

TOPIC 1: Trade, Growth, Inequality and Poverty

1.3 Trade and Poverty

Aim

Even if trade liberalisation were to raise growth rates, this gain may not be distributed equally and it is not certain that the poorest gain from trade reform. How is the poor affected by trade liberalisation and if they do not gain, how could gains from liberalisation be spread more equally?

Outline

- 1) Channels: Poverty and Trade Liberalisation. Focus on Households and Markets
- 2) Note on Some Methodologies used to Analyse the Effects of Trade Reform on Poverty
- 3) Trade and poverty in Mexico - an Econometric Partial Equilibrium Model
- 4) Trade and poverty in India- Econometric Ex Post Analysis

Reading

Winters, A., N. McCulloch, and A. McKay ,2004, Trade Liberalization and Poverty: The Evidence so Far, *Journal of Economic Literature* 62, 72-115 (section 4)

*Nicita, A., 2004, Who Benefited from Trade Liberalization in Mexico? Measuring the Effects on Household Welfare, *World Bank Policy Research Working Paper* No. 3265.

*Topalova, P. ,2005,, Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts, NBER Working Paper No. 11614 or Topalova, P ,2007, Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts in *Globalization and Poverty, Ann Harrison (ed.), 291-336* , University of Chicago Press. Available at <http://www.nber.org/chapters/c0110.pdf>

*Topalova, P., 2010. Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India." *American Economic Journal: Applied Economics*, 2(4): 1–41.

Hertel, T. and Reimer, J. (2005). Predicting the Poverty Impacts of Trade Reform. *Journal of International Trade and Economic Development*, Vol. 14(4), 377-405.

For those interested in reading more about modelling the effects of trade reform on poverty see for example the book by *Bourguignon and Pereira da Silva* (2003) “The impact of economic policies on poverty and income distribution: evaluation techniques and tools” (available at World Bank website

http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2003/10/25/000094946_03100904005491/Rendered/PDF/multi0page.pdf

1. Channels linking trade liberalisation and poverty

There is *no general framework* that predicts the effect of trade liberalisation on poverty. Several different channels of effect can be examined. This is an active research area. Researchers are engaged in developing new methods, analysing the effects in different countries and investigating how the different channels of effect from trade to poverty work.

- **Why is the relation between trade and poverty a complex question?**

Effects of trade liberalisation on poverty can be ambiguous because of

- There are diverse possible channels through which trade liberalisation might affect poverty.
- Poor people are heterogeneous. There are many reasons for poverty. A study on the effects of trade liberalisation on poverty has to take into account differences in employment, consumption and production between the poor. Moreover, trade liberalisation may affect members of the same household differently
- Not only trade reforms can be different (i.e. different strategies may be pursued for liberalisation) but also the effect of trade liberalisation on poverty can depend on the economic environment, institutions and other policies.
- Multi-dimensional nature of poverty and problems of measurement. Most empirical studies use income or consumption-based measures of poverty because they are easier to work with. But, evidently as Sen argues, the amount of income or consumption is not enough. We should also take into account education, health, dignity, freedom to choose and use your capabilities. However, in this lecture we focus on income/consumption based measures of poverty, because most empirical/econometric studies on poverty and trade use such measure.

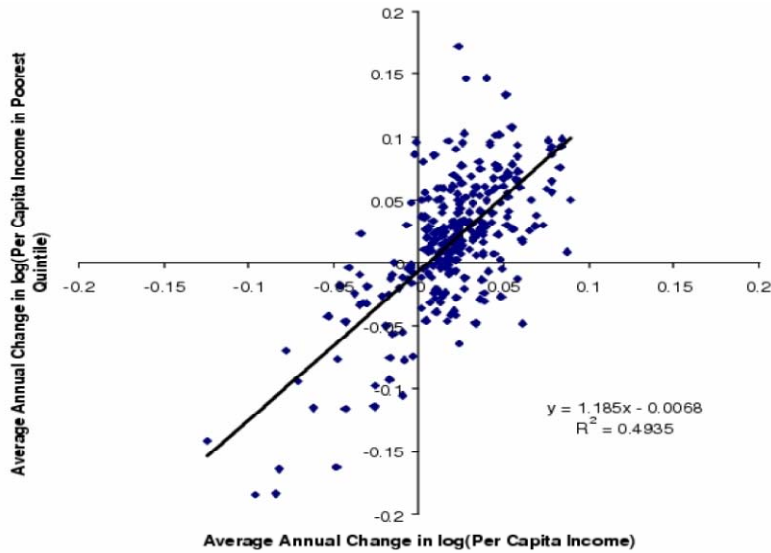
- **Winters et al. 2004 identify the following channels of effect from trade liberalisation to poverty:**

- 1) Macroeconomic channel: Growth and Fluctuations (see previous lectures)
- 2) Households and Markets (Focus in this lecture)
- 3) Wages and Employment (see previous lectures)
- 4) Government revenue and expenditure (no strong evidence that trade liberalisation has decreased social expenditure and hurt the poor).

Channel 1: Trade, Growth and Poverty

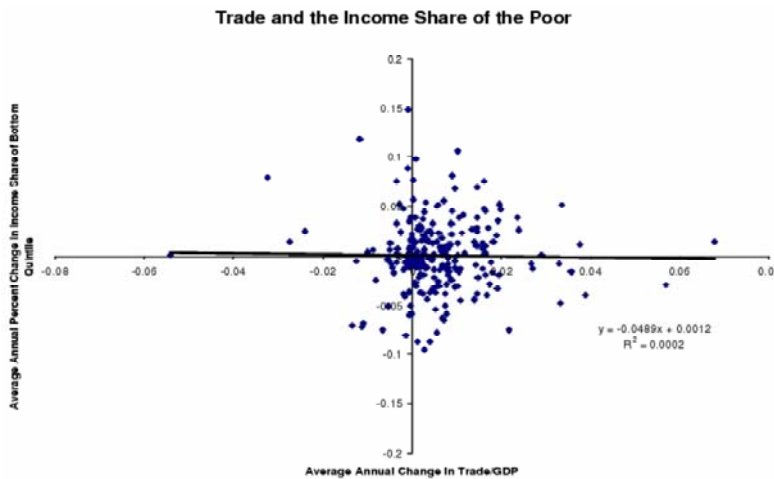
- We have already discussed the macro and micro level evidence on the relationship between trade openness and growth. Despite the limitations of the empirical evidence, the balance seems to be a positive effect of trade openness on growth.
- Evidence on the effect of growth on poverty remains mixed.

Dollar and Kraay (2001): They use data for 137 countries both DC and LDCs for around 40 years from 1960 and found that a 1% rise in real GDP, raises income of the poorest by 1.2%



Source: Dollar and Kraay (2001)

Further, they ask what factors that explain cross country differences in growth rates have a significant effect on the poorest 20% of the population. For example, the relationship between annual changes in trade (i.e. “openness”) and annual income of the poor does not exhibit a linear relation.



