to explore the need for a CGE model capable of capturing and simulating the responses of different household types to specific economic policies, e.g., trade liberalization. The second main objective is to describe the extension and adaptation of an existing Computable General Equilibrium (CGE) model to build different types of households.

In this paper, the Global Trade Analysis Project (GTAP) model is used to simulate the effects of trade liberalization on Mexican households. For this purpose GTAP is used to generate the price changes in commodities and subsequently, a previously developed GTAP model application (Brockmeier, 2003) is extended and applied to register changes in household expenditures. The GTAP model application developed by Brockmeier creates a Social Account Matrix (SAM) structure from the GTAP database.

This paper is organized as follows: Section 2 quotes the importance of the analysis of trade liberalization and its impacts on poverty. Section 3 describes the most important features and recent approaches of household analysis. Section 4 describes the economic situation in Mexico, facts of poverty and inequity in Mexico, and the structure of Mexican households. Section 5 explains the theoretical framework, characteristics and some basic features of the GTAP and a SAM model. Section 6 presents the results and their analysis and the sensitivity of the results to several assumptions. Finally, Section 7 summarizes main conclusions from the results.

2. Poverty and Trade Liberalization

As a result of the continuous efforts of economists, different approaches have been developed. Hertel *et al.* (2003) bind multilateral trade liberalization and its impacts on poverty by

integrating household strata according to income specialization. Hertel *et. al.* create an approach with a high extent of tractability and comparability across countries.

Trade liberalization and analysis of poverty are complex topics, as is the analysis of linkages between them. As pointed out by Winters and McCulloch (2004), there are several factors causing poverty, and even within defined groups there are huge differences in the circumstances of individual poor households. Furthermore, Winters and McCulloch (2004) examine the response of households to different market adjustments. They consider the effect of liberalization on price changes as an important pathway through which poor households are affected. The main point of their study is to analyze the extent to which any price gets passed on to the poor, and how households are able to respond to the price (and other) changes that reach them. Key analysis questions are whether households respond favourably to price movements (e.g., in the price of an agricultural output); and whether price changes will have the same effects on poor households as on wealthy households.

Evidence of the increasing importance of the effects of trade liberalization on poverty is presented in the book “Poverty and the WTO,” edited by Hertel and Winters in 2005. The book contains case studies of developing countries and simulates consequences of the Doha Development Round. These case studies use a variety of innovative techniques to establish the potential impacts of the Doha Round on different household groups and, in some cases, different regions within the country. The focus countries are Bangladesh, Brazil (two studies), Cameroon, China (two studies), Indonesia, Mexico, Mozambique, the Philippines, Russia, and Zambia (Hertel, and Winters, 2005).

3. Household Analysis

Household analysis provides information on variables such as consumptive behaviour, sources of income and accessibility to markets. The impact of these factors (including prices, transfers or access to schools and clinics) at the individual household level are either caused or influenced by policy (Deaton, 1997). In some studies these features have been coupled to an economic model in order to predict effects of trade liberalization on household behavior. One representative study of this approach was developed by Levinsohn, Berry, and Friedman (1999), who examine how the Indonesian economic crisis affected poor households in that country. The

authors combine 1993 consumption data from the Socio Economic Indonesian Survey for 58,100 households with price changes due to the crisis in 1997-1998 to compute household-specific cost-of-living changes. The main results show that very low income households were not insulated from the international shocks, and in fact, tended to be hurt the most. Regardless whether urban or rural, households at lower expenditure levels experienced larger cost-of-living increases. Additionally, the impacts of the crisis on the consumer prices were greater for urban than for rural areas, and greatest overall for the urban poor (Reimer, 2002).

In 2002, Reimer classified studies focussing on the different impact of liberalization on poverty. This classification contemplates four different categories: the first approach, called *cross-country regression analysis*, correlates trade, growth, income, poverty and inequity variables observed at the national level among different countries. The second category encompasses a wide array of *partial equilibrium* and/or *cost-of-living* approaches. The third category involves a *general equilibrium* model that accounts for commodity, terms of trade and factor market effects. The fourth category represents a relatively recent approach, *general equilibrium simulation*, coupled with some form of *post-simulation analysis* based on household survey data. These studies generate a sequential linking of a model based on micro-level data with a model based on macro level data.

This fourth category, also called general equilibrium simulation with post-simulation analysis, presents several advantages over other approaches: one is the use of CGE models in the first model-step. These models offer a more complete structure to simulate the general impact of trade liberalization on the national economy on long-term trends.

The approach applies a two-step analysis. In the first step, a GE model is used to simulate the specific market liberalization shock to obtain sectoral and commodity price changes. These price changes are the result of economic trade changes. In the second step -- or post simulation analysis -- a micro model based on a household survey is used to monitor how these price changes influence the household income-expenditure patterns. In this phase, the use of national household surveys to obtain income-expenditure patterns is quite common. These changes are compared with background values in order to assess the changes in poverty indexes. In many cases, the second step involves the use of a country-household survey.

A limitation of post-simulation analysis is that reactions of households to commodity and factor prices in the post simulation are not transmitted back to the general equilibrium model.

One of the first studies following this approach was launched by Robilliard and Bourguignon (2001). In this research, the effects of the 1997 economic crisis on poor households in Indonesia were analysed. In the first step, the authors used a single region Social Accounting Matrix capturing 38 sectors and 15 production factors. The post simulation analysis is a micro simulation based on a 1996 national household survey (Reimer, 2002).

This micro simulation depicts the way in which households generate their income by focusing on how earnings are determined, and how occupational choices are made. Workers are classified into eight groups: skill, gender and area of residence. The model estimates wage worker earnings, farm and non farm worker profits, and occupational choices. Labor supply is modelled as a discrete choice between inactivity and full-time work (Reimer, 2002). The simulations provide an explanatory pathway for the crisis impacts, and also show how the Indonesian economy would have fared with the same adjustment in trade balance without the credit crisis. The authors also examine different policy options and finally discuss how some of these available policies would lead to a smaller increase in poverty (Reimer, 2002).

Hertel, Preckel, Cranfield and Ivanic (2003) make a comparative study in seven developing countries (Brazil, Chile, Indonesia, Philippines, Thailand, Uganda and Zambia), simulating the possible results of full trade liberalization. The first involves the use of the GTAP model for the simulation of complete elimination of merchandise tariff barriers: agricultural export subsidies (obtained from WTO for 1998) and textile and apparel (obtained from World Integrated Trade Solution (WITS), United Nation Conference on Trade and Development (UNCTAD), and the World Bank quotas in place in 1997). The quota rents associated with restrictions on textile and apparel exports to North America and Europe are also reflected on this study. Services sectors were omitted. Modifications on the standard GTAP model were made to generate fixed to net national income. The transfers are of great importance considering that in many countries they are a significant component of income for the poorest households (Hertel, Preckel, Cranfield and Ivanic, 2003).

The second step of this research stratifies households according to primary sources of income (95% or more of their income): in agricultural enterprises, non-agricultural enterprises, wage/salary labor, and transfers. All other households are classified as diversified, and therefore likely to be less vulnerable to trade shocks. This study brings out an important aspect: the differences in shares of earnings are generally more important in exploring the changes in

marginal household's welfare than the differences in their consumption profiles (Hertel, Preckel, Cranfield and Ivanic, 2003).

The main results of this research show that the aggregate measure of poverty is reduced in Indonesia, Philippines, Thailand, Uganda and Zambia, while it is increased in Brazil and Chile. The largest percentage reduction in poverty occurs among agriculturally specialized households in Brazil and Chile (more than 30 % reductions). Poverty also falls between 7% and 9% for the agriculturally-specialized households in the Philippines and Thailand, and for wage labor households in Indonesia and the Philippines. While, poverty increases range from 5% to 11% among the self-employed, non-agricultural households in Indonesia, and the labor specialized households in Brazil and Chile (Hertel, Preckel, Cranfield and Ivanic, 2003).

