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Analysing effects of trade liberalization on household expenditure with an extended version of the GTAP model: The case of Mexico

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Abstract

The analysis of expenditures for different household categories in developing countries within a CGE framework is a helpful instrument for economists and policy makers. This approach allows researchers to focus on the possible effects that macroeconomic changes and trade reforms might have on household categories.

This paper presents a new household expenditure estimation methodology and an application of a complete household demand system to be integrated into the GTAP model. The complete demand system regarded in this approach is the one proposed by DEATON and MUELLBAUER (1980) the Almost Ideal Demand System in its linear version (LAIDS). The LAIDS contains a set of demand functions defining how commodities are allocated by households in function of prices and household preferences. The integration of household categories into the GTAP model is envisaged by the integration of elasticities coming from the LAIDS.

The data used in this study to analyse commodity acquisition behaviour of ten household categories are from the 2002-2005 National Household Income and Expenditures (ENIGH) conducted by National Institute of Statistical Geography and Informatics (INEGI) in Mexico.

JEL: F14, F17, H31, R20

Keywords: household analysis, LAIDS, demand system, Mexico, GTAP

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1 Introduction

Computable General Equilibrium (CGE) models constitute one of the quantitative instruments available for economists seeking to assess the impact of macroeconomic policies on microeconomic changes in overall income and welfare. However, for economists interested in studies on changes in income distribution, poverty and inequality, CGE models are only useful if they contain detailed information on household income formation and consumption patterns. This detailed information involves the integration of several categories of households with its corresponding link to macroeconomic variables. Rather than including household categories, most of the research done in a CGE framework asset the impact of macroeconomic changes in microeconomic behaviour, and bases its outcomes on rather aggregate indicators such as the equivalent variation (EV) or compensating variation (CV) for the whole country rather than for different household categories (DEATON, 1997; COCKBURN, and DECALUWÉ, 2006).

Modelling approaches presenting frameworks to link macroeconomic reforms and household analysis might be classified in two type of analysis. The first approach integrates household categories into the CGE framework by regarding prices and factor remuneration as dependent on macroeconomic equilibrium (DECALUWÉ *et al*., 1999; COCKBURN 2001; BOCCANFUSSO *et al*., 2003; CORORATON and COCKBURN, 2004, etc). The second approach requires the adaptation of two different models in a sequential process; the first model is used to recreate macroeconomic conditions, its output is fed into the second model which assesses conditions at household level. This latter approach is also known as macro-micro simulation approach (BOURGUIGNON *et al*., 2002; Davies, 2004; FERRAIRA and HORRIDGE, 2004; CHEMINGNI and THABET, 2005; CORONG, 2005; HERTEL *et al.,* 2005; RUTHERFORD *et al*., 2005). The macro micro simulations take macroeconomic changes from a CGE framework into the microeconomic model while conserving the flexible framework for household categories in terms of specific behavioural characteristics of household categories (SAVARD, 2005).

The current study applies a technique similar to the macro-micro simulation approach. Thus, prices and quantity changes obtained from the macro simulation model (the standard GTAP model) are used as shocks in an extension developed here, yielding differentiated changes at household level which are governed by elasticities coming from a Linear Almost Ideal Demand System (LAIDS).

An advantage of the study presented here over the abovementioned studies, is the feasibility to asset the effects of macroeconomic changes in one or more countries on the expenditure patterns of household categories in other country (e.g. changes of food prices in Europe on Mexican households). This possibility is only offered by HERTEL *et al.,* 2005 but limited to the case of households highly specialized in one income source (HERTEL *et al.,* 2005).

In the next section recent literature on the development of different CGE models linked to household analysis is review. Then household income and expenditure patterns for households in Mexico in the following section are presented. Following, the method and empirical model as well as the model extension developed to obtain changes at household level are introduced. The fifth section describes the scenarios simulated when global trade reforms take place. This is followed by empirical results in section six, and finally some conclusions.

2 Household Analysis Linked with CGE Models

The most common objective pursued by the development of CGE models with integrated household analysis is the assessment of expenditure and income patterns with their proceeding consequences in poverty levels caused by macroeconomic policy modifications. Pioneer research considering the integration of consumption and income patterns, such as the ones performed by ADELMAN and ROBINSON (1978), DERVIS *et al.* (1982), KYEREME and THORBECKE (1991), DE JANVRY, *et al.* (1991), BOURGUIGNON, *et al.* (1991), evaluate the effect of diverse policy adjustments on income distribution of different household groups.

The first study applying poverty measurements was performed by DE JANVRY *et al.* (1991) and presents an application to Ecuador. DECALUWÉ *et al.* (1999), and COGNEAU and ROBILLIARD (2000) focus their research on linkages between economic policies, poverty levels and income distribution in developing countries. The latter study integrates information on 4508 households (from household survey data) into a CGE model for Madagascar.

Another of the first studies in this field was COCKBURN (2001) who adapts a standard CGE model to explicitly integrate a large number of households (over 3000 in this case). The author uses data on household income sources and consumption patterns collected in most standard household surveys. The extended model integrates the Nepalese Survey Data into a CGE-SAM based model. The main challenge, at this point described by the author, is the matching and balance of the SAM by the integration of the 3000 households. This last step involves the development of special software, which "controls" the integration, balancing and consistency of the SAM by integrating households gradually. The study assesses the impacts of trade liberalisation (or any other macroeconomic shock) on individual households and how these impacts feed back into the general equilibrium of the economy. As the model estimates income for each household, the authors generate all the data required to carry out standard income based poverty and income distribution analysis. COCKBURN concludes that trade liberalisation in Nepal favours urban households as opposed to households living in fertile plains. In the case of Nepal, COCKBURN concludes, the impacts of trade liberalisation on income distribution appear to be small, however other interesting results emerge. Urban poverty falls and rural poverty increases,

particularly among the moderately poor as opposed to the very poorest. The absolute impact of trade liberalization, whether it is positive (in the urban areas) or negative (in the rural areas), generally increases with the level of income. A detailed and comprehensive comparison of procedures between the approaches of COGNEAU and ROBILLIARD (2000) and COCKBURN (2001) is found in DAVIES (2004).

An interesting approach to trade and poverty issues is offered by HERTEL, *et al*. (2005). They examine how global trade liberalization affects poverty in each of seven different developing countries (Brazil, Chile, Indonesia, Philippines, Thailand, Uganda, and Zambia). Main focus is given on factor market effects on households; this objective is met by the assessment of households according to their main income source.

The first step of the authors' analysis simulates a policy experiment in the Global Trade Analysis Project (GTAP) model of trade (HERTEL, 1997) to generate a vector of factor and commodity price changes for 17 regions of the world. Since the GTAP database is designed for broad country coverage, it is limited to one representative household per region which makes it not suitable for an study of income distribution across different households. The price changes are therefore fed into a post-simulation framework that characterizes households according to factor income and consumption profiles, which are based on International Comparison Project data, and household surveys for seven countries, respectively (HERTEL, *et al*., 2005).

Results of this study show the extent to which households in each of the seven countries are specialized in terms of factor earning profiles. To capture the consequent vulnerability to trade liberalization, households are categorized into five strata, including those getting at least 95percent of income from (i) transfers, (ii) agriculture, (iii) non-agricultural business, (iv) wages, and then (v) a stratum for households that have diversified income sources. Within each stratum, the differences across income levels are preserved.

Changes in real household incomes are calculated, and demand response is simulated by feeding commodity price changes into an estimated global An Implicit Direct Additive Demand System (AIDADS). AIDADS is a generalization of the Linear Expenditure System (LES), allowing for the possibility of non linear, non-monotonic Engel effects (RIMMER and POWELL, 1996). The demand system is used to calculate the poverty level of utility for each region. Equivalent variation (EV) and a first-order compensating variation (CV) measure are then calculated at both the per capita and poverty line levels. Since the CV approximation proves to be quite accurate compared to the exactly computed EV, it is used to decompose the results into underlying commodity and factor market adjustments. The Foster-Greer-Thorbecke measure of poverty is used to calculate the total transfer required to lift all households above the poverty level of utility, as a proportion of the poverty level of income.

HERTEL, *et al*. (2005) find that multi-lateral trade liberalization will reduce overall poverty in Indonesia, Philippines, Uganda, and Zambia, but increase overall poverty in Brazil, Chile, and Thailand. Within regions, the results vary considerably by household group. The largest poverty reduction occurs among agriculture-specialized households in Brazil, while the largest increase occurs among non-agricultural, self-employed, and wage-labor households in Brazil, Chile, and Thailand.

A study including 12 household categories is published by THURLOW and VAN SEVENTER in 2002. This paper reports on the construction and testing of a Standard International Food Policy Research Institute (IFPRI) computable general equilibrium model for South Africa. A Social Accounting Matrix (SAM) with base year 1990 was compiled for South Africa using national accounts information and supply-use tables for 1998. By updating to a recent year, and by distinguishing between producers and commodities, this SAM improves the existing SAM databases for South Africa. This model is then used to simulate the economy- wide impact of a range of hypothetical policy measures, including: increased government spending; the elimination of tariff barriers; and an improvement in total factor productivity. Results indicate that assumptions made regarding the mechanisms of macroeconomic adjustment are important in determining the expected impacts of these policies. Results suggest that the impact of expansionary fiscal policy appears to be growth enhancing, with the Keynesian style adjustment mechanism producing the most positive results. A complete abolition of import tariffs also appears to generate increases in gross domestic product in South Africa with negative and positive consequences for aggregate manufacturing and services respectively.

In the study presented, by RUTHERFORD *et al.* (2005) they employ a computable general equilibrium comparative static model for the Russian economy to assess the impact of accession to the World Trade Organization (WTO) on income distribution and the poor. The model developed here as well as the one developed by COCKBURN (2001) incorporate all 55,000 households from the Russian Household Budget Survey as "real" households in the model. This was accomplished due to their development of a new algorithm for solving general equilibrium models with a large number of agents. In addition, this paper includes foreign direct investment and endogenous productivity effects in trade and poverty analysis. In the medium term, Rutherford *et al.* find that virtually all households gain from Russian WTO accession, with 99.9 percent of the estimated gains falling within a range between 2 and 25 percent increases in household income. Estimates are decisively affected by liberalization of barriers against foreign direct investment in business services sectors and endogenous productivity effects in business services and goods. Again in this case, data reconciliation between the national accounts and the household budget survey is important to the results.

A CGE micro-simulation model is also employed by CORORATON and COCKBURN (2007) to estimate impacts in the Philippines caused by several trade reforms initiated since the beginning of the

1980s. The model integrates the entire 1994 Family Income and Expenditure Survey in Philippines with 24,797 households. Consumer demand is derived from CD utility functions. Results show that tariff reduction induces consumers to substitute cheaper imported agricultural products due to substantial trade-policy reforms for domestic goods, thereby resulting in a contraction in agricultural output. The national poverty headcount decreases marginally as lower consumer prices outweigh the income reduction experienced by the majority of households. However, both the poverty gap and severity of poverty worsens, implying that the poorest of the poor become even poorer. For further literature regarding CGE models coupled with household analysis. Two comprehensive reviews describing different CGE models linking household categories were published by HERTEL and REIMER, 2004 and SAVARD 2005.