Source: Dollar and Kraay (2001)

They ran a basic multiple regression analysis where Y is the ln(Income of the poorest 20%):

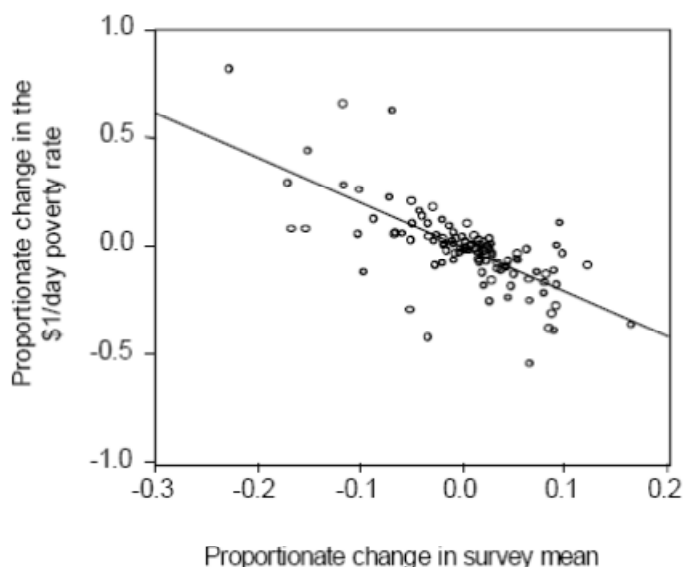
Growth Determinants and Income of the Poor

	Coef	Std.Err.
ln(Per Capita GDP)	1.094	0.108***
(Exports+Imports)/GDP	-0.039	0.088
# Observations	223	

Source: Dollar and Kraay (2001)

Ravallion (2001) has a set of nationally representative household surveys from 50 developing countries mostly in the 1990s. He examines the proportionate change in the rate of poverty against the proportionate growth of average income over **two consecutive periods** (year varies depending on survey data availability). Using a basic OLS, he estimated the slope of this relation which was found to be -2.5 (std err 0.30), $R^2 = 0.44$. That is for a 1% increase in the mean income, share of population below poverty line (absolute) falls by 2.5%. Growth is thus pro-poor

Figure 1: Poverty tends to fall with growth in mean household income or expenditure



Note: Based on data for 47 developing countries in the 1980s and '90s (multiple spells for most countries). The horizontal axis is the annualized change in the log of the real value of survey mean; the vertical axis is the annualized change in the log of the percentage of the population living below \$1/day at 1993 Purchasing Power Parity. The figure has been trimmed of extreme values, but this does not alter the line of best fit indicated.

Table 1: Diverse impacts on poverty underlie the fact that changes in inequality are uncorrelated with economic growth

		What is happening to average household income between the surveys?	
		Falling	Rising
What is happening to inequality between the surveys?	Rising	(16% of spells) Poverty is rising at a median rate of 14.3% per year	(30% of spells) Poverty is falling at a median rate of 1.3% per year
	Falling	(26% of spells) Poverty is rising at a median rate of 1.7% per year	(27% of spells) Poverty is falling at a median rate of 9.6% per year

Note: Based on 117 spells between two household surveys covering 47 developing countries in the 1980s and '90s. Poverty is measured by the % of the population living below \$1/day at 1993 purchasing power parity. Inequality is measured by the Gini index.

Source: Ravallion (2001)

Ravallion also finds that poverty falls more slowly in relation to rising average income growth if income inequality rises (see Table above). However, growth is still more important for poverty reduction than falling inequality.

Hence, Dollar and Kraay (2001) and Ravallion (2001) show that (average) growth benefits the poor.

- But trade liberalisation changes prices and will require adjustments. In the short-run, it is very likely that someone gains and someone loses. What happens to poverty in the long-run if trade liberalisation succeeds to raise growth rates can depend on several other factors. The likelihood that growth can reduce poverty depend on initial conditions, economic environment and institutions (higher government development spending, crop yield, lower inflation) are such that the poor can take advantage of the opportunities created by growth.
- At the micro level: Empirical evidence suggests that trade liberalisation does often raise firm productivity through technological spillovers, 'learning by looking' imports, etc. In the long run this rise in efficiency will generate growth and can reduce poverty via this channel. But:
 - In the short run a rise in productivity may translate into a reduced need for inputs. This may have detrimental consequences for workers, who lose their jobs and thus may raise poverty in the short-run.
 - Many among the poor do not work for wages, so changes in firm productivity are not directly relevant to them. However, the effects may come via consumer prices. And, if output levels rise, this may offset the negative employment effect (see below for more on employment).
- In terms of openness and macroeconomic instability: Macroeconomic instability is a risk to everyone – poor and non-poor households. However, the poor may be less prepared to cope with such risks. In developing countries, official social security system and insurance mechanisms for the poor are missing. Empirical studies have found no correlation between the degree of economic openness and output volatility; empirical evidence on the relation between openness and terms of trade volatility is mixed.

Channel 2: Households and Markets

Household is often the unit over which poverty is defined. Trade liberalisation changes prices, which has effects on the consumption and production of the poor. In many countries a large share of poor people does not work for wages, but the poor are self-employed or work for household enterprises or farms.

A household can have various sources on income, such as social security type transfers, remittances from members of households not living within the household, income in kind. They may also work for wages and sell their produce for profit.

The question is how are all these different components of income affected by a trade liberalisation? And additionally, what does trade liberalisation do to consumption?

In addition, the changes may affect different members of the household differently. Say, that trade liberalisation has a negative impact on household income in total. This might mean that in addition to the responsibility of child rearing, women may have to start to work outside the household. Trade liberalisation may even affect household investment decisions at the level of deciding whether or not to put children into school or work.

Ways in which trade liberalisation can affect households (ignore effects of trade liberalisation on wages and income transfers):

- a) Prices are one channel of effect from trade liberalisation to poverty. Therefore, we need to ask to what extent are these price changes transmitted to poor households. Are there barriers to price transmission?
- b) Sometimes competition and price changes induced by trade liberalisation may become so intense that certain markets that the poor rely on for their income or consumption are destroyed. On the other hand, trade liberalisation may create opportunities for new markets to emerge (for goods not traded before or new consumer goods), which in turn benefit poor households.
- c) How do households respond to trade-related price shocks? Can they adjust to changes in prices? How well can they protect themselves against changes in markets and prices?
- d) Do spill-overs between households exacerbate or alleviate poverty?
- e) Trade liberalisation and vulnerability

Think of a farm household, which produces goods, sells its labour and consumes. Assume labour income and income from transfers are given. An approximation of the welfare (W) effect of a *small* change in prices to a household is

$$\Delta W = \sum_i (q_i - c_i) \Delta p_i$$

where q_i is production of good i , c_i consumption of good i and Δp_i the price change. So, the household can be a net seller or a net producer of a good i .