In 2005, two articles tackled the effects of the Doha development agenda in case studies. Nicita (2005) analyzed the effects of the Doha Round on Mexican households. In the first phase, this research simulates the effects on prices caused by the implementation of the Doha development agenda. The simulation is estimated through a GTAP, and then mapped into the welfare function using household survey data. The households are classified as 1) urban or rural, 2) extremely poor and moderately poor and 3) according to their geographic location (North, South, Center, Mexico City, and Borders). Different scenarios on household welfare were simulated for: a) Doha development without domestic policies; b) full liberalization; c) Doha development with complementary reforms aimed at increasing productivity (or the utilization of surplus labor).

The results suggest that multilateral trade liberalization alone would have a negative, even though very small, effect on Mexican households. However, when the Doha development agenda is complemented by domestic policies aimed at increasing productivity and improving domestic price transmission, the overall effect becomes positive. The scenario contemplating full liberalization creates an improvement in the domestic price transmission resulting in a more uniform distribution of the effects, and in larger benefits for the poorest households (Nicita, 2005).

Bento de Souza Ferreira and Horridge (2005) studied the effect of the Doha Round on Brazilian households. The GTAP model is applied for the generation of price changes and the model is aggregated into 42 industries, 52 commodities, 10 households and 10 labor occupations, all of which vary by 27 regions within Brazil; the analysed year was 2001. The model simulated

changes in import prices and export demands, and excluded effects of Brazil's own tariff reductions. The results obtained were used to update wages and worked-hours in a micro-simulation model. The model then relocates jobs according to the changes in labor demand. The model follows a process of relocation (called quantum weights method) based on the weight of each worker on the labor market. Although job relocation has very little effect on the distribution of wages between the household groups, it may have considerable impact on the variance of income within a group.

The main idea of the procedure followed in this research is that a household contains one or more adults, either working in a particular sector and occupation, or unemployed, as well as dependents. Changes in the labor market create changes in the household income through the adults' occupations. In other words, if one person in a household loses his/her job, but another household member gets a new job, household income may change only slightly. Since households are considered in this study as the expenditure unit, it is expected that household spending variations will be levelled by an income pooling effect. Additionally, the loss of a job will increase poverty more if the displaced worker is the sole wage-earner in a household (Bento de Souza Ferreira and Horridge, 2005).

The results suggest that even significant shocks -- such as the implementation of the Doha Development Agenda -- do not generate changes in the structure of Brazilian poverty and income distribution. The simulated observed effects were positive but small.

4. Economic Situation in Mexico

Mexico has a free market economy with a mixture of modern and outmoded industry and agriculture, increasingly dominated by the private sector. Recent administrations have expanded competition in seaports, railroads, telecommunications, electricity generation, natural gas distribution, and airports. Per capita income is one-fourth that of the US; income distribution remains highly unequal (SE, 2003).

Mexico is the largest trading nation in Latin America, and the eighth largest in the world. GDP growth has been strong since 1996. In 2002, GDP was segregated as it follows: agriculture: 8%, industry: 26.4%, services: 69.6%, and foreign direct investment has surged into the country. Mexico's low costs of production and membership in the North America Free Trade Area

(NAFTA) make it attractive for foreign investments. The majority of Mexico's trade takes place under preferential rules, with the NAFTA remaining of paramount economic significance. In particular, Mexico's principal trade partner is the United States, which in 2000 supplied some 73% of Mexico's imports and attracted about 89% of its exports. In the same year, Canada was the second largest destination for Mexican products, accounting for some 2% of exports (SE, 2003).

4.1 Agriculture

The agriculture, livestock and forestry sector contributed four percent of Gross Domestic Product (GDP) in 2003. Agricultural land is about 75 percent rain-fed and 25 percent irrigated. In terms of land use, the major uses are: (a) agriculture occupying nearly 13 percent of total area, (b) livestock 55 percent, and (c) forestry, 23 percent. Within agriculture, annual cultivation dominates, accounting for roughly 85 percent of the total. Grains -- maize, beans, wheat, and sorghum -- occupy 80 percent of the cultivated acreage (see Table 1). The agricultural sector is characterized by low value crops and by low labor productivity (SAGARPA, 2003).

Since the mid 1990's, Mexico's participation in international trade increased significantly. Between 1990 and 1994, the share of total agricultural trade (i.e., imports plus exports) in the total value of Mexican agricultural production was about 20%, and increased to more than 35% since 1995 (Yunez-Naude, 2002).

4.2 Trade

Mexico is distinguished from developing countries by its open trade policy implemented in the last years. In 1990, Mexico signed the NAFTA with Canada and USA, which became effective in 1994. Thereafter, Mexico entered into new Trade Agreements (TA) with Chile, the EFTA, the EU, Israel, Japan, Singapore, Nicaragua, and the Northern Triangle (El Salvador, Guatemala, and Honduras). At present, Mexico has signed more than 30 TAs (WTO, 2002).

Mexico's agricultural imports have grown rapidly since 1986. Today it is the world's 7th largest importer of agricultural products. Mexico's total imports of agriculture and agri-food products for 2001 grew by more than one billion dollars, from US\$9.7 billion to US\$11.1 in 2000. During 2002, Mexico's main suppliers were: the USA (63.1%), the EU (9.7%), Japan

(5.5%), China (3.7%) and Canada (2.6%). These countries concentrate almost 85% of Mexico's total imports (see Table 2 and 3), (SE, 2005).

The major importing countries of Mexican products are the US 88.6%, Canada 2%, Spain 0.9% and Germany 0.9%. The Mexican agricultural exports that showed a significant increase between 2001 and 2002 were cocoa (82.4%), fresh fruits (71.6%), and raw tobacco (26.9%). Processed food exports that showed a significant increase in the same period were concentrated alcohol extracts (276.9%), tomato juice (128.8%), orange juice (50.6%), and frozen lobster (50.5%) (see, Table 2 and 3), (SE, 2005).

The Mexican economy is about to face considerable challenges in the coming years. On the one hand, Mexico must adjust its economic structure to foster competitiveness and to take advantage of the signed trade agreements. These adjustments should ensure that the negative effects on poor households will be less than those observed on wealthy households.

4.3 Poverty and Inequality in Mexico.

Due to the relatively high income levels, Mexico is considered a medium-development-country and the most highly developed on this category, (UNDP, 2004). Nevertheless, Mexico still has a high incidence of rural poverty (de Janvry and Sadoulet, 2000). In 2003, the Technical Committee for the Poverty Measurement indicates that 56.9% of the Mexican households are considered poor. Incidence of rural poverty is significantly higher than the incidence of urban poverty, caused by the low wages in agricultural sectors compared to the higher wages in manufacturing sectors.

Poverty in Mexico continues to be a serious issue, and is closely linked to high levels of social inequality. Mexico also has one of the World's largest inequalities in distribution of human welfare (UNDP, 2004). According to National Accounts (INEGI, 2004), in 2004 Mexico has had a Gini coefficient of 0.46. In an international report published by UNDP, Mexico is listed as one of the 20 most unequal countries included in the report (UNDP 2004). In the same year, the richest 10% of the Mexican households earned 36.5% of the national income, while the poorest 10% of the households only earned 1.6% of the total national income (INEGI, 2005).

4.4 Characteristics of Mexican Households

Table 4 lists the household survey data on main earning sources for Mexico. The data come from the Mexican Statistical Agency (INEGI) and are drawn from National Employment Survey (INEGI, 2005) and the National Household Income and Expenditures (INEGI, 2004).

Households with the lowest income are represented in the Decile I, households with the highest income in the Decile X. At the national level, wages are regarded as the most important source of income for all deciles. Also, 76% of the total households get 54% of the national income through wages (Table 4). This group is followed by family business (e.g., agricultural profits, fishery, manufacture, trade, services, and others), which in total account for 14% of the national income. Furthermore, income earned by the first 6 household deciles represents 26.8% of the national income, the next 3 deciles stand for 37.6% and Decile X with the highest income, namely 35.6% of the entire income for 2004 (Table 4).

Non-monetary income sources (e.g., auto-consumption, payment in kind, barter, imputed rent) in all household categories represent 16.7% of the total national income. Interestingly, all income sources participate in each household category. In other words, households in the same category (maybe earning the same amounts) might comprise different income sources, or might have the same sources but different earning patterns.