After comprehensive comparison of these studies, it becomes evident that almost all these studies have focus on single regions. The assessment of poverty in cross country studies is only address by HERTEL *et al.* (2005). However, this study focus on income side and changes at expenditure level are not possible to be tracked back to single household categories.

The methodology introduced here and tested for Mexico permits economists to asset poverty impacts through changes in expenditures for different household categories. Similarly to HERTEL *et al.* (2005), the changes in commodity prices generated with GTAP are taken as input for an estimated regional LAIDS for household categories in Mexico. However, this study splits households according to expenditure patterns to obtain impacts on single household categories, complementing in this sense, one of the drawbacks of the approach suggested by HERTEL *et al.* (2005).

3 Mexican Households

Since the economic reform in 1984, macroeconomic changes in the Mexican economy have been transmitted to the population through diverse pathways and absorbed by the Mexican households. The transmission pathways are mainly either via income sources or through changes in prices of purchased commodities creating modifications in household expenditure patterns. From the expenditure side, households react to these changes by modifying their expenditure shares namely by increasing, reducing or substituting commodity expenditures.

This section presents an overview of the structure of expenditure patterns and income formation as important factors which govern preferences of Mexican households and as future key issues to explain household's behaviour. These factors provide also a starting point in understanding the dynamics of Mexican households.

3.1 Household's Income Sources

Table 1 lists survey data on main earning sources for Mexican households. The data comes from the National Employment Survey collected by the INEGI (Encuesta Nacional de Empleo, 2005) and the National Household Income and Expenditures Survey (Encuesta Nacional de Ingresos y Gastos de los Hogares, 2004). Household are divided into ten categories according to their income levels. Income reported in both sources do not match, this was already pointed out by IANCHOVICHINA *et al.* (2001) and attributed mainly to income misreporting by households.

Table 1 Income distribution per household and decile

		HOUSEHOLDS DECILES[a]									
	TOTAL	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**
Wages	48.93	29.90	42.93	50.62	51.78	53.88	54.05	57.10	56.50	52.83	42.10
Industrial profit	1.34	2.99	2.36	2.53	2.26	2.42	1.94	1.52	1.36	1.30	0.65
Trade profit	2.65	3.73	3.86	2.83	3.57	3.38	3.60	3.12	3.32	3.81	1.29
Service profit	2.99	2.88	2.75	3.47	4.16	4.11	5.16	3.07	3.72	2.95	2.01
Agricultural profit	6.93	3.69	2.36	3.17	3.12	2.70	4.27	3.65	4.79	6.88	10.86
Capital profit	5.22	2.19	1.86	1.76	1.97	1.84	1.89	2.54	2.64	3.30	9.71
Other profits	0.20	0.96	0.36	0.72	0.24	0.22	0.13	0.14	0.30	0.22	0.10
Rental income	5.17	0.60	0.49	0.43	0.73	0.78	0.53	1.03	1.35	2.19	11.68
Transfers	8.12	20.39	17.29	12.60	11.00	10.48	9.29	7.96	7.44	8.21	5.72
Other income sources	0.04	0.04	0.02	0.02	0.00	0.02	0.03	0.01	0.00	0.02	0.08
Auto-consumption	0.69	2.65	1.24	0.99	1.07	0.85	0.74	0.79	0.76	0.84	0.34
Payment in kind	1.32	0.53	0.33	0.65	0.94	0.95	0.98	1.48	1.57	1.51	1.48
Negative savings	5.32	12.27	10.45	7.79	7.06	6.69	5.80	5.74	4.80	4.85	4.11
Imputed rent	11.08	17.19	13.71	12.41	12.10	11.67	11.60	11.84	11.45	11.09	9.88

Source: INEGI 2005, own calculations. [a] Percentage of the total income per household

In Table 1, households with the lowest income are represented in decile I, households with the highest income in decile X. According to the ENIGH in 2005 households integrate their income from diverse sources. The average Mexican household receives almost half of its income from wages and 8% from transfers. Household deciles with the lowest income depend stronger on auto-consumption than households with higher income amounts. Transfers -enclosed amongst others subsidies- are an important source of income for the deciles I to III, being as much important as wages. Transfers rapidly decline along the income deciles. Family business (e.g. industrial, trade, services, capital and

agricultural profits, and other profits), is another important source of income accounting for 20 percent of the national income (table 1).

In all household categories, non-monetary income sources (e.g. auto-consumption, payment in kind, barter, imputed rent) represent 20 percent of the average household. Income from imputed rent represents more than 17 percent of total income of the poorest deciles. The average imputed rent[2], is slightly more than 11 percent for all deciles. This percentage decreases slowly across income classes, suggesting that imputed rent is a good indicator of level of income and welfare in Mexico.

3.2 Household Expenditures

Table 2 shows the consumption shares for the average Mexican household and for each income decile. The Mexican average household consumes, on per capita basis, about 1583 pesos (144 US dollar in 2005) per month, of which a third is devoted for food, nearly a quarter is spent in manufactures, and about half is reserved for services. A comparative analysis across deciles shows a downward trend in the food consumption share as income increases and a parallel rise in the consumption of services. The share of expenditures in manufacturing is almost constant across all deciles. At a more disaggregated level, particular differences in expenditure preferences are observed across households. For example, the composition of the food basket is quite different across deciles. According to the ENIGH, the poor obtain most of their calories from cereals and vegetables (see table 2). Meanwhile, the richest rely on more expensive foods such as meat and processed food products.

Across deciles, the share of expenditure on services and manufacturing grows much faster than the one for food. In particular, the expenditure on services, which is almost non-existent in absolute values for the poorest households, grows quickly across the deciles to reach more than 540 US dollars per month for the wealthier deciles. Total expenditure in manufacturing products shows a similar pattern on a smaller scale. IANCHOVICHINA *et al*. (2001) analyzed expenditure and income patterns for deciles in Mexico with data from 1996. By comparing their findings with the most recent statistics of Mexico (2005), the analysis revealed that only the expenditure levels of richer household have increased, while poor households have presented deprived increases in their consumption amount. This implies that in nearly 10 years inequality in income distribution has slightly grown.

[2] the opportunity cost of the rent of the own house

Table 2 Consumption patterns in Mexico, 2005

COMMODITY	HOUSEHOLD DECILES IN MEXICO										
	Total	I	II	III	IV	V	VI	VII	VIII	IX	X
Paddy rice	0.17	0.67	0.43	0.35	0.30	0.26	0.21	0.19	0.14	0.10	0.05
Wheat	0.05	0.14	0.14	0.10	0.07	0.07	0.08	0.05	0.04	0.05	0.01
Cereal grains n.e.c.	3.75	8.85	8.48	7.22	6.59	5.87	4.99	4.59	3.60	2.86	1.32
Vegetables. fruit. nuts	2.57	6.94	5.91	4.79	4.48	3.84	3.57	3.09	2.44	1.89	0.92
Oil seeds	0.55	2.25	1.83	1.22	1.09	0.85	0.71	0.69	0.46	0.29	0.12
Animal products n.e.c	0.68	2.01	1.71	1.46	1.37	1.08	0.95	0.78	0.60	0.44	0.19
Raw milk	1.86	2.56	2.68	2.79	2.98	2.81	2.37	2.33	2.05	1.74	0.93
Fishing	0.57	1.09	0.80	0.77	0.77	0.75	0.55	0.56	0.62	0.56	0.41
Bovine meat products	2.15	2.71	2.77	2.62	3.23	2.87	3.06	2.64	2.52	2.15	1.13
Meat products	3.36	5.58	5.32	5.37	5.53	4.70	4.54	4.31	3.62	2.95	1.56
Vegetable oils and fats	0.33	1.10	0.90	0.70	0.66	0.53	0.41	0.38	0.27	0.21	0.11
Dairy products	1.03	1.35	1.53	1.38	1.41	1.31	1.31	1.12	1.06	0.98	0.67
Sugar	0.25	1.09	0.79	0.59	0.50	0.35	0.30	0.24	0.18	0.14	0.08
Food products n.e.c.	11.64	8.02	9.85	10.47	11.79	12.22	12.50	12.66	12.89	12.56	10.74
Beverages and tobacco	0.53	0.67	0.59	0.54	0.61	0.67	0.48	0.49	0.56	0.54	0.47
Textiles	0.58	0.55	0.53	0.48	0.38	0.69	0.51	0.61	0.58	0.66	0.59
Wearing apparel	3.68	2.67	2.54	2.72	2.86	2.76	3.26	3.40	3.41	3.93	4.50
Leather products	2.10	2.05	2.18	2.34	2.52	2.34	2.37	2.41	2.24	2.15	1.71
Wood products	0.11	0.23	0.21	0.17	0.15	0.17	0.14	0.13	0.11	0.08	0.06
Paper products. publishing	0.15	0.12	0.17	0.16	0.19	0.18	0.19	0.18	0.17	0.16	0.11
Petroleum. coal products	0.21	1.27	0.70	0.51	0.39	0.36	0.26	0.17	0.16	0.09	0.04
Chemical rubber plas prod	9.78	10.22	9.86	10.12	10.41	9.55	9.81	8.96	9.03	9.03	10.50
Ferrous metals	0.04	0.11	0.07	0.05	0.07	0.03	0.05	0.07	0.04	0.03	0.02
Electronic equipment	1.31	0.71	0.92	1.28	1.06	1.42	1.30	1.38	1.37	1.50	1.29
Machinery and equipment	0.12	0.25	0.16	0.14	0.15	0.12	0.13	0.12	0.11	0.10	0.10
Manufactures	0.62	0.45	0.50	0.51	0.52	0.59	0.61	0.65	0.65	0.62	0.68
Electricity	3.03	4.11	3.81	3.21	3.38	3.52	3.51	3.27	3.08	2.82	2.57
Gas manufacture	2.17	2.60	3.12	3.03	3.08	2.74	2.66	2.46	2.23	2.03	1.46
Water	0.81	1.08	1.06	1.10	0.96	1.00	0.96	0.85	0.92	0.86	0.55
Trade	9.44	2.97	3.58	3.76	4.57	5.03	6.23	7.18	9.71	11.27	13.64
Transport n.e.c	5.40	6.17	7.24	8.65	7.02	7.23	7.26	7.11	6.30	5.14	2.86
Communication	4.86	2.55	3.39	3.36	3.75	4.21	4.35	5.03	5.25	5.74	5.26
Financial services n.e.c.	1.66	0.91	0.77	0.85	0.83	0.90	0.70	1.03	1.15	1.74	2.82
Insurance	3.22	1.46	2.17	1.60	1.16	1.82	2.40	2.11	3.41	3.14	4.84
Recreational and oth serv.	2.75	0.52	0.87	1.23	1.13	1.27	1.71	2.01	2.06	2.98	4.54
Public admin & defence, edu	15.4	13.1	11.0	12.0	11.1	12.6	12.2	13.9	14.2	15.9	19.2
Dwellings	3.12	0.89	1.80	2.38	2.93	3.33	3.38	2.88	2.75	2.61	3.91
Food	28.9	44.4	43.1	39.8	40.8	37.5	35.5	33.6	30.5	26.9	18.2
Manufactures	25.2	27.1	26.4	26.4	26.7	26.1	26.2	25.2	24.7	24.6	24.7
Services	45.8	28.5	30.4	33.8	32.5	36.4	38.2	41.2	44.9	48.5	57.1
Monthly expenditure per capita (pesos)	1583.0	609.0	921.0	1183.0	1414.0	1639.0	2008.0	2382.0	2980.0	4196.0	9284.0
US $ per capita per month	163.9	63.1	95.4	122.5	146.5	169.7	207.9	246.7	308.5	434.4	961.2

Source: Own calculations with information of the ENIGH, 2005

The expenditure levels are also used to measure poverty. The official measurement of poverty in Mexico considers three poverty lines: a) food poverty, b) capability poverty, and c) heritage poverty.