An increase in the price of something of which the household is a net seller raises real income and a fall in these prices lowers real income.

a) How do changes in prices at the border affect households?

Changes in tariff-inclusive border prices may not be transmitted in full to the local level. This may be because of high transaction costs: high transport and distribution costs, little competition between traders in general (monopoly power of traders), poor infrastructure, heavy domestic taxes and regulations.

The **local** price of an importable good (m) can be expressed as

$$P_m = P_w r (1+t_m) + c_m$$

where P_w is the world price, r the exchange rate, t_m the proportional tariff or tax and c_m the transaction costs for importables (per unit of good).

For an exportable good (x) the corresponding equation is

$$P_x = P_w r (1-t_x) - c_x$$

Trade liberalisation lowers tariffs on imports, but can also remove or reduce taxes on exports as a means to promote exports.

Tariffs and export taxes, exchange rates and transaction costs affect prices faced by the poor. Changes in border taxes (t) can be offset or exacerbated by changes in transaction costs c . For instance, transaction costs may fall if transportation improves. They may be high, when the distribution sector does not function competitively and absorbs some of price change. Take agricultural goods as an example:

Many export crops, in particular those grown by small farmers, are sold through public or private marketing agencies. The price the producers receive is often lower than world price p_w . The distribution sector collects this difference in prices. This difference may be a transport or marketing cost or simply profit. Note that one reason for the existence of these agencies has been to protect farmers from world price fluctuations – this could mean that changes in prices arising from trade liberalisation would not be transmitted.

Transactions costs provide a certain *degree of protection* to local producers from import competition (from import products reaching local markets at low prices). But, these costs also act as a *tax on potentially cheaper import goods* (for both producers requiring inputs as well as consumers) and a *tax on suppliers of exports*.

Price transmission can be particularly incomplete for poor people living in remote rural areas (where c is higher). Sometimes, in the absence of investment to improve on transport etc., many households in rural areas (e.g. in Sub-Saharan Africa) simply cannot trade their products because transaction costs are higher. They are almost completely blocked out from changes in prices induced by trade liberalisation (e.g. remote regions in Rwanda and Indonesia).

Note that trade liberalisation is often accompanied by domestic market liberalisation.. Vietnam experienced a significant rise in the producer price of rice when restrictions on exporting were removed. However, the marketing system is still not a competitive one, which can constrain development of rice production.

b) Are Markets Created or Destroyed?

Romer's (1994) argument: a major advantage of participating in trade reforms comes from the adoption of new technologies and an increase in the variety of activities and production. Consumers can purchase larger variety of goods and producers have access to a higher variety of inputs. For e.g. Booth et al. (1993) found that in Tanzania, liberalisation led to a greater availability of goods at international prices and this was considered a substantial improvement compared with the past, even by quite poor rural people

Trade liberalisation allows for more imported inputs to advance production, but competition may also drive out some producers.

But often markets are destroyed not because of trade liberalisation per se but other policies like privatisation and changes in domestic marketing arrangements. For instance, if official marketing boards provide small farmers with inputs against future output, but after privatisation, such practices are no longer available, farmers could lose even if output prices were to rise as a result. In Zambia, the abolition of the official maize purchasing monopsony in early 1990s caused hardship in remote areas because transaction costs of collecting was very high and not trade cost effective

c) How well do Households (HHs) Respond?

How do HHs respond to price changes? Can the poor protect themselves against negative effects? Are they able to take advantage of the opportunities created by trade liberalisation?

HHs do respond to the impacts of TL but the respond varies across HHs depending on the type of constraint faced by HHs:

Production:

- No key productive assets

- Credit constraint (less educated, poor quality of land)
- Lack of institutions to help small producers to cope with fluctuating prices.
- More female labour...repercussion in women's health and well being of children.

Consumption:

- For poor HHs with subsistence activities, wage employment, self employment and consumption are jointly determined
 - Some studies show that TL has decrease child labour via its income effect
 - Informal safety nets.
- Deininger and Olinto (2000) have data on slightly below 5000 farming households in Zambia for 1993-94 to 1994-95. They find that the expansion of agricultural productivity after liberalisation was constrained by the absence of productive assets (ownership of cattle, availability of fertiliser and credit).
 - López, Nash, and Stanton (1995) find that in Mexico households with low levels of capital inputs were, on average, less able to respond to opportunities created by rising producer prices after trade liberalisation. But, these farmers also had more problems in obtaining credit, were less educated and farmed poorer quality land. So, there may be several factors behind lack of response.
 - Trade liberalisation can bring with it a new degree of commercialisation. The required standard of production and also the amount of resources required may rise. Some agricultural households are in a better position to deal this and can supply directly to the market than sell via marketing boards or distributors.

For instance, in Malawi, trade liberalisation led to the appearance of traders who buy food commodities from farmers and sell in urban areas or export (Parris, 1999). But, because most small farmers do not have the resources to store their output, they sell immediately after harvesting, when prices tend to be low, because of large supply. Poorer farmers are less able to store output (have less access to storing facilities or to access credit to buy such facilities) and therefore less able to respond to changes in marketing and prices.

Another problem may be that trade liberalisation may encourage the expansion of cash crop production (crops for sale) to the extent that food crop production suffers and food safety concerns may arise. Additionally, this may raise women's workload if men switch to working on cash crop production and leave food crop production entirely to women.

- Households may also adjust by changing the internal resource allocation as a result of price changes brought about by liberalisation. For instance, Edmonds and Pavncik (2002) find that the share of children working fell in Vietnam as a result of trade liberalisation. Liberalisation raised price of rice and thus also family income.

In sum, what these findings suggest is that complementary policies should be in place ensure that also the poorer rural households can respond to opportunities and challenges of trade liberalisation. Examples would be to improve access to credit, provision of inputs and guidance via good quality rural extension services.

d) Do the Spillovers Benefit the Poor?

Even if the poor are not directly affected by increased demand for their product generated by a trade liberalisation, they may be affected indirectly. This would happen, because those who do benefit directly demand more inputs and consumption goods and services from the others:

Production linkages:

“backward” - sector demands factors or intermediate inputs.

“forward” - other sector uses output as input.

Expenditure linkages: the extent to which increased income in one sector (say agriculture) raises demand for the outputs of another sector (say non-farm sector).

Such linkages can be strong in rural areas and for policy purposes it is useful to know which sectors can be associated with largest growth linkages.

e) Trade liberalisation and vulnerability

Vulnerability is related, but not necessarily same as poverty. Not just the level, but also variability of income is important. Pritchett, Suryhadi, and Sumarto (2000) define vulnerability as: high probability of being below the poverty line over a three-year period.