5. Theoretical Framework

5.1 Standard GTAP-Model

The quantitative approach used in this study to estimate the effects of trade liberalization on household welfare relies on the comparative-static multi-regional GTAP model. The model possesses a structure able to simulate links among national economies; private, intermediate and government consumption; trade, and services. The model is based on the Constant Difference Elasticity (CDE) demand theory for handling private household preferences. Since the GTAP database is designed for broad country coverage, the standard model structure presents only one representative household per region. Further features of the model are perfect competition in all markets, as well as a profit and utility maximizing behavior of producers and consumers. All policy interventions are represented by price wedges (Hertel, 1997).

5.2 Household System in GTAP

The applied model considers a private consumption demand system in CDE form. The CDE expenditure function was introduced by Hanoch, (1975), who discussed models that were more general than the Constant Elasticity of Substitution (CES) but less general than a flexible functional form, for example, the translog. The CDE is based on the assumption of implicit additivity, which, in the case of N commodities, constrains the symmetric $N \times N$ matrix of elasticities of substitution to depend on only N parameters. The CDE also allows for a richer representation of income effects in the demand system. In particular, marginal budget shares may vary with expenditure levels.

In general, an expenditure function can be represented in the following manner:

$$E = G(p,u) = \{ \min p'x : f(x) \geq u \},$$

where p and x are N -dimensional vectors of prices and demands, u is utility, and E is minimum expenditure. The function $f(\cdot)$ represents utility, and $G(\cdot)$ is the minimum expenditure function. Function $G(\cdot)$ is homogeneous of degree 1 in prices, allowing the following normalization of prices and expenditure by minimum expenditure:

$$G(E^{-1}p,u) = G(z,u) = 1,$$

where the z 's are the normalized prices. To obtain the CDE expenditure function, Hanoch (1975) restricts the number of substitution effects to N by imposing additivity in the normalized prices. The implicit function proposed takes the form:

$$G(z,u) = \sum_{i=1}^N B_i U^{e_i b_i} \left(\frac{P_i}{X} \right)^{b_i} \equiv 1,$$

where P_i is the price of commodity, X expenditure, the b_i 's are the N parameters, which determine substitution possibilities among commodities in consumption (SUBPAR in GTAP); the e_i 's are N expansion parameters, which appear owing to non-homotheticity in consumption (INCPAR in GTAP); and the B_i 's are scale parameters necessary to specify the function. It is required that $B_i > 0$ and $e_i > 0$, and $b_i < 1$, with either $0 < b_i < 1$ or $b_i < 0$ for all i (Hertel *et al.*, 1991).

If the substitution parameters are rewritten as $\alpha_i = 1 - b_i$, the Allen partial elasticities of substitution can be expressed as:

$$\sigma_{ij} = \alpha_i + \alpha_j - \sum_k s_k \alpha_k - \frac{\delta_{ij} \alpha_i}{s_i}$$

Where: $\delta_{ii} = 1$, and $\delta_{ij} = 0$ for $i \neq j$, and the s_i 's are expenditure shares. The name *Constant Difference in Elasticities* arises due to the fact that the difference between the elasticities of substitution σ_{ij} and σ_{ih} is invariant to index i (Hertel *et al.*, 1991)

$$(\sigma_{ij} - \sigma_{ih}) = (\alpha_j - \alpha_h)$$

5.3 Utility from Private Consumption

The model computes the percentage change in per capita utility from aggregate household expenditure for a given country (or region) [U(r)] and a money metric equivalent of aggregate utility change, [EV(r)]. The utility measure, U(r), indicates changes in welfare of the average individual in region r. The equivalent variation measure, EV(r), summarizes the welfare changes resulting from a policy shock in dollar values (Hertel, 1997).

5.4 Database

The data set used is the GTAP database version 6. The database consists of bilateral trade, transport, and protection matrices linking 87 country / regional economic databases, where 14 out of the 87 countries are composite regions, e.g., Rest of Southeast Asia (XSA) or Sub-Saharan Africa (XSS). Moreover, 57 sectors are covered including a very detailed agricultural sector with 12 agricultural primary sectors and 8 food processing sectors. The remaining sectoral part comprises services, manufacturers and other primaries. Finally, besides those country and sector matrices, the database also contains five factors: natural resources, land, capital, unskilled, and skilled labor (Hertel, 1997).

5.5 Regional and Sectoral Aggregation

In order to keep calculations as simple as possible, the database is aggregated in four regions and 10 main sectors (see Table 5). This aggregation facilitates a convenient overview of

Mexican households. At the same time, the aggregation provides a good picture of the main trading partner for Mexico.

The aggregation contains four different regions, according to their economic status: rest of NAFTA (USA and Canada), OECD (except Canada, USA and Mexico), ROW (rest of the world) and Mexico. The sectors selected (according their importance for the Mexican households) are: cereals, meat, vegetables, dairy products, sugar and other sweeteners, beverages and tobacco, energy, other primary activities, manufactures, and services.

5.6. Model Extension

Brockmeier (2003) developed an application which derives a Social Accounting Matrix (SAM) model from the GTAP database. This innovative GTAP extension permits the visualization of all economic issues involving transactions among sectors and agents (producers, government, private households) with a high level of accuracy. However, the SAM model contains a unique regional private household. In this research this SAM model was extended by splitting the regional private household into 10 household categories according to expenditure patterns observed in Mexico. This model extension involved the implementation of a new set and also a new coefficient. The new set HHCA represents the expenditure patterns of Mexican households based on calculations from the National Household's Income and Expenditure Survey 2004 (INEGI, 2004). This set is a matricial arrangement containing the expenditure share coefficients observed for each household decile spent per sector. The new coefficient HH_CAT is introduced within the database to obtain the value of expenditures made by each household category in the different economic sectors in Mexico. HH_CAT is calculated according to changes in the value of expenditures by private households for each sector in regard to HHCA. The HH_CAT values obtained represent the new expenditure value of each household's category per sector in Mexico.

5.7 Scenarios

The scenarios were designed considering the future conditions that Mexico will face as a result of present trade negotiations, and therefore changes on the Mexican economy in the coming years. Table 6 contains the condensed information of these scenarios.

Scenario I : The first scenario entails the conditions of international trade liberalization by reducing import tariffs and export subsidies by 40%. Since Mexico has signed trade agreements (e.g. NAFTA, with EU, Japan, Israel, several countries in Latin America) in the last years, this scenario is very likely to happen. However fiscal policies adopted in the coming years by the Mexican government are disregarded in this scenario.

Scenario II: In order to analyze a lower degree of tariff cutting scenario, this scenario presents the situation in which 80 percent of import tariffs; export subsidies are reduced. Such a scenario could be cited as an intermediate step before complete international trade liberalization.

Scenario III: This scenario evaluates the effects on households caused by an 80-percentage-reduction on export subsidies worldwide.

Scenario IV: This scenario evaluates the effects on households caused by an 80-percentage-reduction on import tariffs worldwide.

6. Results of Simulations

These results present possible effects on Mexican households when liberalizing international markets under specific circumstances. The effect on prices is assumed to be homogeneous for all household categories. The effect of prices on households will involve different changes, depending on the household position on market. For households who are net sellers, an increase in prices will increase their revenues, while a decrease in prices will reduce their revenues. An inversely similar effect will be observed on household which are net buyers. In Mexico, self-employment and family businesses (14%) are the second income category after wages (INEGI, 2005).

Consumption shares for the different household categories in Mexico were already reported by Ianchovichina, Nicita and Soloaga (2001) (Table 7). Food share represent for the first decile more than 50% of total expenditures, also for the subsequent two deciles (II, III) food commodities count as the main expenditure. In the next three sectors, food commodities still represent an important expenditure (more than a third). These values emphasize the importance of food commodities for poor households. Services are the second highest expenditure for the same households.

6.1 Prices and demand

Change in prices brought about by full liberalization depends mainly on the extent to which the sector was protected before liberalization (current conditions). As part of the NAFTA agreements, Mexico partially cut tariffs on agricultural products. The average tariff changed from 12 to 6 % by 2000.