The first line takes into account those households in which income is not sufficient to cover the basic nourishment needs, e.g., income is equivalent to 18.26 pesos per day (1.2 $ US in 2004) per capita in rural areas, and 24.6 pesos (1.9 $ US in 2004) per day in urban areas. In 2004, 13.7 percent of the Mexican households were in this situation accounting (all households in decile I and 30 percent of households in decile II). The second line, is called poverty of capability counts those households whose income is not enough to cover food for basic nourishment, education and health. In the same year, poverty of capability reached 19.8 percent of households (decile I and II). The third line includes those households whose income is insufficient to cover basic altogether nourishment, health, wearing apparel, dwelling, and transport. These people earned by 2004 fewer than 33 pesos per capita in rural areas and 49.6 pesos in urban areas. People living under these conditions in 2004 represented 47 percent of the total households (households I to V). (COMITE TÉCNICO PARA LA MEDICIÓN DE LA POBREZA, 2005).

4 Method and Empirical Model

4.1 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 behaviour of producers and consumers. All policy interventions are represented by price wedges (HERTEL, 1997).

4.2 Value of consumed commodities in GTAP

The notation introduced in this section is in line with the notation used in the GTAP model, where letters in lower case denote proportional percentage changes and upper cases letters denote absolute level of the variables.

The allocation of total private commodities consumption in a region[3] is defined in GTAP as (HERTEL, 1997):

[3] A region in the GTAP framework refers to a country or a composite region of countries

$$VPA_{ir}=PP_{ir}*QP_{ir} \quad (1)$$

Where

VPA_{ir} total value of private consumption of commodity i in region r

PP_{ir} private price of commodity i in region r

QP_{ir} total quantity of commodity consumed i in region r

Differentiating both sides of (1), and after dividing by VPA_{ir} we obtain:

$$\frac{dVPA_{ir}}{VPA_{ir}} = \frac{\partial(PP_{ir} * QP_{ir})}{QP_{ir} * PP_{ir}} \quad (2)$$

Percent changes in the composite value of total household consumption of commodity i are then expressed as (HERTEL, 1997):

$$vpa_{ir} = pp_{ir} + qp_{ir} \quad (3)$$

The latter equation denotes the percentage changes of total private consumption of commodity i in region r.

4.3 Database

The data set used is the GTAP database release 6.2. 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 labour (HERTEL, 1997). Further features and full documentation of the model are published in HERTEL (1997) and constantly updated in the homepage of the Center for Global Trade Analysis Project (www.gtap.org).

4.4 Regional and Sectoral Aggregation

In order to keep calculations as simple as possible, the database is aggregated in ten regions and ten main sectors (see Table 3). The sectors selected (according their importance for the Mexican households) are: cereals, meat, vegetables, dairy products, processed food, alcoholic beverages and tobacco, energy, manufactures, housing services, and services. This aggregation facilitates a convenient overview of Mexican households. At the same time, the aggregation provides a good picture of the main trading partners for Mexico.

Table 3 Sectoral aggregation of the GTAP-Database Version 6.2

Sectoral Aggregation	
Cereals	Paddy rice, wheat, cereal grains nec; processed rice
Vegetables	Vegetables, crops nec
Meat	Animal products, fishing, Meat: cattle, sheep, goats, horses; Meat products nec
Dairy & other animal products	oilseeds, raw milk, Vegetable oils and fats; dairy products
Processed food	Sugar cane, sugar, food products nec
Beverages and tobacco	Beverages and tobacco
Energy	Oil, gas, electricity, gas manufacture
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
Housing services and primary activities	Cattle, sheep, goats, horses; Plant based fibbers, wool, forestry, coal, petroleum, minerals, textiles dwellings

Source: Own design

The regional aggregation contains ten different world regions, these regions where so aggregated to cover regional importance of Mexican trade partners. The regions are: Mexico, USA, Canada, Venezuela, Chile, The European Union (27 countries), Japan, Brasil, Argentina, Central America and the rest of the World (ROW).

4.5 Model Extension

The new household module presented in this study adopts changes in price and quantities of commodities obtained from GTAP for traded commodities to calculate changes in expenditures for household categories. Household categories in the module respond to a homothethic LAIDS function modelled through elasticities and prices. Following, the foundation of the household module is described.

Changes in budget shares

At household level, budget shares W_{ihr} are calculated through the Almost Ideal Demand System (AIDS) (DEATON and MUELLBAUER (1980):

$$W_{ihr} = \alpha_{ih} + \sum_{j} \gamma_{ijhr} \ln PP_{jr} + \beta_{ihr} \ln\left[\frac{XH_{hr}}{PPRIV_{hr}}\right] \quad (4)$$

The linearization of the model is introduced through the use of the Stone index price $\ln PPRIV_{hr}$ as:

$$\ln PPRIV_{hr} = \sum_{i \in TRAD} W_{ihr} \ln PP_{ir} \quad (5)$$

Where:

W_{ihr}	household income share devoted to commodity i by household h in region r
PP_{ir}	price of good i for household h in region r
PP_{jr}	price of good j for household h in region r
XH_{hr}	total expenditure of household h in region r
$\ln PPRIV_{hr}$	private price index of household h in region r
α_{ihr}, β_{ihr}, and γ_{ijhr}	behavioral parameters. The demand elasticities for the LAIDS are functions of α_{ihr}, β_{ihr}, and γ_{ijhr}

The model is considered as a first order approximation to the general relation between W_{ihr}, $\ln (XH_{hr})$ and $\ln PPRIV_{hr}$. Under the following parametric restrictions, the model satisfies the restrictions of demand theory: additivity, homogeneity and symmetry.

The additivity requires:

$$\sum_{i \in TRAD} \alpha_{ihr} = 1, \sum_{i \in TRAD} \beta_{ihr} = 0, \sum_{i \in TRAD} \gamma_{ijhr} = 0 \text{ (j= 1,2,...n)} \quad (6)$$

The homogeneity and symmetry are satisfied respectively, by

$$\sum_{j \in TRAD} \gamma_{ijhr} = 0 \tag{7}$$

$$\gamma_{ijhr} = \gamma_{jihr} \tag{8}$$

Percent change (w_{ihr}) is obtained by the differentiation of (1) with respect to prices of third commodities and to total expenditures (DEATON and MUELLBAUER, 1980):

$$dW_{ihr} = \frac{\partial W_{ihr}}{\partial PP_{jr}} dPP_{jr} + \frac{\partial W_{ihr}}{\partial XH_{hr}} dXH_{hr} \tag{9}$$

It follows directly that if (9) is differentiated, it yields

$$dW_{ihr} = \left(\sum_{j \in TRAD} \frac{\gamma_{ijhr}}{PP_{jr}} - \beta_{ihr} * \frac{W_{jhr}}{PP_{jr}} \right) dPP_{jr} + \frac{\beta_{ihr}}{XH_{hr}} dXH_{hr} \tag{10}$$

Expressing (10) in percent changes of absolute values and after simplification is obtained:

$$w_{ihr} = \frac{\left(\sum_{j \in TRAD} \gamma_{ijhr} - \beta_{ihr} * W_{jhr} \right) * pp_{jr} + \beta_{ihr} * xh_{hr}}{W_{ihr}} \tag{11}$$

Taking into account that the elasticities in LAIDS are given by (MDAFRI and BRORSEN, 1993):

$$\frac{\left(\gamma_{ijhr} - \beta_{ihr} * W_{jhr} \right)}{W_{ihr}} = \varepsilon_{ijhr} \tag{12}$$

and

$$\frac{\beta_{ihr}}{W_{ihr}} = \eta_{ihr} - 1 \tag{13}$$

Where:

ε_{ijhr} Marshallian cross price elasticities

η_{ihr} Expenditure elasticities

Equation (11) might be also expressed as:

$$w_{ihr} = \sum_{j \in TRAD} \left(\varepsilon_{ijhr} * pp_{jr} \right) + (\eta_{ihr} - 1) * xh_{hr} \qquad (14)$$

which represents the changes of shares of consumed commodity i of total household expenditure as function of prices of other commodities and of total expenditure. This equation is used in the household module. Cross price elasticities and expenditure elasticities have been calculated using data from Mexican households from 2002-2005. Percentage changes in commodities are obtained from the GTAP model.

Changes in value of consumption of commodity i by household h in region r

Consumption of household deciles at regional level is expressed as the share of the value allocated for commodity i from the total expenses of household h in region r:

$$W_{ihr} = \frac{VDHH_{ihr}}{XH_{hr}} \qquad (15)$$

Where

$VDHH_{ihr}$ Value spend in commodity i by household h in region r

Changes in the value commodity i consumed by household h in region r is achieved by solving (12) for $VDHH_{ihr}$:

$$VDHH_{ihr} = W_{ihr} * XH_{hr} \qquad (16)$$

Obtaining the differential of (16) yields:

$$dVDHH_{ihr} = XH_{hr} * dW_{ihr} + W_{ihr} * dXH_{ir} \quad (17)$$

Expressing (17) in percent changes and after dividing it by $VDHH_{ihr}$, is obtained:

$$vdhh_{ihr} = w_{ihr} + xh_{ir} \quad (18)$$

Derivation of changes in total expenditure in household h in region r

Total household expenditures commodities for a given household category h in region ris defined as

$$XH_{hr} = \sum_{i \in TRAD} VDHH_{ihr} \quad (19)$$

Changes in household expenditures are derived from the differential of (19):

$$dXH_{hr} = \sum_{i \in TRAD} dVDHH_{ihr} \quad (20)$$

Dividing (20) through XH_{hr}, and substituting the value of W_{ihr} (15) changes in expenditures are obtained as:

$$xh_{hr} = \sum_{i \in TRAD} W_{ihr} * vdhh_{ihr} \quad (21)$$

Calculation of changes in expenditures is performed through the composite changes in prices and quantities at regional level Equation (3):

$$xh_{hr} = \sum_{i \in TRAD} W_{ihr} * (qp_{ir} + pp_{ir}) \quad (22)$$

The choice of average regional changes (pp_{ir} and qp_{ir}) instead of household changes ($vdhh_{ihr}$) is instrumented here in order to avoid singular matrices in computational solving process of the model[4].