Households have different sources of income – could be thought of as a result optimal portfolio choice. Trade liberalisation may change optimal portfolios. For instance the example of switching from food crops to cash crops. Cash crops may bring higher returns, but potentially also more variable income. Also poor households may be risk averse and unwilling to invest in new activities. For instance, credit constraints may lead to such unwillingness even if returns would be higher from the new activity or production tool.

Trade liberalisation may also lead to price variation – for instance abolishing marketing boards may raise price variation. But the empirical evidence on trade liberalisation and price volatility rather scarce and results mixed.

No strong empirical evidence linking trade liberalisation and poverty traps but some evidence on spatial poverty traps and inter-generational transmission of poverty effects (trade liberalisation might reduce expenditure in education, child nutrition, health).

2. Note on some methodologies used to analyse the effects of trade reform on poverty

Ex ante studies

- Analyse the welfare effects of trade reforms ex ante – before the reform took place. This uses simulation methodologies and partial equilibrium general equilibrium models.
- This is a specialist literature beyond the current scope of this course. Three common ex ante approaches are described in these references: partial equilibrium models, general equilibrium models and models where estimated price changes from general equilibrium models are used in an analysis of household survey data.

Ex post studies

- The studies by Nicita and Topalova on the reading list focus on the effects of a trade reform that took place.

For details on partial and general equilibrium models read Bourguignon and Pereira da Silva (2003) and Robinson (2003)¹. Next we provide a flavour of partial equilibrium models that is useful to understand the study by Nicita.

- **Partial Equilibrium (Multimarket) Models²**

¹ Robinson, S. (2003). Macro Models and Multipliers: Leontief, Stone, Keynes, and CGE Models, International Food Policy Research Institute (IFPRI).

² Mainly based on Arulpragasam and Conway (2003) in Bourguignon and Pereira da Silva.

- The policies analysed with partial and general equilibrium models generally relate to price/quantity changes (tariffs, taxes etc.)
- The models predict household response to a price shock (and quantities) that feed into changes in profits and wages. In the case of trade, the price shock is generally a fall in tariffs.
- General equilibrium models have a full characterisation of the goods and factor markets and wages, prices, and private income are determined endogenously. In contrast, the partial equilibrium approach is more simple (less data required), but ignores some of the indirect general equilibrium effects and focuses on selected connected commodity markets which the policy in question is most likely to affect.
- The changes in prices affect the production and consumption of these certain goods and thus have implications for wages. The demand and supply of the goods examined are interlinked. Changes in the price of one good generate an indirect demand/supply response in another good (substitutes, complements).
- Partial equilibrium models are most appropriate for a) the evaluation of policies that change the relative price of a specific good - for example, the removal of a subsidy or the elimination of a tariff or quota; and b) when there is a well-defined set of close substitutes or complements.
- Households are generally assumed to be both producers and consumers.
- Data from household surveys is required to estimate the shares of household expenditure affected by the price changes (via own-price and cross-price elasticities of demand).
- Producer survey information is used to estimate own-price and cross-price elasticities of supply.
- These estimates are combined to create a system of demand and supply functions, and price-or quantity-clearing is imposed for each good in the system of equations.
- Relative prices and quantities produced and consumed domestically are derived for the new equilibrium.
- From these estimates, one can estimate the marginal effect on households (change in household welfare) based on the information on consumption and production.
- As opposed to general equilibrium models, partial equilibrium models do not evaluate the effects on government budgets and on prices and quantities outside the set of interrelated goods markets.

Steps in partial equilibrium models

- 1) Identify market in which policy reform has a direct effect and those markets which are strongly interlinked in demand or supply with the markets in which the direct effect is measured.
- 2) Create a system of demand and supply functions.
- 3) Market closure rule - either price- or quantity-clearing for each good. So a general assumption in this literature is that markets clear. Policy reform will change relative prices of goods and quantities produced and consumed domestically.
- 4) Combine the changes in relative prices and quantities with household survey information to determine the marginal impact of the policy reform on the incidence and depth of poverty.

And to measure the incidence and depth of poverty, it requires a poverty line and disaggregated set of data on income or consumption distribution across households. Also it requires aggregated data for factors and commodities and software to solve for the endogenous prices and quantities. Finally, it requires a mapping of these endogenous variables into the income and consumption of households.

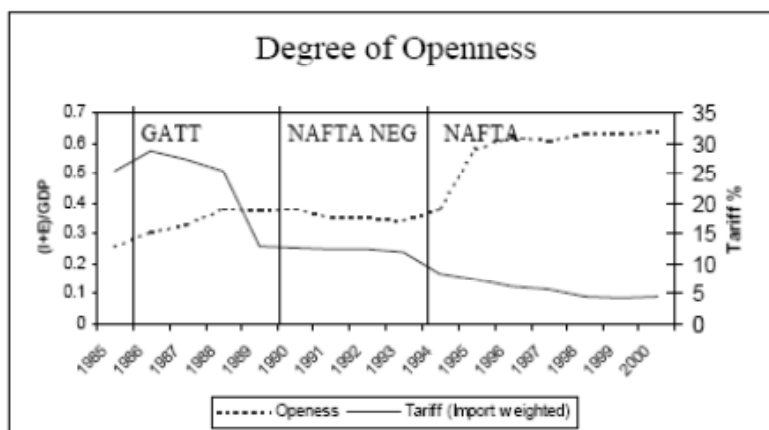
3. Who benefited from trade liberalisation in Mexico? Nicita (2004)

The aim: Examine how much trade liberalisation has affected domestic prices and labour income across groups and regions.

The findings:

- Poverty: Direct effect of reducing poverty by about 3 percent (approximately 3 million individuals out of poverty). But increased income and regional inequality.
 - Prices: the results indicate that trade liberalisation has lowered relative prices of most non-animal agricultural products and, while reducing the cost of consumption, has reduced households' agricultural income, widening the income gap between urban and rural areas
 - Wage rates: Skilled workers have benefited relative to unskilled workers. Wages of unskilled workers have in many regions decreased as a result of trade liberalisation. Similar differences are found in the geographic distribution of the benefits of trade liberalisation, with the states closest to the U. S. border gaining threefold more relative to the least developed states in the south.
- Nicita (2004) uses a partial equilibrium model to estimate the effects of the Mexican trade liberalisation in the 1990s on poverty. This is an ex post econometric analysis.
 - Interesting: the model also includes differential transmission of prices from the border to different regions of the country. The regional aspect of price transmission has generally been neglected in these models.
 - The effects of trade liberalisation are first translated into changes in regional prices and wages. These estimates are plugged into a farm-household model to estimate the effect on households' welfare.
 - Phases in Mexico's trade liberalisation:

Figure 2.1 – Mexico's degree of Openness



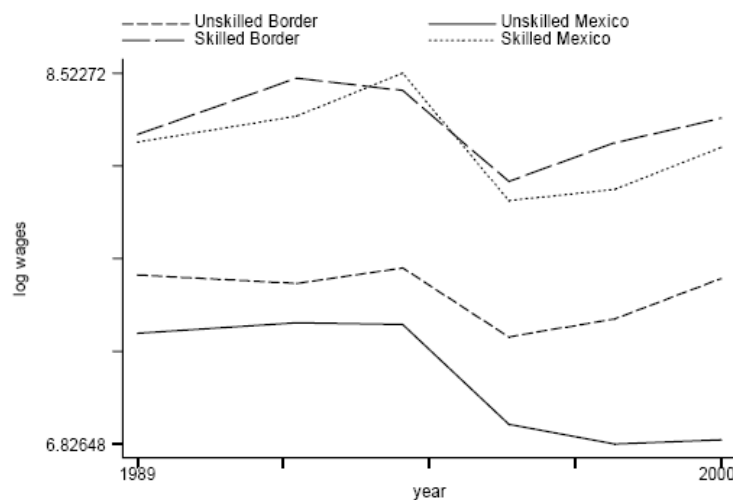
Source: World Development Indicators, World Bank.

$$(I+E)/GDP = (Imports+Exports)/GDP$$

- The paper relies on half-dozen household surveys spanning the entire period of trade liberalisation (1989-2000). Data comes from Encuesta de Ingresos y Gastos de los Hogares (ENIGH) conducted by the Instituto Nacional de Estadística Geográfica e Informática (INEGI)
- The study analyses 12 product aggregates: 8 agricultural and 4 manufacturing. These represent about 75 percent of the consumption basket of poor households.

- Poor households spend slightly more than 50 percent in food. Non-food manufacturing products represent about 25 percent of the consumption basket, and the remaining 25% represent expenses in non-mapped products and services.
- All prices with the exception of sugar fell between 1989 and 2000. During this period, the decline of real prices ranged from about 7 percent for cereals to about 40 percent for dairy products.
- Real wages increased steadily in Mexico during the early 1990s, but fell during the sharp economic downturn in 1995. Skilled wages then rose at a faster rate than unskilled wages (see fig 2.2. below).
- According to CEPAL, The incidence of poverty remained stable around 40 percent during the 1990s. The incidence of poverty in Mexico varies by region. Northern states are on average richer and the southern states the ones with highest poverty rates.

Figure 2.2 – Log Real Wages (pesos)



Note: Wages are weighted averages of all education groups using cell sizes as weights. Border wages are the one observed in the 6 border states, Mexico wages are the wages observed in the remaining 26 states. Source: Author's calculation based on tariff data from INEGI households surveys, 1989-2000.

Source: Nicita (2004)

- Model

The paper starts by describing a farm-household model on household welfare. Next, it develops a model to link the trade liberalisation to changes in the prices of goods at a regional level. Finally, it links the price effect of trade liberalisation to labour income. Price and earnings changes are then plugged into household's indirect utility function to obtain the effects of trade liberalisation on household welfare.

Household welfare

In Mexico more than half of the households receive at least one-third of their income from the sale of agricultural products.

The indirect utility function of the households can be written as:

$$u_h = V_h[y_h, P] = V_h[m_h + \pi_h, P] \quad (1)$$

where P refers to prices, y to income. Total income is the sum of the income from farm activity π_h and non-farm activity m_h . The latter includes earned income (wages) and unearned incomes (gift, transfers and remittances). That is, income of household h is given by the sum of labour income and profits associated with the household's own production of a particular good.

$$y_h = \underbrace{wl_h}_{\text{labor income}} + \underbrace{\sum_g \pi_{hg}}_{\text{profits}} \quad (2)$$

where w is the prevailing wage rate, l is the (net) amount of labour sold in the market by household h and $\sum \pi_{h,g}$ are profits obtained from directly selling good g in the market.

Assume that households choose optimally the amount of labour to sell in the labour market and the amount to produce in their own business. The effect of a small change in prices and wages on household welfare can be obtained from (differentiate (1) and (2); substitute (2) in (1) and divide everything by y_h , see paper for details).

$$\begin{aligned} \frac{du_h}{y_h} = & \underbrace{\theta_h^l dw_h}_{\text{labor}} + \underbrace{\sum_g \theta_{hg}^x dp_{gh}}_{\text{agric. income}} - \underbrace{\sum_g \theta_{hg}^c dp_{gh}}_{\text{consumption}} - \underbrace{\sum_g \eta_{hg} \theta_{hg}^c dp_{gh}}_{\text{income effect}} \\ & - \frac{1}{2} \left(\underbrace{\sum_g \varepsilon_{hg} \theta_{hg}^c dp_{hg}^2}_{\text{price effect}} + \underbrace{\sum_g \sum_{k \neq g} 2 \varepsilon_{hgk} \theta_{hg}^c dp_{gh} dp_{kh}}_{\text{cross price effect}} \right) \end{aligned} \quad (3)$$

where η_{hg} is the income demand elasticity, ε_{hg} is the price elasticity of demand and ε_{hkg} is the cross price elasticity of good g to good k .

$\theta_{hg}^c = p_{gh}c_{hg}/y_h$ is the share of income spent on good g by household h

$\theta_h^l = wl_h/y_h$ is the share of income obtained in the labor market by household h

$\theta_{hg}^x = p_{gh}x_{hg}/y_h$ the share of income of household h obtained by selling good g in the market at price p .

x_{hg} is the quantity of good g sold on the market by household h .

Changes in wages (dw_h), prices (dp_{hg}) and income (dy_h) are expressed in percentage terms.

Assume income shares are fixed. Welfare change is decomposed into

- Change in labour income
- Change in net production/consumption of the good.

The latter depends on production income and consumption. Consumption patterns are further affected by income, price and cross-price elasticities of demand.

A change in the price of good g favours/harms the household to an extent given by the “net exposure” of its budget to that particular good.

In order to express the change in welfare in monetary units, it can simply be multiplied by household income.

Nicita uses previously estimated income and cross-price elasticities. However, to be able to estimate the welfare changes to a household of a tariff change, **he needs dw and dp_g – changes in wages and prices.**

⇒ *Price transmission*

Model captures trade costs - the extent to which local markets respond to movements in the prices at the border.

$$P_{gtr} = e_t P X_{gt}^* (1 + \tau_{gt}) TC_{gtr} = e_t (\phi_{gtr} CP_{gt}^*) (1 + \tau_{gt}) TC_{gtr} \quad (4)$$

where P_{gtr} **domestic price for imported good g in time t in region r** , $P X_{gt}^*$ is the international price, e_t the exchange rate, τ_{gt} the tariff and TC_{gtr} are trade costs. $P X_{gt}^*$ can be expressed as production cost CP_{gt}^* multiplied by a regional mark-up ($\phi_{gtr}=1 + \lambda$, where λ is the profit margin). * implies expressed in foreign currency.