Table 8 presents the percentage changes in price and demand commodities for the four simulated scenarios. In the case of scenario I, II, III, the results present the same trend when regarding prices. Prices decrease for all sectors but for energy. Values in Table 8 present changes in prices lower than 5 % for all sectors, even in the case of 80% of reduction in export subsidies and import tariffs (Scenario II).

In contrast, scenario IV suggests moderate increase in prices for households in Mexico of cereals, dairy products, vegetables and sugars. The remaining sectors show decrease in prices, but none of these changes is higher than 1.0 %.

Turning now to demand side, scenarios I, II, and III present similar results, namely a rise in demanded quantities per household. All sectors, but energy increase demanded quantities. Scenario II presents the highest values, which is logical considering the degree of liberalization simulated in this scenario (80% reduction in import tariffs and export subsidies).

Demand at household level in the scenario IV, will decrease for all sectors (Table 8). However, none of these changes is lower than -0.03%.

6.2 Effects on Labor Wage

The effects of trade liberalization on labor wages are an important factor in the analysis of household income. By 2002, a total of 77.0 % Mexican households got 54 % of total income from wages. Table 9 indicates the share of labor per household category for Mexico. Poor households depend more strongly on unskilled labor than they do on skilled labor, e.g., for decile I, 97.7% of wages are from unskilled labor versus 2.3% of skilled wages. In contrast, more wealthy households have a major dependency on skilled labor income, e.g., for Decile X 73.6%

of wages are for skilled labor versus 26.4% for unskilled labor. Any drastic change in unskilled labor will be perceived more intensively by poor households than changes affecting skilled labor.

Table 10 resumes the effects of trade liberalization on wages. A direct effect of trade liberalization will be a drop in wages of both unskilled and skilled labor. The decrease of wages is directly proportional to the degree of liberalization. Thus, in the first scenario (40% reduction in import tariffs and export subsidies) the drop in wages (-0.63% for unskilled labor and -0.52% for skilled labor) is approximately the half (-1.23% for unskilled labor and -1.02 % for skilled labor) of the values calculated when simulating 80 percentage of reduction in import tariffs and export subsidies.

The next step is to investigate the disaggregated effects of liberalization on Mexican households. Scenarios III and IV compared the effects of import tariffs reductions versus export subsidies reduction. Both simulated scenarios cause reductions in labor wages. However, the results suggest a stronger effect of reduction in import tariffs on households than the effect of reduction export subsidies. Scenario III causes a higher drop in wages both skilled and unskilled (-0.74% and -0.98% respectively) in Mexico than the drop caused by reduction in export subsidies (-0.27% and -0.25% respectively) simulated in scenario IV.

6.3 Household Expenditures

We turn now to the expenditure patterns. Table 11 synthesizes the effects of trade liberalization on household expenditures per deciles. Scenarios I, II and III present significant changes in expenditure patterns for all deciles. However, in the last scenario the observed changes are more modest.

Comparing scenarios I and II with current conditions, the overall effect is a drop in expenditure shares per sector. Scenario I present a slightly decrease in expenditures for all sectors across households. This trend continues and it turns more pronounced in Scenario II when simulating 80% reduction in import tariffs and export subsidies. Indeed, the higher the trade liberalization, the higher the reduction in expenditures per sector.

Comparison between current conditions and scenarios III and IV confirm the trend observed in the first two scenarios. Reductions in expenditures patterns per sector, is also observed in both scenarios. Nevertheless, the reductions in export subsidies worldwide will cause

very small changes on household expenditures for all the deciles in Mexico. Values before liberalization and after 80 percentage removal of export subsidies worldwide remain almost unchanged. However, the effect of reduction of import tariffs on household expenditures poses a more powerful effect on household expenditures.

The results of simulations suggest that reductions in import tariffs will have a stronger effect on household expenditures than reductions in export subsidies. This observation is valid across sectors.

7. Conclusion

In this paper, a new methodology was developed to estimate changes on the expenditure distribution of Mexican household categories with the help of a previously developed GTAP application (Brockmeier, 2003). The methodology is characterized by an innovative incorporation of household categories in a CGE model.

In general, the effects of liberalization on Mexican households will be directly proportional to the degree of liberalization. Thus, the effect of 80% cuts in import tariffs and export subsidies is almost twice the effects caused by 40% import tariffs and export subsidies cutting.

The comparison of effects of reduction in import tariffs versus reduction of export subsidies brings to light differentiated effects. Import tariff reduction (scenario III) will have stronger effects on Mexican household expenditure patterns than reductions in export subsidies (scenario IV) worldwide. Scenario III suggest drop of food commodity prices for households, meanwhile scenario IV shows increase in prices of cereals, dairy products, and vegetables. Demand overall sectors (with energy as exception) in scenario III increases. In contrast scenario IV shows drop of demand for all the sectors.

For the four simulated scenarios, labor wages decrease. This uncompensated change in prices (expenditures) and wages (income) will have effects on household welfare. In the next steps of this research, these effects will be integrated into the model.

An important discovery of this paper is the fact that labour wages in all simulated scenarios will decrease, which will bring about decrease in income budget for all households. Important is also to emphasize the simultaneous fall in prices, which at certain extent could

compensate household welfare. However, it is still necessary to bridge household income sources with household categories in order to estimate more specifically the welfare effects per household. This approach is particularly important especially for those households living under poverty conditions, due to their acute sensibility to small changes in income and expenditure patterns.

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Table 1. Major Basic Crops: Volume of Production, Cultivated Area and Yields (simple averages) (Yunez-Naude, 2002).

| Product | Period | Production (Thousand of Mt. Tons) | | | Cultivated Area (Thousand of hectares) | | | Yields (Tons/Cultivated Ha) | | |
|----------|-----------|-----------------------------------|--------------|-------------|--|--------------|-------------|-----------------------------|--------------|-------------|
| | | a.Total | b. Irrigated | c. Rain fed | a. Total | b. Irrigated | c. Rain fed | a. Total | b. Irrigated | c. Rain fed |
| Barley | 1983-90 | 520.64 | 185.39 | 335.25 | 303.04 | 53.39 | 249.65 | 3.25 | 2.42 | 1.79 |
| | 1991-93 | 536.15 | 213.48 | 322.67 | 295.87 | 51.93 | 243.94 | 3.62 | 4.36 | 1.72 |
| | 1994-2001 | 523.75 | 154.56 | 369.19 | 282.08 | 33.59 | 248.49 | 4,13 | 2,46 | 2,56 |
| Beans | 1983-90 | 997.53 | 269.87 | 727.66 | 2,163.85 | 226.80 | 1,937.05 | 0.55 | 4,68 | 0.45 |
| | 1991-93 | 1,128.22 | 375.68 | 752.54 | 2,070.25 | 298.59 | 1,771.66 | 0.64 | 1,53 | 0.50 |
| | 1994-2001 | 1,147.97 | 395.05 | 752.91 | 2,258.36 | 281.36 | 1,969.88 | 0.62 | 1,68 | 0.47 |
| Maize | 1983-90 | 12,472.19 | 2,932.05 | 9,540.13 | 8,076.36 | 994.49 | 7,081.86 | 2,89 | 4,13 | 2,12 |
| | 1991-93 | 16,435.37 | 5,792.44 | 10,642.93 | 7,993.44 | 1,438.16 | 6,555.28 | 4,68 | 4,21 | 3,03 |
| | 1994-2001 | 17,699.01 | 5,913.30 | 11,785.71 | 8,717.77 | 1,242.44 | 7,378.48 | 1,14 | 3,30 | 3,10 |
| Sorghum | 1983-90 | 5,566.17 | 2,548.40 | 3,017.77 | 1,950.09 | 579.53 | 1,370.56 | 4,57 | 2,02 | 2,27 |
| | 1991-93 | 4,080.70 | 1,806.38 | 2,274.32 | 1,313.81 | 377.25 | 936.56 | 1,17 | 3,63 | 2,34 |
| | 1994-2001 | 5,624.51 | 2,179.81 | 3,444.70 | 2,027.90 | 393.45 | 1,634.45 | 3,87 | 2,46 | 1,54 |
| Soybeans | 1983-90 | 704.05 | 604.64 | 99.41 | 401.09 | 317.02 | 84.07 | 3.07 | 3.54 | 1.46 |
| | 1991-93 | 605.36 | 536.23 | 69.13 | 305.51 | 253.00 | 52.52 | 3.84 | 4.17 | 1.53 |
| | 1994-2001 | 182.51 | 106.34 | 76.16 | 126.51 | 65.07 | 61.44 | 1.94 | 2.34 | 1.61 |
| Wheat | 1983-90 | 4,292.31 | 4,036.00 | 256.30 | 1,086.64 | 886.86 | 199.78 | 4.21 | 2.46 | 1.94 |
| | 1991-93 | 3,754.56 | 3,397.67 | 356.90 | 953.49 | 734.09 | 219.40 | 3.85 | 2.57 | 2.78 |
| | 1994-2001 | 3,207.30 | 2,864.48 | 342.82 | 789.01 | 553.00 | 230.68 | 1.21 | 4.58 | 2.67 |
| Totals | 1983-90 | 24,552.89 | 10,576.37 | 13,976.52 | 13,981.07 | 3,058.09 | 10,922.97 | 3.84 | 2.23 | 1.90 |
| | 1991-93 | 26,540.36 | 12,121.87 | 14,418.48 | 12,932.38 | 3,153.02 | 9,779.36 | 4.68 | 4.00 | 2.48 |
| | 1994-2001 | 28,385.06 | 11,613.55 | 16,771.50 | 14,201.62 | 2,568.92 | 11,523.42 | 4.68 | 2.27 | 2.56 |