5 Scenarios

This section defines the scenarios simulated in the GTAP model with the integration of the household module. This research presents the simulation of three different scenarios. The first scenario simulates the most important bilateral trade agreements signed by Mexico. Second and third scenarios represent possible outcomes of multilateral trade liberalization. Given that the WTO member countries have not reached any commitments on cuts in tariff and export subsidies, these scenarios are merely speculations and should not be taken as projections. Other important point to bear in mind is the complexity of the structure of tariffs reductions and export subsidy programs in every country. This fact makes it necessary to compile some simplifications regarding the global economy. Due to the simplifications taken in the present study, results are not forecasts but rather trends that the economy might follow. As the centre of this study are the effects of multilateral trade liberalization on households in Mexico, these scenarios address different conditions of future global liberalization stages (see Appendix A for a complete description of the documentation and policies underlying these scenarios).

The first scenario Free Trade Agreements (FTAs) describes the tariff elimination reduction scheduled under different FTAs ratified by Mexico in this case the three TAs namely the NAFTA, the Economic Partnership Agreement (EPA) Japan-Mexico and the FTA EU-Mexico. The importance of this scenario derives from the liberalization stages that Mexico will face with their most important trade partners the US, Canada, European Union, Japan (WTO, 2008). As the tariff elimination regarded in these agreements is staged, the simulation of this scenario is performed as a chain of simulations in order to reach the conditions under these three agreements by 2015 (see Table 4).

[4] Recalling $(15)\ vdhh_{ihr} = w_{ihr} + xh_{hr}$, this might imply that Equation 22 should be defined as: $xh_{hr} = \sum_{i \in TRAD} W_{ihr} * vdhh_{ihr}$ which would cause a singularity problem in the computation of the model.

Table 4 Overview of scenarios

Instrument	Scenarios		
	FTAs	**Doha Round**	**Full Trade Liberalization**
		FTAs scenario plus	
Import tariff cuts	Products from the US and Canada scheduled in the NAFTA by 2008 Products from the European Union scheduled in the FTA Mexico EU by 2010 Products from Japan scheduled in the EPA Mexico Japan by 2015	Agricultural and food processed products from developed countries: -40% Agricultural and food processed products from developing countries: -25%	Total elimination in all regions
Export subsidies cuts	n.a.	Total elimination in all regions	Total elimination in all regions

Source: Based on NAFTA, FTA Mexico-EU, EPA Mexico-Japan, and WTO documentation (see Appendix A)

The second scenario tackles the possible outcomes from cuts according to the negotiations in frame of the WTO agreements as result of the Doha Development Agenda (DDA). First, conditions from the FTAs scenario are adopted as basis in scenario DDA. Finally, the third scenario simulates complete full trade liberalization. This scenario shows the potential effects that total elimination of subsidies and import tariff worldwide would have on households in Mexico.

6 Results

Although the study generated also global changes, these analyses are out of scope of this study. However projects focused on trade liberalization and its effects on national economies have been widely explored in other studies (IVANIC, 2005; BROCKMEIER and PELIKAN (2006); HERTEL *et al.*, 2007, etc). The main focus in this paper is given to households, thus results here presented concentrate on household expenditures and food expenditure of households in Mexico, which is the novel contribution of this research.

Changes in Prices and Quantities

The major changes in prices and output as result of trade liberalization are observed in scenario FTAs simulating the undersigned trade agreements by Mexico with their most important trade partners (the US, Canada, Japan and the European Union). In this scenario changes in prices are negative for all agricultural markets. Output decreases only in the case of cereals and dairy products which are the

sectors with the lowest prices in this simulation, in all other cases the output increases. Changes in prices and output in scenario FTAs are more noticeable for cereals, where cuts in tariff rates increases the entry of cereals coming mainly from the US (WTO, 2008)) which present a lower price than in Mexico, the increase in imports causes a fall in domestic production of cereals as well (see table 5).

Table 5 Changes in private prices and industrial output in Mexico (%)

Commodities	FTAs		Doha Round		Full Trade Liberalization	
	price	output	Price	output	price	output
Cereals	-6.95	-16.24	-6.42	-14.36	0.24	4.32
Vegetables	-1.92	1.49	-1.52	2.03	-0.36	1.44
Dairy Prod.	-5.82	-5.16	-2.96	-1.11	-4.12	-4.55
Meat	-1.08	5.21	-1.41	2.05	-2.01	2.03
Proc Food	-1.65	0.81	-2.09	0.87	-1.88	-0.55
Tobb & Bev	-0.94	0.02	-1.49	0.13	-1.89	0.42
Energy	0.01	-0.06	-0.67	0.05	0.86	1.32
Manufactures	0.01	-0.08	-0.92	-0.04	-3.65	-0.54
Services	0.07	-0.04	-0.69	-0.05	-1.93	0.09
Housing serv	0.01	-0.01	-0.72	-0.08	-1.82	-0.11

Source: Own calculations

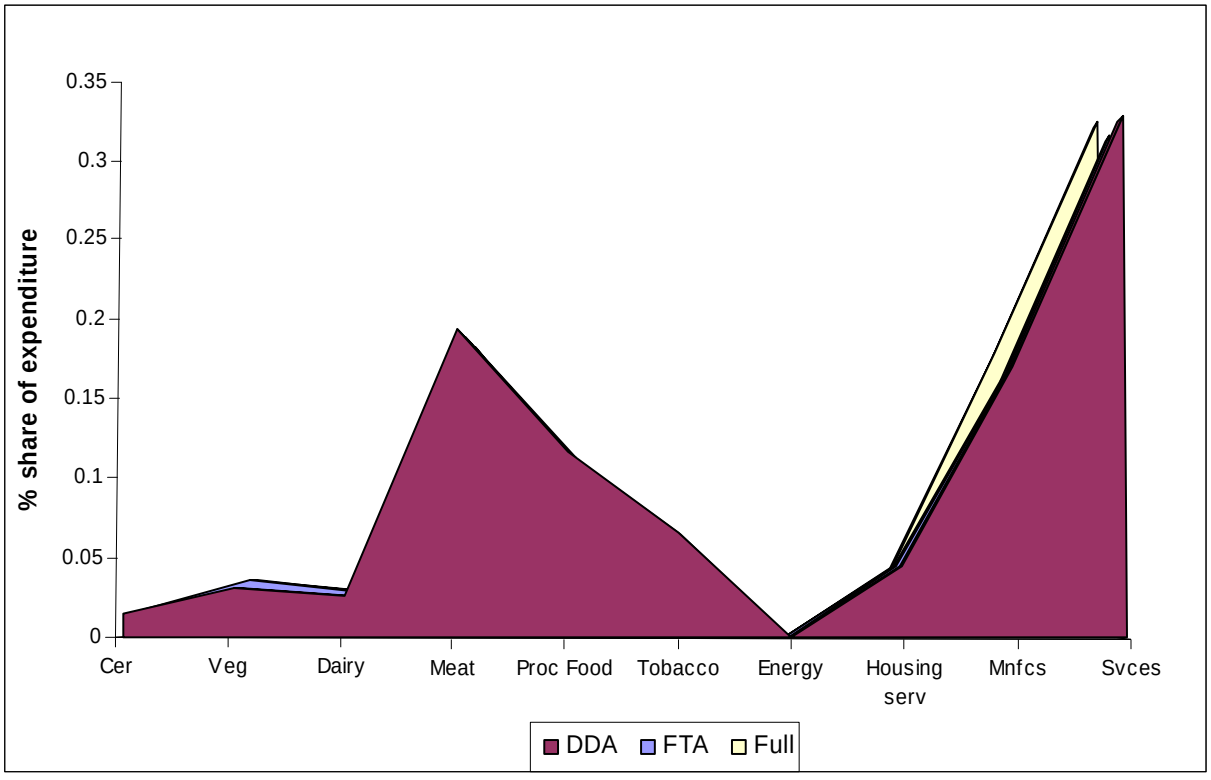
The implementation of the DDA will cause little changes after the implementation of the FTAs, mainly because 95 percent of the Mexican trade takes place within NAFTA partners (WTO, 2008). In this case implementation of tariff cuts and export subsidies from the Doha round do not have a higher influence than the cuts launched in line with NAFTA. Scenario DDA also entails the removal of export subsidies, which cause rises in prices of agricultural products exported from regions providing high export subsidies such as Japan, the EU, and the US. Given that Mexico is a net importer mainly from cereals and dairy products coming from US and Canada, prices will increase in comparison to prices in FTAs scenario in which cuts in tariffs were implemented. However, these price changes are rather small. Most notorious changes are observed in agricultural products, which happen to be the most distorted products by market protection across world regions. Cereals (-6.95 percent) and dairy products (-5.8 percent) are the products with the highest fall in prices.

In scenario simulating full trade liberalization, prices and output increase considerably more in the case of DDA (see table 5). In this case, the full elimination of import tariffs and export subsidies would increase price of products exported by countries with high levels of export subsidies. This increase in prices causes reverse effects than those observed by the implementation of scenario FTA, in which Mexico profits from subsidized products coming mainly from the EU27, the US, Canada. A good example of this is the case of cereals (0.24 percent), for which Mexico is a major importer from the US (WTO, 2008). Prices of dairy products remain low (-4.12 percent) even after full trade liberalization. Nonetheless, most of the dairy and animal products have been set aside from the FTAs.

Changes in Expenditures Patterns

At household level, results across deciles present different trends. To facilitate the analysis of simulations, the results are compared by decile across simulations. In decile I, the sharp reduction in food prices observed in scenario FTAs and DDA rises demand of staple food while the demand of services and manufactures falls (probably an income reallocation effect) (see Table 6). As most of these households are not able to cover their basic nutrition needs the higher the drop in prices of food commodities the higher is the increase in expenditure shares. In contrast, the elimination of all trade barriers (scenario full liberalization) would cause a substitution phenomenon in these households. As response to higher prices in cereals and the simultaneous drop in prices of dairy products, households shift their diet to a higher consumption of dairy products and vegetables while reducing consumption of cereals, and processed food (see graph 1).