To estimate (4) :

Assume that the profit margin (ϕ_{gt}) can be proxied by the ratio between the price of import competing goods in region r and production cost to produce and sell the good in the region.

$$\phi_{gtr} = \left(\frac{PD_{gtr}}{CP_{gt}^* e_t (1 + \tau_{gt}) TC_{gtr}} \right)^\alpha, \text{ and } 0 \leq \alpha \leq 1 \quad (5)$$

Note that α can be interpreted as the level of competition in the domestic market. If $\alpha = 1$ (no pass through), then substitute 5 into 4 so $P_{gtr} = PD_{gtr}$ i.e. and foreign good cannot be sold profitably in the market

Use (5) and (4) to obtain and take \ln :

$$\ln P_{gtr} = \alpha \ln PD_{gtr} + (1 - \alpha) \ln CP_{gt}^* + (1 - \alpha) \ln(1 + \tau_{gt}) + (1 - \alpha) \ln TC_{gtr}$$

Note that the estimation is carried on in an “unrestricted” form, so

$$\ln(P_{gtr}) = \beta_0 + \beta_1 \ln X_{gt} + \beta_2 \ln Z_{gtr} + \beta_4 d_r + \gamma \ln(1 + t_{gt}) + \gamma_1 \ln((1 + t_{gt}) d_r) \quad (6)$$

where

X_{gt} (proxy for CP_{gt}) is the international price of good g expressed in domestic currency
 Z_{gtr} (proxy for PD_{gtr}) is a vector of control variables that includes local supply and regional income. So, the regional mark-up is controlled for by various region specific variables.

d (proxy fro TC_{gtr}): Since about 80 percent of Mexico’s imports originate from the United States, the trade cost variable is constructed as the shortest driving distance (in thousand of

kilometers) from each of the state's capitals to the United States border (Tijuana, Ciudad Juarez and Nuevo Laredo).

The model also includes an interaction term between the distance d and the tariff rate, in order to isolate empirically the regional variation in price transmission.

Note that $\gamma=1-\alpha$ is the **pass-through elasticity**. The price transmission is defined as the percentage change in the domestic price resulting from a one percent change in the tariff rate. In the extreme case when $\gamma = 1$ or $\alpha=0$ the transmission is complete. When $\gamma = 0$ or $\alpha=1$ the transmission is zero.

Data: domestic prices for 32 regions in 6 time periods – panel data estimation.

To obtain the percentage change in prices dp_g over liberalisation period, one needs to calculate:

$$dp_g = (P_{tar89} - P_{tar2000})/P_{tar2000}$$

where $P_{tar2000}$ represents the price estimates for the year 2000 and P_{tar89} refers to the price estimates calculated with the tariff of 1989 according to (6). These are regional.

Theory suggests a positive sign on the transmission coefficient γ and, since most Mexican imports originate from the United States, a negative sign on the interaction term.

Table 4.1 – Regression Results: Pass-through Price Elasticities.
Dependent variable – Log of domestic price.

<i>Agricultural Products</i>								
Variable	Cereals	Dairy	Fruit	Pulses	Meat	Oils and Fats	Sugar	Vegetables
Constant	-4.761*** (1.570)	6.999*** (1.902)	-1.776* (0.914)	22.709*** (2.319)	11.326*** (1.187)	5.565*** (0.479)	1.417*** (0.516)	-0.764 (1.863)
Distance	-0.005 (0.017)	-0.046*** (0.017)	-0.027** (0.012)	0.015 (0.010)	0.028*** (0.009)	-0.004 (0.008)	-0.021*** (0.008)	-0.012 (0.012)
International Price	0.168*** (0.059)	2.123*** (0.348)	0.047 (0.131)	4.200*** (0.461)	1.733*** (0.103)	0.770*** (0.052)	-0.061* (0.038)	0.026 (0.257)
Local supply	0.010 (0.015)	-0.012 (0.024)	-0.013 (0.011)	-0.045*** (0.010)	-0.015 (0.009)	0.006 (0.004)	0.021*** (0.005)	0.042** (0.017)
Regional CPI	3.695*** (0.671)	2.163*** (0.633)	1.919*** (0.332)	-0.084 (0.344)	1.039*** (0.301)	0.391** (0.196)	0.150 (0.215)	1.737*** (0.430)
Tariff	0.326* (0.179)	0.317 (1.020)	0.227*** (0.074)	-0.979*** (0.142)	-3.175*** (0.580)	0.223*** (0.056)	0.266*** (0.064)	0.144*** (0.046)
Tariff*Distance	-0.171*** (0.045)	0.161 (0.132)	0.035* (0.019)	0.034 (0.033)	-0.027* (0.016)	0.063*** (0.015)	0.001 (0.016)	0.137 (0.134)
Observation	192	192	192	192	192	192	192	192
R squared	0.452	0.318	0.439	0.360	0.811	0.757	0.241	0.434
<i>Manufacturing Products</i>								
Variable	Food Products	Household Appliances	Other Manufact.	Textiles and Apparel				
Constant	2.103* (1.203)	-1.772 (1.081)	-4.296*** (0.848)	-4.451*** (0.583)				
Distance	0.035** (0.015)	0.021 (0.016)	-0.004 (0.008)	0.026*** (0.010)				
International Price	-0.151 (0.157)	0.011 (0.033)	-0.015 (0.197)	0.020*** (0.005)				
Local supply	-0.007 (0.013)	-0.009 (0.008)	-0.022 (0.016)	-0.074*** (0.013)				
Regional CPI	0.270 (0.467)	3.075*** (0.494)	3.577*** (0.247)	3.824*** (0.267)				
Tariff	1.019*** (0.104)	0.769*** (0.133)	0.671*** (0.085)	0.546*** (0.058)				
Tariff*Distance	-0.123*** (0.030)	-0.109** (0.044)	-0.116*** (0.020)	-0.097*** (0.014)				
Observation	192	192	192	192				
R squared	0.404	0.774	0.769	0.418				

Note: All variables, except distance, are in log. White corrected standard errors are shown in brackets. Significance level of 1%, 5% and 10% are indicated by ***, ** and * respectively.

Source: Nicita (2004)

Interpreting coefficients: for cereals (mostly maize), the results show a transmission coefficient of about 32 percent. Since the coefficient γ_1 is -0.17, the change in tariffs has no effect for regions that are further than 1900 kilometers from the northern border (interaction term becomes 0).

The results show that changes in tariff have different effects for different products. Manufacturing products are in general more responsive to changes in tariffs, and the domestic prices of agricultural products are influenced less by tariffs (sometimes not at all). However, agricultural products are still very much protected through tariff and non-tariff barriers and agricultural products usually face more competition from internal markets and have higher transport costs.