Table 2. Trade of major Agricultural and Food Items (FAO, 2004).

| Food Consumption 2000-2002 (major items) | | Agricultural Production 2002 (major items) (1000 MT) | | | | |
|--|-----------|--|----------|----------|----------|----------|
| (Share of total Dietary Energy Supply) | | | | | | |
| Maize and products | 34% | Indigenous cattle meat 1 476 | | | | |
| Sugar and products | 14% | Cow milk, whole (fresh) 9 658 | | | | |
| Wheat and products | 9% | Indigenous chicken meat 2 150 | | | | |
| Trade of Major Agricultural and Food Items | | | | | | |
| | 1979-1981 | 1989- 1991 | 1999 | 2000 | 2001 | 2002 |
| | (1000 MT) | | | | | |
| Maize and products | | | | | | |
| Import | 2 533.4 | 3 080.4 | 5 653.9 | 5 448.3 | 6 279.1 | 5 605.9 |
| Export | 0.9 | 42.9 | 79.3 | 61.2 | 71.6 | 222.2 |
| Net trade (Exports-Imports) | -2 532.4 | -3 037.5 | -5 574.5 | -5 387.1 | -6 207.5 | -5 383.7 |
| Sugar and products (raw eq.) | | | | | | |
| Import | 595.2 | 1 138.6 | 60.5 | 54.6 | 85.1 | 85.2 |
| Export | 35.4 | 192.1 | 650.7 | 408.1 | 265.8 | 567.6 |
| Net trade (Exports-Imports) | - 559.8 | - 946.5 | 590.1 | 353.5 | 180.7 | 482.4 |
| Wheat and products | | | | | | |
| Import | 1 034.5 | 488.4 | 2 780.8 | 2 911.6 | 3 518.6 | 3 306.2 |
| Export | 21.7 | 107.7 | 524.0 | 761.0 | 761.9 | 708.3 |
| Net trade (Exports-Imports) | -1 012.8 | - 380.7 | -2 256.8 | -2 150.6 | -2 756.8 | -2 597.9 |
| Meat and products, bovine | | | | | | |
| Import | 4.04 | 83.7 | 322.0 | 380.1 | 386.1 | 444.1 |
| Export | 7.0 | 4.7 | 7.9 | 10.8 | 10.04 | 09.07 |
| Net trade (Exports-Imports) | 2.05 | - 79.1 | - 314.2 | - 369.2 | - 375.7 | - 434.4 |
| Milk and products (excl. butter) | | | | | | |
| Import | 1 718.1 | 2 432.2 | 2 484.5 | 2 676.7 | 3 160.9 | 2 998.9 |
| Export | 0.0 | 4.5 | 3.7 | 1.5 | 1.4 | 0.3 |
| Net trade (Exports-Imports) | -5.0 | -42.3 | -179.1 | -210.7 | -226.5 | -246.9 |

Table 3. Main Imports and Exports of Agricultural Products (FAO, 2004).

| | 1999 | 2000 | 2001 | 2002 | 1999 | 2000 | 2001 | 2002 |
|-----------------------------|---------|---------|---------|---------|----------|-----------|-----------|-----------|
| | 1000 MT | | | | MLN US\$ | | | |
| Trade Balance | | | | | | | | |
| Agricultural Products | | | | | -1 783.8 | -1 986.8 | -3 146.4 | -3 721.1 |
| Total Merchandise | | | | | -19027.9 | -25726.8 | -26000.0 | -25000.0 |
| IMPORTS | | | | | | | | |
| Total Merchandise Trade | | | | | 91 565.4 | 112 764.0 | 109 000.0 | 110 000.0 |
| Agricult. Products, Total | | | | | 8 752.3 | 9 561.0 | 10 759.0 | 11 615.4 |
| Beef and veal, boneless | 231.1 | 276.1 | 282.5 | 328.7 | 536.6 | 710.2 | 828.9 | 979.3 |
| Soybeans | 4 067.3 | 3 984.9 | 4 479.7 | 4 382.5 | 828.7 | 784.1 | 851.8 | 925.4 |
| Maize | 5 545.8 | 5 347.6 | 6 174.0 | 5 512.9 | 648.2 | 548.3 | 648.7 | 668.5 |
| Food preparations NES | ... | ... | ... | ... | 390.4 | 461.9 | 526.0 | 611.8 |
| Sorghum | 4 566.3 | 5 142.0 | 5 032.1 | 4 716.8 | 456.9 | 469.0 | 516.4 | 525.9 |
| Wheat | 2 658.7 | 2 794.4 | 3 385.8 | 3 139.8 | 360.0 | 333.8 | 423.5 | 485.1 |
| Cotton lint | 275.9 | 439.3 | 415.6 | 467.6 | 388.0 | 542.6 | 515.5 | 457.1 |
| Crude organic materials NES | ... | ... | ... | ... | 377.8 | 391.3 | 423.3 | 420.1 |
| Cereal preparations | 155.7 | 269.5 | 253.3 | 2 063.0 | 25.05 | 37.3 | 35.0 | 256.9 |
| Rapeseed | 866.4 | 1 004.2 | 885.3 | 897.0 | 222.2 | 210.7 | 185.8 | 236.9 |
| EXPORTS | | | | | | | | |
| Total Merchandise Trade | | | | | 72 537.5 | 87 037.2 | 83 000.0 | 85 000.0 |
| Agricult. Products, Total | | | | | 6 968.5 | 7 574.2 | 7 612.6 | 7 894.3 |
| Beer of barley | 923.7 | 1 052.6 | 1 208.4 | 1 305.0 | 721.1 | 881.2 | 994.5 | 1 164.1 |
| Tomatoes | 665.4 | 690.0 | 771.5 | 848.3 | 534.8 | 462.6 | 540.8 | 632.4 |
| Beverages, dist. alcoholic | 100.7 | 114.4 | 109.5 | 100.1 | 289.4 | 475.3 | 503.4 | 593.4 |
| Chillies and peppers, green | 325.6 | 325.1 | 334.3 | 374.2 | 272.6 | 374.3 | 426.8 | 364.7 |
| Cattle* | 959.9 | 1 223.9 | 1 141.7 | 947.9 | 290.7 | 404.3 | 415.0 | 363.8 |
| Food preparations NES | ... | ... | ... | ... | 191.8 | 207.4 | 291.9 | 267.5 |
| Sugar confectionery | 119.0 | 94.4 | 129.6 | 138.9 | 202.6 | 149.1 | 182.8 | 212.8 |
| Beverages, non-alcoholic | 144.0 | 185.8 | 202.4 | 296.1 | 87.1 | 111.3 | 120.6 | 201.8 |
| Cucumbers and gherkins | 357.2 | 371.4 | 374.3 | 386.1 | 139.6 | 176.7 | 192.3 | 201.6 |
| Coffee, green | 238.1 | 280.1 | 162.1 | 146.4 | 622.8 | 651.7 | 241.7 | 186.5 |