Graph 1 Change in expenditure shares of the poorest households (decile I) in Mexico under three different scenarios



Source: Own calculations

Shares in expenditure of households classified in decile II decrease as prices for food products fall, together the share of manufactures increases (scenario FTAs and DDA). In the case of scenario "full liberalization" where prices increases for all commodities so it does expenditure shares.

In the case of decile V, this decile represents the poverty borderline. Households embedded in this decile increase their expenditure patterns in scenario FTAs and full trade liberalization, while scenario Doha might create falls in expenditure shares. Households in this decile increase consumption of meat and processed food in the three scenarios here regarded (Table 6). Trends in decile VI to IX vary, these households increase expenditure share as prices decrease, while in the case of rich households, these modifications are low (see table 6).

Table 6 Percent changes in commodity expenditure by decile households in Mexico

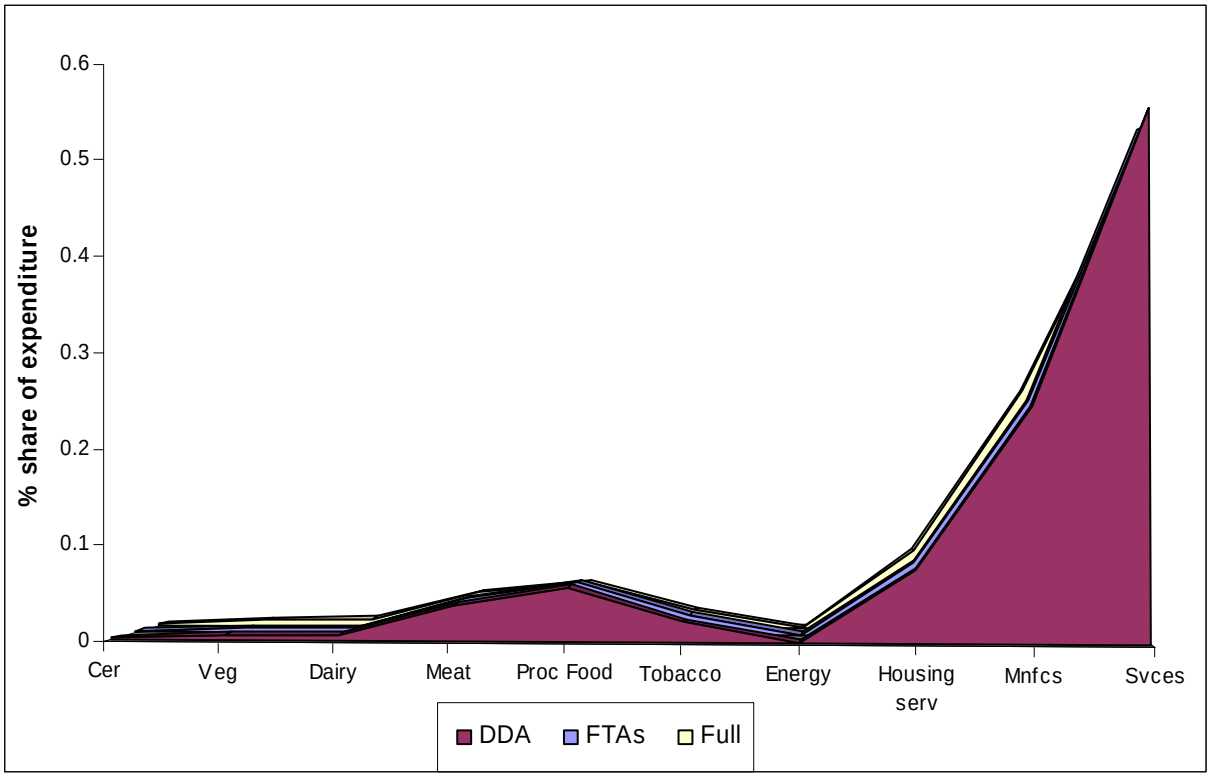
	FTAs									
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**
Cereals	7.02	-0.95	-0.66	-0.07	-3.87	-0.18	0.83	-0.63	-0.37	0.00
Vegetables	2.80	-0.48	-1.21	-0.94	-0.50	-0.16	-0.94	-0.65	-1.66	0.29
Dairy Prod.	5.20	-1.08	-0.73	-0.90	-1.50	0.25	0.27	-0.93	-1.26	0.47
Meat	-0.06	-0.93	-1.12	-1.31	2.95	-0.47	-1.10	-1.17	0.26	-0.41
Proc Food	-0.28	-0.77	-0.20	-1.76	-15.48	0.01	-2.35	-3.98	-6.03	-1.98
Tobb & Bev	-0.33	-1.26	5.04	5.12	-0.20	3.36	4.17	4.35	5.1	-1.16
Energy	-0.35	-1.19	-0.69	-0.01	1.02	-3.09	-0.3	-0.35	-0.21	-0.02
Manufactures	-3.42	2.03	-1.14	-3.43	1.63	-0.96	-0.1	-1.18	-2.25	1.61
Services	-1.72	-7.91	-0.10	-0.17	0.75	-0.44	0.63	1.37	1.15	-1.71
Housing serv	0.91	0.07	-4.27	7.23	3.03	-4.2	2.37	-3.11	3.41	1.41
	DDA									
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**
Cereals	5.69	-1.60	-1.27	-0.04	-5.19	-0.89	-0.09	-1.18	-1.07	-0.34
Vegetables	1.48	-0.77	-1.55	-0.65	-1.47	-1.11	-0.95	-1.66	-1.92	-0.34
Dairy Prod.	2.23	-1.88	-1.47	-1.04	-1.87	-0.46	-0.01	-0.19	-0.58	5.82
Meat	-0.86	-0.86	-1.60	-1.02	2.35	-1.21	-0.86	-1.44	-0.93	-1.03
Proc Food	-1.88	-1.78	-0.40	-1.05	-17.62	-1.23	0.18	-1.15	-2.17	-4.68
Tobb & Bev	-0.82	-1.81	4.62	5.33	-0.15	3.14	1.93	1.56	3.25	-2.90
Energy	-0.09	-1.10	-1.12	0.60	0.42	-3.07	-1.44	-1.21	-1.62	0.17
Manufactures	-2.09	2.49	-0.78	-7.97	0.09	-1.00	-1.83	-2.51	-1.64	2.02
Services	-1.28	-7.08	-0.28	-1.26	0.05	-2.06	-0.38	-0.43	-0.28	-4.81
Housing serv	-0.84	0.35	-2.55	2.25	-1.79	-4.77	-2.33	-5.08	1.07	4.05
	FULL TRADE LIBERALIZATION									
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**
Cereals	-2.48	-3.06	-2.50	0.28	-4.7	-1.91	-0.43	-2.47	-2.3	0.24
Vegetables	-0.87	-0.81	-1.88	0.09	-3.21	-2.69	-0.93	-3.07	-3.42	-0.14
Dairy Prod.	4.00	-3.17	-2.33	-0.77	-1.33	-0.66	-2.98	-0.54	-1.59	22.08
Meat	-1.97	-1.44	-2.5	-0.61	-1.02	-2.16	-0.49	-2.11	-1.94	-2.05
Proc Food	-8.38	-1.72	-0.91	-1.21	-8.18	-2.24	-4.31	-3.75	-4.66	-12.76
Tobb & Bev	-2.97	-2.86	4.27	6.18	-0.85	1.79	2.38	1.52	5.00	-7.93
Energy	-5.06	0.67	-1.40	1.52	-1.53	-3.50	-3.90	-2.71	-4.37	0.48
Manufactures	6.70	0.60	-0.52	-15.34	-2.72	-1.35	-4.96	-4.84	-2.52	4.04
Services	2.41	-1.87	-0.48	-1.85	0.44	-3.77	1.06	0.42	-0.43	-10.28
Housing serv	-3.27	2.07	2.75	-12.24	-13.52	-5.17	-14.42	-8.51	1.68	11.22

Source: Own calculations

Households in decile X have same trend in all scenarios. Consumption of food commodities slightly increases. The increase in these products is proportional to the intensity of cuts in prices (see

dairy products in scenario full trade), being higher in increase in shares in scenario full trade liberalization where both food and non food products experienced reduction in prices (see table 6 and graph 2). It appears that even at low prices (FTAs scenario) households do a slight increase in expenditure shares compared to the increases observed also for the scenario the highest prices (full trade liberalization). This might be the effect that richer households in Mexico cover their needs of food either scenario. The higher increases are mostly observed in commodities considered across Mexico as luxuries, such as manufactures and housing services. However in all scenarios consumption of processed food and services falls, while it might be a reallocation of expenditures which is being shifted to consumption of housing services or/and manufactures (see graph 2).

Graph 2 Change in expenditure shares of the richest households in Mexico (decile X) under three different scenarios



Source: Own calculations

Overall households in Mexico present differentiate patterns of consumption, which it becomes evident in this study, when prices of commodity change as result of different schemes of global liberalization. Primarily, poor households tend to cover their needs on food items even by abstinence of more expensive items such as meat or services, while richer households increase consumption of commodities when prices decrease, without having to restrict consumption of other commodities.

7 Conclusions

The development of household analyses has different objectives, most of them focused on effects of economic reforms on income distribution and poverty. This paper introduces a new methodology for the investigation of effects of global reforms on household categories. This study starts with a review of current existing procedures to link CGE models with household analysis with emphasis in the most important features and findings or each approach.

The methodology proposed here to asset household's expenditure takes as platform the GTAP framework. The assessment of household categories is achieved through the integration of a household module based on expenditure and cross price elasticities specific for each household category. Though in this study only households in Mexico are analysed, the approach support the simultaneous household analyses of several countries.

The results on the expenditure levels of Mexico reaffirms conclusions for Mexico already reached by other studies (IANCHOVICHINA, *et al.,* 2001; NICITA, 2005) suggesting the small negative effects that multilateral trade liberalization without domestic support might have on households. Furthermore, this study presents differentiated effects on household expenditures based on a demand household system. In the first scenario implementing the three trade agreements that Mexico has undersigned with her most important trade partners, prices decrease which increases demand in consumption of food items mainly by poor households. Scenarios simulating possible outcomes of the Doha round and full trade liberalization show increase in prices of products in Mexico due to its status of net importer. These two scenarios bring also rises in expenditure values across households.

Furthermore, this study disaggregates effects across households based on expenditure patterns specific for each category in Mexico. As this module gives straightforward updated values of expenses per commodity per household in a region, the variety of applications in poverty measurement and income distribution in an international frame is large.