⇒ *Labour Income*

The earning equation for each individual can be written as:

$$W_{ijt} = W_{ijt} (P_{gt} H_{jt} Z_{it})$$

where W_{ijt} is the wage of individual i in household j at time t , P_{gt} is a vector of prices for goods g in time t , H_{jt} is a vector of household characteristics and Z_{it} is a vector of individual characteristics. Household survey data includes data on both prices and wages.

The empirical estimation is simply a regression of individual wages on the prices of goods interacted with regional and schooling dummies, plus individual controls. Therefore, wage responses to prices are limited to vary across regions and between skilled and unskilled workers. The varying coefficients of the price regressors depend on the region of residence of the household and the level of education of the individual. The results capture the effect of a particular price on a type of wage in a determined region.

$$\ln w_{ijt} = \sum_{g,r,s} \theta^r \theta^s \ln p_{ij}^{g,r} \beta_{ij}^{g,r,s} + Z_{it} \gamma + H_{jt} \delta + \varepsilon_{ijt}$$

The model is estimated with 5 goods (agriculture, food products, textiles and apparel, household equipment, and other manufacturing), 5 regions (US border, north, center, Mexico City area, and south), and 2 levels of wages (skilled and unskilled).

To obtain the percentage change in wages (dw), we need to obtain

$$dw_h = \sum \beta_g dp_{gh}$$

where β_g is the price-wage elasticity for good g (regression coefficient of wage regression), dp_{gh} is the percentage change in price faced by the household (estimated above). For simplicity, the subscripts for region, time and skilled/unskilled wages are omitted.

Table 4.2 – Price-wage Elasticities
Dependent Variable – Log of wage

Control Variables		Price - Wage Elasticities						
		Region	Skill	Agricultural Products	Food Products	Households Appliances	Other Manufact.	Textiles and Apparel
Regional CPI	0.327*** (0.070)	Border Region	Skilled	-0.215 (0.176)	-0.481** (0.196)	-0.286* (0.251)	0.348** (0.193)	0.409** (0.175)
Agricultural Worker	-0.542*** (0.023)		Unskilled	-0.276 (0.256)	-0.629** (0.204)	-0.016 (0.291)	0.463** (0.235)	0.534** (0.228)
Permanent employment	0.290*** (0.016)	Northern Region	Skilled	-0.377* (0.271)	0.205 (0.166)	-0.577*** (0.238)	0.198 (0.145)	0.343 (0.149)
Household Head	0.425*** (0.014)		Unskilled	0.713*** (0.269)	-0.551* (0.173)	-0.216 (0.284)	-0.265 (0.313)	0.174 (0.299)
Age	0.009*** (0.001)	Central Region	Skilled	-0.301* (0.255)	-0.262 (0.188)	-0.335** (0.244)	0.362 (0.285)	0.317 (0.244)
Education Premium	0.186*** (0.005)		Unskilled	0.082 (0.298)	-0.062 (0.225)	-0.591** (0.314)	-0.412 (0.271)	0.729** (0.191)
Local Endowment	0.001*** (0.000)	Mexico City	Skilled	0.157 (0.344)	0.316 (0.251)	-0.920*** (0.426)	-0.065 (0.311)	0.532** (0.283)
Gender	0.110*** (0.013)		Unskilled	0.223 (0.967)	-0.192 (0.210)	-0.431 (0.340)	-0.716 (0.223)	0.791** (0.239)
Dummy year 1989	0.203*** (0.066)	Southern Region	Skilled	0.032 (0.436)	-0.147 (0.221)	-0.440* (0.474)	0.144 (0.460)	0.292 (0.416)
Dummy year 1992	0.362*** (0.056)		Unskilled	1.180*** (0.384)	0.474 (0.249)	-1.552* (0.365)	0.531 (0.451)	-0.192 (0.366)
Dummy year 1994	5.383*** (0.731)							
Dummy year 1996	0.390*** (0.039)	# of Observations		44160				
Dummy year 1998	-0.178*** (0.028)	R-Squared		0.458				
Dummy year 2000	-0.136*** (0.042)							

Note: All variables are in log, with the exception of dummies. White corrected standard errors are shown in brackets. Significance level of 1%, 5% and 10% are indicated by ***, ** and * respectively.

Source: Nicita (2004)

Results:

- All control variables have the expected sign and are statistically significant
- Wage price elasticities: 10 responses for each of the prices of the five product aggregates, each of which is estimated for two different skill levels. What affect wages?
 - Border and North region: changes in price of food affect wages significantly and negatively. Trade reform decreased real price of food, so effect on wages is positive
 - All regions except central region: HH appliances have a negative effect on skilled wages. Trade reform decreased the price of HH equipment, hence wages of skilled workers increase contributing to the wage gap.
 - Border region and Mexico City: Price of textiles and apparel has a positive effect on wages. Trade reform had a negative effect on price of textile and apparel so wages have fallen.
 - Border region: Price of manufactured good has a positive effect on wages. Trade reform resulted in an overall decline in prices of manufactures so wages in the border fell
- Regions in the north and close to USA have experienced the largest increase in wages. Southern wages have declined.
- Skilled wages tend to be more responsive than unskilled wages in the case of skilled labour intensive industries (e.g. HH equipment).
- Results suggest like in Hanson and Harrison (1999) that Mexico was disproportionately protecting unskilled intensive industries.

⇒ *Trade and Poverty*

To summarise this information, the households are aggregated into groups according to their income level and geographic region. Welfare measures are presented as averages for each group. Given the different types of labour and the fact that estimates are by region, the welfare equation (3) takes into account skilled and unskilled labour

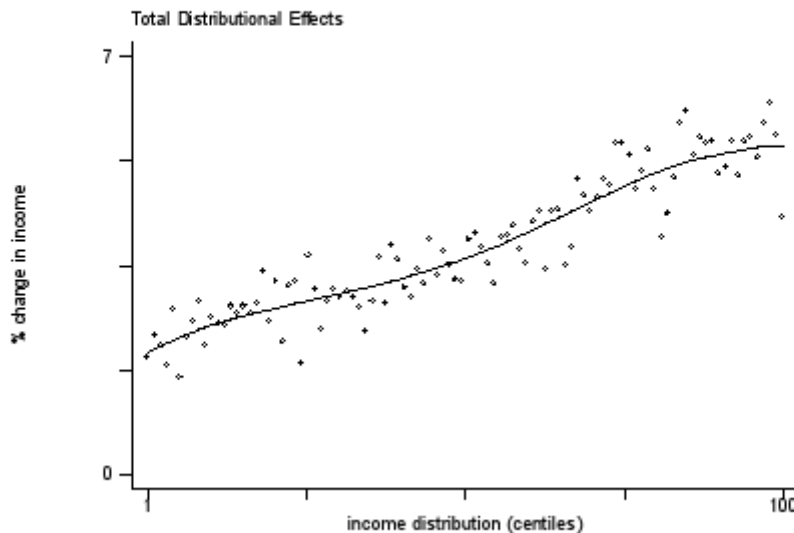
$$\frac{du_h}{y_h} = \underbrace{\theta_h^l dw_h}_{\text{labor}} + \underbrace{\sum_g \theta_{hg}^x dp_{gh}}_{\text{agric. income}} - \underbrace{\sum_g \theta_{hg}^c dp_{gh}}_{\text{consumption}} - \underbrace{\sum_g \eta_{hg} \theta_{hg}^c dp_{gh}}_{\text{income effect}}$$