* thousand heads

Table 4. Income composition in Mexico^a (%).

| | TOTAL | HOUSEHOLDS DECILES | | | | | | | | | |
|-------------------------|----------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X |
| WAGES INCOME | 54 (76) | 0.48 (4.80) | 1.24 (6.40) | 2.04 (7.57) | 2.78 (7.99) | 3.43 (8.04) | 3.99 (7.99) | 5.25 (8.30) | 6.81 (8.49) | 9.80 (8.80) | 18.37 (8.21) |
| MANUFACTURE PROFIT | 0.84 (4) | 0.03 (0.71) | 0.05 (0.59) | 0.05 (0.46) | 0.09 (0.48) | 0.07 (0.41) | 0.09 (0.42) | 0.14 (0.47) | 0.08 (0.28) | 0.13 (0.37) | 0.12 (0.19) |
| TRADE PROFIT | 3 (12) | 0.05 (0.85) | 0.10 (1.16) | 0.18 (1.21) | 0.15 (1.29) | 0.24 (1.36) | 0.26 (1.39) | 0.29 (1.27) | 0.42 (1.33) | 0.38 (1.08) | 0.60 (0.87) |
| SERVICES PROFIT | 3 (12) | 0.05 (0.84) | 0.12 (1.24) | 0.17 (1.15) | 0.22 (1.14) | 0.26 (1.20) | 0.36 (1.28) | 0.43 (1.46) | 0.45 (1.28) | 0.50 (1.10) | 0.68 (0.82) |
| AGRICULTURAL PROFIT | 1 (6) | 0.06 (2.22) | 0.04 (0.96) | 0.05 (0.75) | 0.04 (0.54) | 0.03 (0.44) | 0.10 (0.57) | 0.03 (0.29) | 0.08 (0.26) | 0.05 (0.19) | 0.16 (0.11) |
| FISHERY PROFIT | 1 (4) | 0.016 (0.80) | 0.02 (0.51) | 0.06 (0.56) | 0.04 (0.34) | 0.04 (0.27) | 0.07 (0.40) | 0.07 (0.26) | 0.08 (0.27) | 0.14 (0.27) | 0.16 (0.12) |
| OTHER PROFITS | 6 (7) | 0.02 (0.67) | 0.03 (0.61) | 0.05 (0.45) | 0.06 (0.33) | 0.12 (0.42) | 0.21 (0.60) | 0.28 (0.61) | 0.32 (0.62) | 0.96 (1.22) | 3.84 (1.74) |
| RENTAL INCOME | 4 (5) | 0.01 (0.25) | 0.03 (0.37) | 0.03 (0.36) | 0.02 (0.20) | 0.02 (0.28) | 0.06 (0.37) | 0.05 (0.33) | 0.12 (0.51) | 0.27 (0.92) | 3.04 (1.70) |
| RETIREMENT | 4 (11) | 0.08 (0.58) | 0.12 (0.75) | 0.13 (0.75) | 0.17 (1.02) | 0.20 (1.03) | 0.25 (1.11) | 0.35 (1.30) | 0.50 (1.70) | 0.75 (1.56) | 1.98 (1.88) |
| SUBSIDIES | 1 (19) | 0.15 (4.58) | 0.13 (3.08) | 0.12 (2.43) | 0.10 (1.98) | 0.11 (1.69) | 0.13 (1.64) | 0.00 (1.20) | 0.13 (1.10) | 0.1 (0.98) | 0.14 (0.56) |
| TRANSFERS | 2 (15) | 0 (2.2) | 0.17 (2.20) | 0.13 (1.56) | 0.15 (1.61) | 0.16 (1.37) | 0.21 (1.56) | 0.24 (1.44) | 0.27 (1.30) | 0.26 (1.08) | 0.48 (1.00) |
| ABROAD REMITTANCES | 1 (5) | 0.03 (0.38) | 0.10 (0.67) | 0.09 (0.57) | 0.12 (0.61) | 0.15 (0.72) | 0.18 (0.77) | 0.17 (0.55) | 0.30 (0.71) | 0.16 (0.42) | 0.34 (0.18) |
| OTHER INCOME SOURCES | 0.04 (0.28) | 0.16 (0.02) | 0.11 (0.02) | 0.09 (0.01) | 0.07 (0.02) | 0.06 (0.03) | 0.06 (0.03) | 0.04 (0.03) | 0.04 (0.05) | 0.03 (0.01) | 0.02 (0.07) |
| AUTOCONSUMPTION | 0.7 (0.18) | 0.05 (2.45) | 0.04 (1.43) | 0.03 (1.18) | 0.04 (1.12) | 0.05 (1.21) | 0.07 (1.50) | 0.05 (1.04) | 0.08 (1.16) | 0.10 (1.18) | 0.18 (0.81) |
| PAYMENT IN KIND | 2 (13) | 0.004 (0.15) | 0.02 (0.54) | 0.04 (0.78) | 0.05 (1.05) | 0.06 (1.19) | 0.09 (1.56) | 0.13 (1.68) | 0.19 (2.23) | 0.28 (2.23) | 0.75 (2.16) |
| BARTER | 4 (62) | 0.19 (6.95) | 0.25 (6.80) | 0.25 (6.46) | 0.30 (6.24) | 0.29 (6.21) | 0.36 (6.13) | 0.43 (6.41) | 0.53 (6.14) | 0.58 (5.93) | 1.14 (5.43) |
| IMPUTED RENT | 12 (84) | 0.27 (8.40) | 0.41 (8.41) | 0.48 (8.11) | 0.60 (8.19) | 0.72 (8.09) | 0.89 (8.39) | 1.14 (8.58) | 1.30 (8.53) | 1.81 (8.65) | 4.76 (8.70) |

Source: INEGI 2005, own calculations

^a first value is percent of national total income and in brackets percent of total households

Table 5. Aggregation of the GTAP-Database Version 6.2.

| | |
|-----------------------|--|
| Sectoral Aggregation | |
| Cereals | Paddy rice, wheat, cereal grains nec; processed rice. |
| Meat | Animal products, fishing, Meat: cattle, sheep, goats, horses; Meat products nec |
| Dairy products | oilseeds, raw milk, Vegetable oils and fats; dairy products |
| Vegetables | Vegetables, crops nec. |
| Sugars | Sugar cane, sugar, food products nec. |
| Beverages and Tobacco | Beverages and tobacco |
| Energy | Oil, gas, electricity, gas manufacture |
| Other primaries | Cattle, sheep, goats, horses; Plant based fibbers, wool, forestry, coal, petroleum, minerals, textiles |
| Manufactures | Wearing apparel, leather, wood pdts., paper pdts., minerals, chemical rubber, electronic and machinery equipment, industrial products |
| Services | Public administration, defence, health, education, services nec, air transport, construction, construction, trade, communication financial services, business services |
| Regional Aggregation | |
| OECD | Austria, Belgium, Denmark, Finland, France, Germany, United Kingdom, Greece, Ireland, Italy, Luxembourg, Japan, Australia, NZ, Sweden, Switzerland, Netherlands, Portugal, Spain, Czech Republic, Poland, Hungary, Slovak Republic |
| Mexico | Mexico |
| ROW | Cyprus, Latvia, Lithuania, Slovenia, Malta, Estonia, African regions, rest of Latin-America, XSA, XSS, ROW. |
| Rest of NAFTA | Canada and US |

Table 6. Description of simulated scenarios.

| Shocks | Scenarios description | | | |
|------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| | Scenario I | Scenario II | Scenario III | Scenario IV |
| Imports tariffs | 40% reduction all regions | 80% reduction all regions | 80% reduction all regions | |
| Export subsidies | 40% reduction all regions | 80% reduction all regions | | 80% reduction all regions |

Table 7. Consumption shares (%), overall and by income decile.