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Appendix A Comprehensive Description of Trade Agreements as Basis for the Scenarios

Scenario FTAs (Free Trade Agreements)

1. NAFTA

The simulations introduced represent the economic situation of Mexico in 2008 as result of the full implementation of the NAFTA. The NAFTA contemplates the elimination of all trade restrictions and tariffs between the three members in a 15-years-period (1st January 2008). Additionally, the NAFTA covers some exempted products selected by every State member (see table A-1). The steps needed to be introduced in the GTAP database as part of the NAFTA implementation are:

Goods considered in headings to be liberalized in a 10-years-period and freed of tariffs by 1 January 2003. Mexico eliminates tariffs for the U.S. in wheat, barley, rice, dairy products, soy oil, soy, poultry, peaches, apples, frozen strawberries, swine, swine meat, cotton, and the seasonal tariff for oranges. The US eliminates tariffs in wheat (durum), rice, limes, winter vegetables, dairy products and frozen strawberries.

Goods considered in headings to be liberalized in a 15-years-period and free of tariffs by 1 January 2008. Mexico eliminates tariffs for the U.S. in maize, dry beans, and powdered buttermilk. The US eliminates tariffs for the Mexican concentrated orange juice, winter vegetables and peanuts.

By 1 January 2008, last tariff barriers contemplated as part of the NAFTA negotiations are going to be eliminated. Namely, Mexico eliminates tariff for maize, beans and dehydrated milk coming from the US. The US eliminates tariffs in concentrated orange juice, winter vegetables and nuts. Products not included in the negotiations are presented in table A-1.

Table A-1 Products set aside from the NAFTA

	Mexico	**Canada**	**United States**
Mexico		Dairy Products Poultry Eggs Sugar products	NONE
Canada	Dairy Products Poultry Eggs Sugar products		Dairy Products Poultry Eggs Margarines
United States	NONE	Dairy Products Peanut Peanut cream Sugar products Cotton	

Source: NAFTA Documentation (FTIS, 2007)

With the U.S., Mexico registered 1158 agricultural headings for the tariff elimination; from which 1004 (87 percent) are considered in the general system of lowering of duties. The 154 remaining

headings (13 percent) are subject to a special treatment under the form of prohibitions, tariffs and safeguard special in the form of tariff quota (Table A-1).

With Canada, Mexico registered 1158 headings of which 1030 were put under the general schedule of lowering of duties, 51 correspond to conditional lowering of duties and 77 were exempted of the liberation schedule. Chapters having tariffs subject to the highest condition in the liberalization schedule, and subjected to restrictions, tariffs and quotas, were the corresponding to dairy products, meat, sugar, some early vegetables and fruits, maize, and some fats mainly. With Canada some headings corresponding to these chapters were exempted of the duties lowering schedule (see table A-1).

The simulation of NAFTA is introduced as shocks in tariff of imported products in the three country partner and based on the bilateral agreements reached in the framework of NAFTA (see table A-2).

Table A-2 Overview simulation of NAFTA (imports from rows into columns) final ad valorem tarif

	Mexico	Canada	United States
Mexico			
Cereals		0	0
Vegetables		0	0
Dairy Products		0	0
Meat		0	0
Processed Food		5.40	0
Tobacco and alcohol		0	0
Canada			
Cereals	0		0
Vegetables	0		0
Dairy Products	60.80		0
Meat	0		0
Processed Food	1.02		0
Tobacco and alcohol	22.80		0
United States			
Cereals	0	0	
Vegetables	0	0	
Dairy Products	1.06	0	
Meat	0	0	
Processed Food	0.02	0	
Tobacco and alcohol	3.19	0	

Source: Own calculations based on the GTAP data base

2. FTA Mexico-European Union

This part of scenario FTAs has as main purpose to evaluate the potential effects of this agreement on the Mexican economy. The tariff elimination stipulated by this FTA follows a progressive

tariff elimination schedule, as well as the NAFTA. The EU-Mexico FTA has a phase-out scheme based on equal annual cuts applied to an initial negotiated base rate (similar to the NAFTA tariff elimination schedule).

From the total of traded products between Mexico and the EU, approximately 7 percent correspond to agricultural products, for which a progressive liberalization in five phases for agricultural products (2000-2010) has been scheduled. With the signature of the FTA, almost 80 percent of the total agricultural products coming from Mexico into the EU and 42 percent of the EU agricultural products entering into Mexico will be by 2010 free of duties. This represents 62 percent of total agricultural trade between Mexico and the EU. Some sensible products for both parties are excluded from these negotiations (sugar, meat, dairy products, cereals, bananas, and orange juice), however special quotas must be fulfilled for some important products coming from Mexico e.g. honey, avocados and orange juice. Tariffs will be eliminated or tariff-free quotas established for roughly 300 types of products, including coffee beans and wine. (Some other agricultural products, such as rice, wheat, apples, tangerines, dairy products, and blue-fin tuna, will not be subject to tax-free measures)

The agreement classifies agricultural products, including fisheries, according to a numerical system (1, 2, 3, 4, 4a, 5, 6, and 7). This numerical system of categories specifies the implementation periods of the tariff reductions for agricultural products. Table A-3 defines those categories in terms of the percent of the base tariff that will be applied each year after the agreement's implementation.

Table A-3 Categories considered in tariff lowering in frame of the EU-Mexico FTA in agricultural products

	Tariff rate applied at each year after the FTA implementation										
Category	Entry into force	Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010
1	Free	-	-	-	-	-	-	-	-	-	-
2	75%	50%	25%	Free	-	-	-	-	-	-	-
3	89%	78%	67%	56%	45%	34%	23%	12%	Free	-	-
4	100%	100%	100%	87%	75%	62%	50%	37%	25%	12%	Free
4a	90%	80%	70%	60%	50%	40%	30%	20%	10%	Free	-
5	Products in category 5 are in a wait list, which must be discussed by both parties to consider further steps in the process of liberalization.										
6	Contains specifications of TRQ for both parties										
7	Contains specifications on preferential customs duties.										

Source: Mexico EU Free Trade Agreement Documentation (2004)

The EU was granted with progressive and in 2008 total liberalization on wines, beer, spirits and other alcoholic beverages, cut flowers, tomatoes, tobacco, olive oil and pectic substances. Mexico

obtained the immediate elimination of tariffs on coffee, cacao, chickpeas, tequila, bier, mango papayas, guavas and other tropical fruit and vegetables. EU most sensitive agricultural products were either excluded from the agreement or placed in a wait list to be reviewed no later than three years after the implementation of the agreement. These products (Category 5 of the tariff elimination schedule) included live bovine animals, beef and edible meat offal (either fresh or frozen), hams, certain poultry and pork products, eggs, honey, cut flowers, dairy products (such as milk, cream and yoghurt), butter, certain cheeses, some fruits and vegetables (such as bananas, apples, avocado, strawberries, grapes, peaches, pears, potatoes, peas, beans, spinach, tomatoes, mushroom), sugar and ethyl alcohol, all cereals (except buckwheat) and some fruit and vegetable juices (see table A-4).

Table A-4 Category five and products excluded from negotiations between the EU and Mexico

Main products excluded from liberalized import into the EU	*Main products excluded from liberalized import into Mexico*
bovine animals, beef, swine, poultry / dairy / eggs / honey / cut flowers / some fruits and vegetables (e.g. olives for the production of oil, sweet corn, asparagus, peas, beans, apples, pears, strawberries, grapes, bananas) / cereals except buckwheat / sugar / some juices (tomatoes, citrus fruits, pineapple, apple, pear) / vermouth / ethyl alcohol / vinegar	bovine animal, beef, swine poultry / dairy / eggs / potatoes / bananas / cereals except buckwheat / roasted coffee / some oil and fats (palm oil, cobra oil, animal fats or oil) / sugar / cocoa / grape juice and grape most rum
Main TRQs (quota/year) conceded for into the EU	*Main TRQs (quota/year) conceded for into Mexico*
eggs (1,500 t, half duty) / honey (30,000 t, half duty) / cut flowers (1,500 t, duty free) / aspargus (600 t, duty free; 1,000 t prepared, half duty) / peas (500 t, half duty) / cane molasses (275,000 t, duty free) / prepared tropical fruit (1,500 t, duty free) / juices (orange 1,000 t, half duty; 30,000 t, 25% duty; 2,500 t pineapple juice, half duty), canned tuna (2,000 t, half duty)	No TQR conceded

Source: Mexico EU Free Trade Agreement Documentation (2004)

The Agreement contains tariff quotas for certain agricultural products that are not subject to full liberalisation, as well as review clauses for further liberalisation. The Decision contains provisions for co-operation in the field of customs, standards and technical regulations, Sanitary and Phytosanitary (SPS) measures, and for the opening of public procurement markets. To this purpose a number of Special Committees at expert level was established. Main TRQs applied to a specific group of goods (Category 6), such as salmon, herring and tuna and other fish products. Mexico was given TRQs for eggs, honey, cut flowers; asparagus, avocado, strawberries, molasses, pineapple juice, frozen peas and

fresh orange juice (see Table A-4). Tuna steaks (and some other tuna products like canned tuna) are given tariff-quota concessions (Category 6), where an aggregate quantity of 2,000 tonnes is allowed with a preferential customs duty. The quota is set to grow by 500 metric tonnes each year (CFFA, 2006). As regards tuna loins, a preferential tariff rate quota for tuna loins originating in Mexico is considered. Starting with a quota of 5,000 tonnes in year 1, this is set to rise to 14,000 tonnes by year 2010, with a ceiling of 15,000 tonnes in subsequent years at a duty rate of 6 percent (CFFA, 2006) (see Table A-4).

Soybeans fall into category 3 for the period August 1 through January 31, which has a base rate of 15 percent. They already enter duty-free the rest of the year and therefore those falls into category 1. Regarding vegetable oils, soybean, sunflower seed, canola, sesame, and corn oil all are in category 4. Mexico was most generous in reducing its tariffs on unmanufactured tobacco. Wrapping tobacco, for example, has a base rate of 67 percent ad valorem, which will be eliminated upon the agreement's entry into force. Cigarettes, fall into category 5 and therefore will not be subject to any reduction.

Fresh fruits and vegetables and preparations thereof possessed at the beginning of the FTA base tariffs on range from 10 to 20 percent and fall into category 1. Fresh cherries are in category 3.Important exceptions include potatoes, apples, dry beans, peaches, which are in category 5, and apricots, pears and plums which fall into category 4. In looking at alcoholic beverages, beer, which has a base rate of 20 percent falls into category 1. Most of the wines have a base rate of 20 percent and fall into either category 2 or 3 (Table A-5).