| Product group | I | II | III | IV | V | VI | VII | VIII | IX | X |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Food | 50.46 | 46.20 | 41.61 | 38.63 | 36.03 | 32.35 | 30.71 | 26.89 | 22.47 | 11.49 |
| Manufactures | 22.57 | 20.75 | 20.60 | 20.52 | 20.24 | 20.49 | 19.94 | 20.71 | 22.53 | 21.74 |
| Primary | 6.34 | 3.32 | 1.85 | 1.23 | 0.96 | 0.46 | 0.41 | 0.17 | 0.07 | 0.03 |
| Services | 26.84 | 32.88 | 37.67 | 40.47 | 43.35 | 46.64 | 48.92 | 51.82 | 53.82 | 58.20 |
| Residual | 0.14 | 0.17 | 0.12 | 0.37 | 0.38 | 0.52 | 0.43 | 0.58 | 1.18 | 8.57 |

Source: Ianchovichina, Nicita and Soloaga, 2001

Table 8. Percentage changes in private consumption prices and private household demand for commodities in Mexico.

| Sector | Scenario I | | Scenario II | | Scenario III | | Scenario IV | |
|--------------------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| | % change in price | % change in demand | % change in price | % change in demand | % change in price | % change in demand | % change in price | % change in demand |
| Cereals | -2,09 | 0,31 | -4,33 | 0,61 | -4,41 | 0,71 | 0,02 | -0,08 |
| Meat | -0,87 | 0,06 | -1,67 | 0,01 | -1,53 | 0,08 | -0,16 | -0,06 |
| Dairy products | -1,92 | 0,37 | -4,33 | 0,83 | -5,15 | 1,2 | 0,4 | -0,22 |
| Vegetables | -1,05 | 0,09 | -2,07 | 0,11 | -2,18 | 0,21 | 0,04 | -0,09 |
| Sugars | -1,26 | 0,17 | -2,6 | 0,28 | -2,51 | 0,37 | -0,12 | -0,07 |
| bev. tob and food prod. | -1,05 | 0,11 | -2,12 | 0,14 | -1,98 | 0,21 | -0,16 | -0,06 |
| Energy | 0,16 | -0,38 | 0,56 | -1 | 0,81 | -0,94 | -0,17 | -0,08 |
| Other prim | -1,18 | 0,17 | -2,49 | 0,29 | -2,27 | 0,34 | -0,24 | -0,04 |
| Manufactures | -1,26 | 0,21 | -2,66 | 0,37 | -2,48 | 0,43 | -0,19 | -0,06 |
| Services | -0,63 | -0,03 | -1,25 | -0,2 | -1 | -0,15 | -0,24 | -0,05 |
| Total | -2,09 | 0,31 | -4,33 | 0,61 | -4,41 | 0,71 | 0,02 | -0,08 |

Source: Own calculations

Table 9. Percentage changes in wages labor as effects of trade liberalization in Mexico.

| | SCENARIO I | SCENARIO II | SCENARIO III | SCENARIO IV |
|------------------|------------|-------------|--------------|-------------|
| Unskilled | -0,63 | -1,23 | -0,98 | -0,25 |
| Skilled | -0,52 | -1,02 | -0,74 | -0,27 |

Source: Own calculations.

Table 10. Composition of income obtained from labor per decile (%).

| DECILE | LABOR | |
|--------------|--------------|--------------|
| | SKILLED | UNSKILLED |
| TOTAL | 42.85 | 57.15 |
| I | 2.30 | 97.70 |
| II | 6.16 | 93.84 |
| III | 9.47 | 90.53 |
| IV | 12.14 | 87.86 |
| V | 13.70 | 86.30 |
| VI | 18.98 | 81.02 |
| VII | 22.03 | 77.97 |
| VIII | 31.51 | 68.49 |
| IX | 42.59 | 57.41 |
| X | 73.60 | 26.40 |

Source: own calculations, INEGI 2004.

Table 11. Changes in expenditure patterns for Mexican households caused by trade liberalization.

Background

| Sector | I | II | III | IV | V | VI | VII | VIII | IX | X |
|-------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Cereals | 140 | 172 | 192 | 217 | 230 | 236 | 249 | 240 | 270 | 249 |
| Meat | 1188 | 1818 | 2176 | 2509 | 2701 | 3033 | 3238 | 3595 | 4111 | 4731 |
| Dairy products | 234 | 361 | 425 | 485 | 524 | 590 | 620 | 638 | 728 | 844 |
| Vegetables | 255 | 310 | 365 | 420 | 412 | 493 | 478 | 497 | 542 | 631 |
| Sugars | 1929 | 2020 | 2709 | 2500 | 2800 | 2967 | 3167 | 3743 | 4821 | 5805 |
| bev. tob and food prod. | 786 | 771 | 985 | 1044 | 1205 | 1298 | 1624 | 2003 | 2583 | 4774 |
| Energy | 34 | 58 | 74 | 89 | 98 | 117 | 131 | 161 | 193 | 348 |
| Other prim | 148 | 229 | 322 | 417 | 513 | 625 | 772 | 1005 | 1412 | 3118 |
| Manufactures | 1749 | 2886 | 3695 | 4370 | 4914 | 5707 | 6467 | 7804 | 9301 | 15313 |
| Services | 3054 | 4827 | 6512 | 8009 | 10202 | 13259 | 17245 | 22961 | 36989 | 97153 |
| Total | 9517 | 13453 | 17454 | 20061 | 23600 | 28325 | 33990 | 42648 | 60950 | 132966 |

Scenario I (40% reduction in import tariffs, 40% reduction in export subsidies)

| Sector | I | II | III | IV | V | VI | VII | VIII | IX | X |
|-------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Cereals | 141 | 174 | 194 | 219 | 232 | 238 | 251 | 242 | 272 | 251 |
| Meat | 1212 | 1855 | 2220 | 2559 | 2755 | 3093 | 3303 | 3668 | 4194 | 4826 |
| Dairy products | 239 | 368 | 434 | 496 | 535 | 603 | 633 | 651 | 744 | 861 |
| Vegetables | 259 | 315 | 371 | 428 | 420 | 502 | 486 | 506 | 551 | 642 |
| Sugars | 1953 | 2046 | 2743 | 2531 | 2835 | 3004 | 3207 | 3790 | 4882 | 5878 |
| bev. tob and food prod. | 797 | 782 | 1000 | 1059 | 1223 | 1316 | 1648 | 2032 | 2621 | 4844 |
| Energy | 34 | 59 | 76 | 91 | 100 | 120 | 133 | 165 | 197 | 355 |
| Other prim | 149 | 230 | 323 | 419 | 514 | 627 | 774 | 1009 | 1416 | 3129 |
| Manufactures | 1755 | 2896 | 3708 | 4385 | 4932 | 5727 | 6490 | 7831 | 9334 | 15368 |
| Services | 3123 | 4935 | 6657 | 8188 | 10431 | 13555 | 17630 | 23475 | 37816 | 99325 |
| Total | 9663 | 13660 | 17724 | 20375 | 23976 | 28786 | 34556 | 43368 | 62027 | 135478 |

Scenario II (80% reduction in import tariffs, 80% reduction in export subsidies)

| Sector | I | II | III | IV | V | VI | VII | VIII | IX | X |
|-------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Cereals | 143 | 176 | 195 | 221 | 234 | 240 | 254 | 244 | 275 | 254 |
| Meat | 1229 | 1880 | 2250 | 2594 | 2793 | 3136 | 3348 | 3717 | 4251 | 4892 |
| Dairy products | 240 | 370 | 436 | 498 | 538 | 606 | 637 | 655 | 747 | 866 |
| Vegetables | 264 | 321 | 378 | 435 | 427 | 511 | 495 | 514 | 561 | 653 |
| Sugars | 1976 | 2070 | 2775 | 2561 | 2869 | 3040 | 3245 | 3835 | 4939 | 5947 |
| bev. tob and food prod. | 809 | 793 | 1014 | 1074 | 1241 | 1336 | 1671 | 2062 | 2659 | 4914 |
| Energy | 35 | 61 | 77 | 93 | 102 | 122 | 136 | 168 | 201 | 362 |
| Other prim | 149 | 230 | 324 | 420 | 516 | 629 | 776 | 1011 | 1420 | 3136 |
| Manufactures | 1758 | 2900 | 3713 | 4391 | 4938 | 5734 | 6498 | 7841 | 9345 | 15386 |
| Services | 3194 | 5048 | 6810 | 8376 | 10670 | 13867 | 18035 | 24014 | 38684 | 101606 |
| Total | 9796 | 13849 | 17971 | 20663 | 24326 | 29219 | 35095 | 44061 | 63083 | 138017 |

Source: Own calculations

Table 11cont. Changes in expenditure patterns for Mexican households caused by trade liberalization.