Table A-5 Classification of representative products to be liberalized

Category	Representative items
1	Fruits and vegetables (64%) / unwrapped tobacco/ soybeans (February 1- July 31)/ frozen orange juice
2	Fruits and vegetables (18%) /Wine
3	Soybean (August 1 – January 31)/ Fresh cherries/ Wine/ Animal feeds / Cotton and cotton wastes
4	Vegetable oils / soybean rests / sunflowerseed / canola / sesame / corn/ apricots/ pears/ plums
4a	
5	Potatoes/ apples/ dry beans/ peaches/ milk substitutes/ grains and cereals (corn, rice, sorghum, barley, rye, dry beans) / caned peaches / prepared potatoes / caned tomatoes/ jams and jellies/ grape juice/ cigarettes
6	fisheries (tuna steaks)
7	nutritional preparations

Source: Mexico EU Free Trade Agreement Documentation (2004)

Regarding preparations of fruits and vegetables, the base rate on most of these products was 20 percent. As the table below shows, 64 percent of these falls into category 1 and 18 percent fall into category 2. In category 1 is also included frozen orange juice. The remaining 18 percent fall into category 5. Products in this latter group include canned peaches, prepared potatoes, canned tomatoes, jams and jellies, and grape juice.

Animal feeds, most of the oilseed meals have a base rate of 15 percent and fall into category 3. Preparations for balanced rations and milk replacers both fall into category 5. Finally, cotton and cotton wastes have a base rate of 10 percent and most fall into category 3.

The base rate from which all reductions are made do not correspond to that defined by the current "most favoured nation" (MFN) rate. On December 31, 1998, after Mexico and the EU had started negotiations, Mexico raised the MFN rate on 70 percent of its agricultural tariffs (913 products), many by a significant amount. The EU strongly objected to the use of these higher tariffs as the base rates, therefore, they reached a compromise and agreed to use the rates that were in effect on July 1, 1998.

Since 2003, in Mexico 37.9 percent of EU agricultural products are free of tariffs, next cut stage are scheduled by 2008 and 2010, up to 42.55 percent. Analogously, 68.2 percent of European agricultural products that enter into Mexico since 2003 are liberalized. Also since the same year, 71 percent of the EU fishing products entering into Mexico are liberalized. Similarly, 88 percent of total imports coming from Mexico into the European Union. Two remaining tariff cuts schedule in 2008 and 2010 will finally liberalize 74.14 percent of total trade between Mexico and the EU. At the last stage of liberalization, total liberalization contemplated in the framework of this agreement corresponds to 80 percent reduction in products entering into the EU from Mexico by January 1, 2010. Also Mexico will reduce tariffs at zero on 42 percent of agricultural goods coming from the EU by January 1, 2010. The general schedule of duties lowering is presented in table A-6 and A-7.

Table A-6 Mexico's schedule of duties lowering in EU-Mexico Synthesis by chapter of tariff

	Category/ Number of headings by chapter								
Chapter	1	2	3	4	4a	5	6	7	Total
01. Live Animals	21	0	3	1	0	13	0	0	38
02 Meat and eatable despoliation	3	0	3	1	0	59	0	0	66
03 Fish and Crustaceans	59	20	3	0	13	0	0	0	95
04 Milk & dairy products, eggs & honey	2	0	0	0	0	46	0	0	48
05Products of animal origin	17	9	1	2	0	1	0	0	30
06 Live trees and other plants	40	0	0	0	0	0	0	0	40
07 Vegetables, plants, roots and tubercles	75	2	0	0	0	4	0	0	81
08 Fruits	50	0	7	5	3	3	0	0	68
09 Coffee and tea	2	25	2	0	0	5	0	0	34
10 Cereals	2	3	0	0	0	17	0	0	22
11 Products of milling industry	0	0	2	1	4	30	0	0	37
12 Oils seeds	75	2	6	0	0	0	0	0	83
13 Gums resins & other vegetable sap	7	23	2	0	0	0	0	0	32
14 Vegetable plaiting materials	10	0	1	0	0	0	0	0	11
15 Fats and oils animals and vegetables	12	4	3	16	12	19	0	0	66
16 Meat products	9	5	2	2	1	16	2	0	37
17 Sugar products	3	0	0	0	0	20	0	2	25
18 Cacao products	1	0	0	0	0	13	0	0	14
19 Preparations with cereals	3	0	4	0	0	17	0	0	24
20 Preparation of vegetables	47	13	0	0	0	13	0	0	73
21 Diverse nutr. preparations cereals	8	11	1	5	1	12	0	0	38
22 Beverages	16	0	21	3	2	5	0	0	47
23 Foods prepared for animals	5	4	14	1	0	14	0	0	38
24 Tobacco and manuf substitutes	11	2	0	0	0	1	0	0	14
29.Organic chemical (sugars)	0	0	1	0	0	0	0	0	1
33. Essential oils and perfumery	0	0	25	0	0	0	0	0	25
35 Albuminoidal subst.	6	2	5	2	0	8	0	0	23
38 Miscelanoues chemical products	0	0	1	0	0	0	0	1	2
41. Raw hides and skins	6	0	7	0	0	0	0	0	13
43. Furskins and artificial fur	11	0	0	0	0	0	0	0	11
50. Silk	4	0	0	0	0	0	0	0	4
51 Wool	12	0	10	0	0	0	0	0	22
52 Cotton	1	0	6	1	0	0	0	0	8
53 Other vegetable text fibers	4	0	2	0	0	0	0	0	6
Total	522	125	132	40	36	316	2	3	1176

Source: Mexico EU Free Trade Agreement Documentation (2004)

Table A-7 European Union's schedule of duties lowering in EU-Mexico Synthesis by chapter of tariff

	Category/ Number of headings by chapter								
Chapter	1	2	3	4	4a	5	6	7	Total
01. Live Animals	13	2	3	17	0	11	0	0	46
02 Meat and eatable despoliation	40	19	16	42	0	112	0	0	229
03 Fish and Crustaceans	52	175	5		94				326
04 Milk and dairy products, eggs and honey	4	0	0	1	0	145	7	14	171
05Products of animal origin	22	0	0	0	0	0	0	0	22
06 Live trees and other plants	14	20	3	2	0	6	0	6	51
07 Vegetables, plants, roots and tubercles	14	7	32	53	0	13	1	0	120
08 Fruits	15	15	39	51	35	10	2	0	167
09 Coffee and tea	49	6	0	0	1	0	0	0	56
10 Cereals	5	0	0	0	0	48	0	0	53
11 Products of milling industry	0	0	8	4	0	71	0	0	83
12 Oils seeds	75	3	2	0	0	0	0	0	80
13 Gums resins & other vegetable sap	15	0	2	0	0	0	0	0	17
14 Vegetable plaiting materials	12	0	0	0	0	0	0	0	12
15 Fats and oils animals and vegetables	55	54	9	15	0	3	0	7	143
16 Meat products	3	29	3	17	7	29	5	0	93
17 Sugar products	0	0	0	0	0	30	0	16	46
18 Cacao products	2	4	0	0	0	0	0	21	27
19 Preparations with cereals	1	0	0	0	0	13	0	0	14
20 Preparation of vegetables	7	41	20	114	0	101	13	5	301
21 Diverse nutritional preparations cereals	9	8	0	1	0	3	0	13	34
22 Beverages	35	26	0	1	0	17	0	7	86
23 Foods prepared for animals	32	5	0	25	0	5	0	0	67
24 Tobacco and manuf. substitutes	0	25	5	0	0	0	0	0	30
29.Organic chemical (sugars)	0	0	0	0	0	0	0	5	5
33. Essential oils and perfumery	33	0	0	0	0	0	0	1	34
35 Albuminoidal subst.	11	4	0	2	0	6	2	0	25
38 Miscelanoues chemical products	0	0	0	0	0	0	0	8	8
41. Raw hides and skins	16	0	0	0	0	0	0	0	16
43. Furskins and artificial fur	13	0	0	0	0	0	0	0	13
50. Silk	4	0	0	0	0	0	0	0	4
51 Wool	16	0	0	0	0	0	0	0	16
52 Cotton	6	0	0	0	0	0	0	0	6
53 Other vegetable text fibbers	7	0	0	0	0	0	0	0	7
Total	580	443	147	345	137	623	30	103	2408

Source: Mexico EU Free Trade Agreement Documentation (2004)

This FTA has been up to 2008 in one step and further stepwise implemented to simulate gradual changes in the Mexican economy introduced as result of the implementation of the FTA Mexico EU. This scenario contemplates the simulation of subsequent shocks in order to reproduce the effects of the gradual programmed tariff reduction as scheduled by the FTA. Table A-8 contains the description of the steps simulated in this scenario.

Table A-8 Scenario 2 EU Mexico FTA Tariff cuts in commodities imports Final value of AV%

Year	Mexico	European Union
2008		
Cereals	3.81	3.87
Vegetables	2.27	0.73
Dairy Prod	46.48	8.93
Meat	4.08	2.36
Processed Food	6.55	8.08
Tobacco and alcohol		0.80
2009		
Cereals	3.73	3.52
Vegetables	2.36	1.05
Dairy Prod	46.48	8.92
Meat	4.00	2.63
Processed Food	6.22	7.53
Tobacco and alcohol		0.79
2010		
Cereals	3.68	3.21
Vegetables	2.22	0.6
Dairy Prod	46.48	8.91
Meat	3.99	2.52
Processed Food	3.75	7.9
Tobacco and alcohol		0.79

Source: Own calculations based on the GTAP data base

3 EPA Mexico-Japan

From the total of traded products between Mexico and Japan, approximately 70 percent will be free of tariffs by 2015 and 30 percent will remain subject to tariffs. Excluded agricultural products are fishery- and pork products mainly. With the signature of the EPA, 99.6 percent of the bilateral agricultural trade between Mexico and Japan will be by 2015 free of duties. Some sensible products for both parties are excluded from these negotiations (rice, wheat, apple, mandarin, oranges, dairy products, bluefin tunfish, mackerel, escallop fur and fur products), however special quotas must be fulfilled for some important products coming from Mexico e.g. honey, pork and orange juice.

The Japan Mexico EPA sets out for agricultural products seven patterns (A, B4, B6, B8 Ca, X, P) of immediate tariff elimination, staged tariff elimination/reduction, introduction of tariff quota, etc. One of the patterns shall be applied to each product. Classification of products according to the treatment of custom duties is presented in table A-9.

Table A-9 Classification of representative products to be liberalized

	Tariff rate applied at each year after the FTA implementation										
Category	Entry into force	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015
A	Free	-	-	-	-	-	-	-	-	-	-
B4	75%	50%	25%	Free	-	-	-	-	-	-	-
B6	83%	66%	49%	32%	16%	Free	-	-	-	-	-
B8	87.5%	75.0%	62.5%	50%	37.5%	25%	12.5%	Free	-	-	-
Ca	91.0%	82.0%	73.0%	64%	55.%	46.%	37.0%	28%	19%	9%	Free
X	Products in category X are excluded from any reduction or elimination of customs duties.										
Q	Contains specifications on preferential customs duties.										