Background

| Sector | I | II | III | IV | V | VI | VII | VIII | IX | X |
|-------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Cereals | 140 | 172 | 192 | 217 | 230 | 236 | 249 | 240 | 270 | 249 |
| Meat | 1188 | 1818 | 2176 | 2509 | 2701 | 3033 | 3238 | 3595 | 4111 | 4731 |
| Dairy products | 234 | 361 | 425 | 485 | 524 | 590 | 620 | 638 | 728 | 844 |
| Vegetables | 255 | 310 | 365 | 420 | 412 | 493 | 478 | 497 | 542 | 631 |
| Sugars | 1929 | 2020 | 2709 | 2500 | 2800 | 2967 | 3167 | 3743 | 4821 | 5805 |
| bev. tob and food prod. | 786 | 771 | 985 | 1044 | 1205 | 1298 | 1624 | 2003 | 2583 | 4774 |
| Energy | 34 | 58 | 74 | 89 | 98 | 117 | 131 | 161 | 193 | 348 |
| Other prim | 148 | 229 | 322 | 417 | 513 | 625 | 772 | 1005 | 1412 | 3118 |
| Manufactures | 1749 | 2886 | 3695 | 4370 | 4914 | 5707 | 6467 | 7804 | 9301 | 15313 |
| Services | 3054 | 4827 | 6512 | 8009 | 10202 | 13259 | 17245 | 22961 | 36989 | 97153 |
| Total | 9517 | 13453 | 17454 | 20061 | 23600 | 28325 | 33990 | 42648 | 60950 | 132966 |

Scenario III (80% reduction in import tariffs)

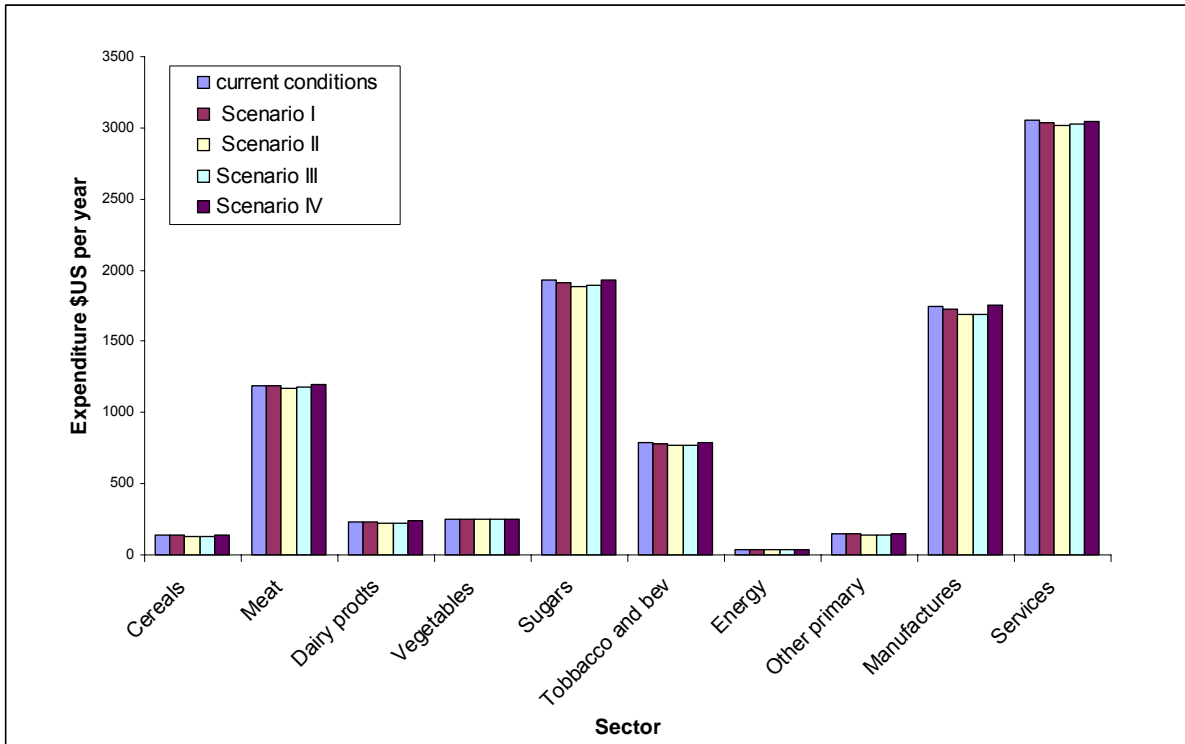
| Sector | I | II | III | IV | V | VI | VII | VIII | IX | X |
|-------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Cereals | 132 | 162 | 181 | 204 | 216 | 222 | 234 | 226 | 254 | 234 |
| Meat | 1176 | 1800 | 2154 | 2483 | 2673 | 3002 | 3205 | 3559 | 4069 | 4683 |
| Dairy products | 221 | 340 | 400 | 457 | 494 | 556 | 584 | 601 | 686 | 795 |
| Vegetables | 250 | 304 | 358 | 412 | 404 | 484 | 469 | 487 | 531 | 618 |
| Sugars | 1890 | 1980 | 2654 | 2449 | 2744 | 2907 | 3103 | 3667 | 4724 | 5688 |
| bev. tob and food prod. | 773 | 758 | 969 | 1026 | 1185 | 1276 | 1597 | 1969 | 2540 | 4694 |
| Energy | 34 | 58 | 74 | 89 | 98 | 117 | 131 | 161 | 193 | 347 |
| Other prim | 143 | 221 | 311 | 404 | 496 | 604 | 746 | 972 | 1365 | 3016 |
| Manufactures | 1689 | 2787 | 3569 | 4221 | 4746 | 5512 | 6246 | 7537 | 8983 | 14790 |
| Services | 3023 | 4777 | 6445 | 7927 | 10098 | 13123 | 17068 | 22725 | 36609 | 96154 |
| Total | 9330 | 13187 | 17113 | 19673 | 23154 | 27803 | 33383 | 41905 | 59954 | 131020 |

Scenario IV (80% reduction in export subsidies)

| Sector | I | II | III | IV | V | VI | VII | VIII | IX | X |
|-------------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Cereals | 140 | 172 | 192 | 217 | 230 | 236 | 249 | 240 | 270 | 249 |
| Meat | 1195 | 1828 | 2188 | 2523 | 2716 | 3049 | 3256 | 3615 | 4134 | 4758 |
| Dairy products | 240 | 369 | 435 | 497 | 536 | 604 | 635 | 653 | 745 | 863 |
| Vegetables | 255 | 310 | 365 | 421 | 413 | 494 | 479 | 498 | 543 | 632 |
| Sugars | 1929 | 2021 | 2709 | 2500 | 2800 | 2968 | 3168 | 3743 | 4822 | 5806 |
| bev. tob and food prod. | 785 | 770 | 985 | 1043 | 1205 | 1297 | 1623 | 2001 | 2581 | 4770 |
| Energy | 33 | 58 | 74 | 89 | 98 | 117 | 131 | 161 | 193 | 347 |
| Other prim | 148 | 229 | 321 | 417 | 512 | 624 | 771 | 1004 | 1410 | 3115 |
| Manufactures | 1750 | 2887 | 3697 | 4372 | 4917 | 5710 | 6470 | 7808 | 9306 | 15322 |
| Services | 3049 | 4818 | 6500 | 7994 | 10184 | 13234 | 17213 | 22919 | 36920 | 96973 |
| Total | 9524 | 13463 | 17465 | 20073 | 23610 | 28333 | 33993 | 42642 | 60924 | 132834 |

Source: Own calculations

Graph.1. Changes in expenditure patterns for decile I in Mexico.



Graph.2. Changes in expenditure patterns for the decile X in Mexico.