Source: Mexico-Japan Economic Partnership Agreement Documentation (MOFA, 2005)

Japan granted immediate for live animals, Japan was granted with progressive liberalization on wines, beer, spirits and other alcoholic beverages, cut flowers, tomatoes, tobacco, olive oil and pectic substances. Mexico obtained the immediate elimination of tariffs on coffee, cacao, chickpeas, tequila, mango papayas, guavas and other tropical fruit and vegetables. Japan most sensitive agricultural products were either excluded from the agreement or placed in a wait list to be reviewed (category R) These products include pineapple, sugar and sugar products and some fresh fruits as bananas, apples, avocado (see table A-10).

Table A-10 Exceptions from trade liberalization between Japan and Mexico

Main products excluded from liberalized import into Japan	*Main products excluded from liberalized import into Mexico*
mandarins, pineapple, sugar and sugar products and some fresh fruits as bananas, apples, avocado	Dairy products, anchovies, potatoes, beans, manioc, coconuts, kiwis, citrus fruits, ginger, saffron, wheat, sugar (cane and dry sugar),
Main TRQs (quota/year) conceded for into Japan	*Main TRQs (quota/year) conceded for into Mexico*
Honey, tomato processed products (tomato puree, tomato paste, etc.), pork, orange juice, beef, chicken, fresh orange (initially designated tariff-free quota for market cultivation, subsequently tariff-elimination quota)	Meat of poultry (in four increasing stages), meat of swine (in eight stages), meat of rind (fours stages), honey, tomato processed products (tomato puree, tomato paste, etc.),

Source: Mexico-Japan Economic Partnership Agreement Documentation (MOFA, 2005)

Cucumber and gherkins fall into category B8 with a base rate of 12 percent. Mushrooms containing added sugar are classified as B8 with an initial base rate of 13.4 percent. Regarding vegetable oils, soybean, sunflower seed, rape seed, sesame seeds, and corn oil all are in category A.

Japan conceded zero tariffs since the beginning for unmanufacted tobacco and cigars. Smoking tobacco was set aside from the negotiations. Cigarettes, fall into category X and therefore will not be subject to any reduction. Vegetables such as asparagus, pumpkin and cigars were liberalised since the beginning of the EPA and fall into category A. Fresh fruits such as grapefruit, frozen vegetables and mixed vegetable juices are in category B6. Other fresh fruits such as: pear, cherries, peaches, and therefrom preparations are in category B8. In looking at alcoholic beverages, tequila, wine, which have a base rate of 15 percent falls into category A.

Animal feeds, most of the oilseed meals fall into category A. Preparations for balanced rations and milk replacers both fall into category X. Finally, cotton and cotton wastes are free from tariffs since the implementation of the EPA (see table A-11and A-12).

Table A-11 Japan's Schedule under the EPA Mexico-Japan

						Category/ Number of headings by chapter			
Chapter	A	B4	B6	B8	Ca	Q	X	P	Total
01. Live Animals	3	0	0	0	0	0	1	0	4
02 Meat and eatable despoliation	3	0	0	0	0	3	2	0	8
03 Fish and Crustaceans	4	0	0	0	0	0	3	0	7
04 Milk & dairy products, eggs & honey	1	0	0	0	0	0	7	0	8
05Products of animal origin	11	0	0	0	0	0	1	0	12
06 Live trees and other plants	1	0	0	0	0	0	0	0	1
07 Vegetables, plants, roots and tubercles	15	3	12	0	0	0	13	0	43
08 Fruits									
09 Coffee and tea	19	16	11	1	2	0	36	0	85
10 Cereals	25	2	0	0	0	0	30	0	57
11 Products of milling industry	10	0	0	0	0	0	10	0	20
12 Oils seeds	2	19	0	0	1	0	0	0	22
13 Gums resins & other vegetable sap	19	0	0	0	0	0	13	0	32
14 Vegetable plaiting materials	1	0	0	0	0	0	1	0	2
15 Fats and oils animals and vegetables	6	0	0	0	0	0	2	0	8
16 Meat products	11	0	3	6	0	0	28	0	48
17 Sugar products	19	0	0	0	0	8	14	0	41
18 Cacao products	3	0	0	0	0	0	19	0	22
19 Preparations with cereals	3	0	0	1	0	0	7	0	11
20 Preparation of vegetables	0	0	0	0	0	0	15	0	15
21 Diverse nutr. prep cereals	2	5	30	35	17	5	58	0	152
22 Beverages	12	2	2	1	3	0	21	0	41
23 Foods prep for animals	12	1	1	0	3	5	11	0	33
24 Tobacco and manuf. subst	16	1	0	0	0	0	5	0	22
Total	522	125	132	40	36	316	2	3	1176

Source: Mexico-Japan Economic Partnership Agreement Documentation (MOFA, 2005)

Table A-12 Mexico's Schedule under the EPA Mexico-Japan

	Category/ Number of headings by chapter								
Chapter	A	B4	B6	B8	Ca	Q	X	P	Total
01. Live Animals	46	0	0	0	0	0	11	0	57
02 Meat and eatable despoliation	33	0	0	0	0	23	23	1	80
03 Fish and Crustaceans	59	0	1	0	0	0	41	7	108
04 Milk & dairy products, eggs & honey	3	2	5	0	0	1	41	0	52
05Products of animal origin	28	0	0	0	0	0	3	0	31
06 Live trees and other plants	67	0	0	0	0	0	0	0	67
07 Vegetables, plants, roots and tubercles	44	9	14	0	0	0	32	0	99
08 Fruits									
09 Coffee and tea	24	13	16	7	1	1	34	0	96
10 Cereals	9	2	0	0	0	0	24	0	35
11 Products of milling industry	8	0	0	0	0	0	18	0	26
12 Oils seeds	1	0	0	0	1	0	38	0	40
13 Gums resins & other vegetable sap	73	0	0	0	0	0	19	0	92
14 Vegetable plaiting materials	18	0	0	0	0	0	19	0	37
15 Fats and oils animals and vegetables	6	0	0	0	0	0	3	0	9
16 Meat products	16	0	2	4	0	0	50	0	72
17 Sugar products	30	0	0	0	0	8	13	1	52
18 Cacao products	0	0	0	0	0	0	28	0	28
19 Preparations with cereals	3	0	0	1	0	0	11	0	15
20 Preparation of vegetables	0	0	0	0	0	0	28	0	28
21 Diverse nutr. prep cereals	1	3	23	33	9	5	37	7	118
22 Beverages	4	0	10	2	3	2	29	0	50
23 Foods prep for animals	33	1	3	4	2	0	9	0	52
24 Tobacco and manuf. subst	29	1	0	0	0	0	9	0	39
Total	535	31	74	51	16	40	520	16	1283

Source: Mexico-Japan Economic Partnership Agreement Documentation (MOFA, 2005)

This agreement is implemented in one step from the beginning of the EPA until 2008, from 2008 up to the total implementation of the EPA, the scenario is simulated stepwise. The gradual modification in tariff eliminations is introduced by subsequent shocks in the GTAP extended model. Table A-13 contains the description of the steps for the simulation of this EPA.

Table A-13 Scenario 3 Japan Mexico FTA Tariff cuts in commodities imports Final value of AV%

Year	Mexico	Japan
2008		
Vegetables	2.33	1.17
Dairy Prod	19.86	2.0
Meat	11.66	25.16
Processed Food	10.92	5.9
Tobacco and alcohol	4.0	3.02
2009		
Vegetables	2.24	1.09
Dairy Prod	19.51	2.0
Meat	11.57	25.16
Processed Food	10.59	5.81
Tobacco and alcohol	3.3	2.94
2010		
Vegetables	2.17	1.04
Dairy Prod	19.22	2.0
Meat	11.51	25.16
Processed Food	10.33	5.74
Tobacco and alcohol	2.74	2.87
2011		
Vegetables	2.16	1.03
Dairy Prod	19.22	2.0
Meat	11.47	5.16
Processed Food	10.24	5.68
Tobacco and alcohol	2.57	2.83
2012		
Vegetables	2.14	1.03
Dairy Prod	19.22	2.0
Meat	11.44	25.16
Processed Food	10.16	5.63
Tobacco and alcohol	2.40	2.80
2013		
Vegetables	2.14	1.03
Dairy Prod	19.22	2.0
Meat	11.44	25.16
Processed Food	10.12	5.62
Tobacco and alcohol	2.32	2.76
2014		
Vegetables	2.14	1.02
Dairy Prod	19.22	2.0
Meat	11.44	25.16
Processed Food	10.09	5.60
Tobacco and alcohol	2.23	2.73
2015		
Vegetables	2.14	1.02
Dairy Prod	19.22	2.0
Meat	11.44	25.16
Processed Food	10.05	5.58
Tobacco and alcohol	2.15	2.7

Source: Own calculations based on the GTAP data base

Scenario DDA (Doha Development Agenda)

IN 1995 the WTO was created jointly with its creation, the first rules determining international trade in agricultural and food were introduced. During the meeting of the WTO members in Uruguay, also known as the Uruguay Round, all agricultural products were subject to trade rules by the WTO's agreement on agriculture. Upcoming WTO negotiations on trade rules took place in the Meeting in Doha at which negotiations on trade rules for agricultural products were proposed; therefore this meeting is also called the Doha Development Agenda (DDA). The DDA hold as main objective the trade liberalization as engine to development in poorer countries. The DDA is made up of three different support policies reforms: market access, aggregate measures of support (AMS) and export competition, the last agreements on agricultural trade liberalization in the frame of the WTO negotiations were reached in July 2004 and are reviewed in Table A-14. All WTO members, except least developed countries (LDC's) were required to commit themselves in these agreements to liberalize the international agricultural trade.

Table A-14 Elements of the DDA scenario based on the July 2004 Framework Agreement

-**Market access** uses the tiered formula (as progressive income tax):
For developed countries, marginal rates (45, 70, and 75 percent) change at 10 to 90 percent tariffs
For developing countries, marginal rates (35,40, 50 and 60 percent) change at 20, 60, and 120 percent tariffs
For LDC's no cut to tariffs
-Aggregate Measures of Support apply tiered formula:
For developed countries, marginal rates 60 percent (AMS less than 20 percent) and 75 percent
For developing countries, marginal rate of 40 percent
For LDC no cuts to domestic subsidies
-Export subsidies abolished
-Non agricultural market access: 50 percent cuts in tariffs (33 percent developing countries, zero percent LDC's)

Source: HERTEL and WINTERS (2005)

As the centre of this study is the effects of multilateral trade liberalization in Mexico, cuts are simulated as an average of tariff elimination rather than the application of tiered and linear formulas. Diverse studies approaching effects across countries of the diverse formulas have been better simulated and are out of the scope of this study. This scenario takes as basis table A-14 and applies average tariff cuts of 40 percent in developed countries and 30 percent in developing countries for agricultural products; in LDC's tariff reduction is not included. Export subsidies are completely eliminated for all regions.