$$- \frac{1}{2} \left(\underbrace{\sum_g \varepsilon_{hg} \theta_{hg}^c dp_{hg}^2}_{\text{price effect}} + \underbrace{\sum_g \sum_{k \neq g} 2 \varepsilon_{hgk} \theta_{hg}^c dp_{gh} dp_{kh}}_{\text{cross price effect}} \right)$$

where $\ell = \theta_h^{s,u}$ is the share of income from skilled or unskilled labour, θ_{hg}^x is the income share from the sale of good g and θ_{hg}^c is the budget share for good g . The parameters dw and dp_g come from estimated models above and the income and cross-price elasticities come from Nicita (2004).

The figure 5.1 below shows that all income groups benefited from trade liberalisation. The richer the household, the more its disposable income increased. Poorest households have gained about 2 percent from trade liberalisation, and richest by about 6 percent.

Figure 5.1 – Change in Households' Welfare, by income percentile.

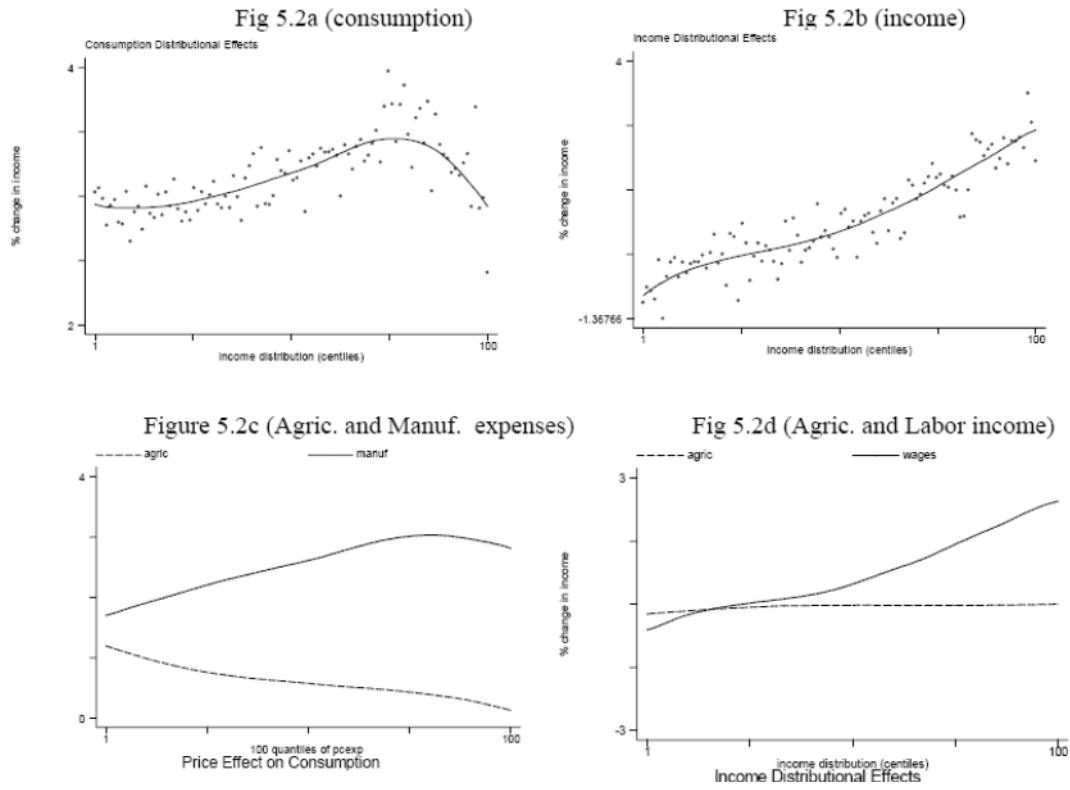


Source: Nicita (2004)

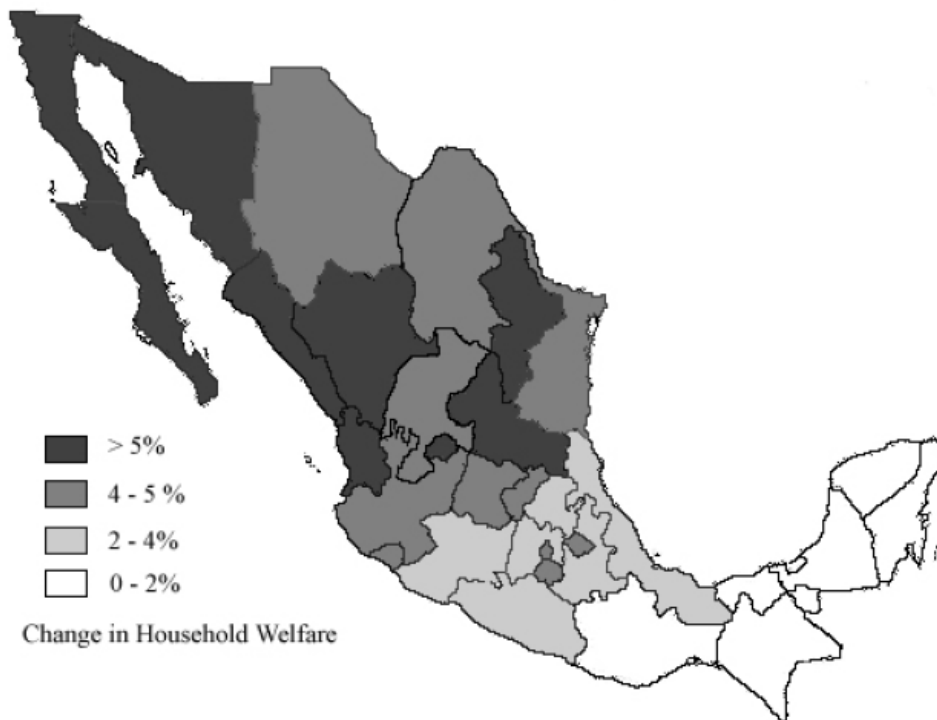
The figures below (5.2) show poor households would have gained from trade liberalisation only because goods in the consumption baskets, especially manufacturing products, became less expensive. Poorest households lose both in terms of wages and agricultural income. Even

if trade liberalisation has benefited all income groups, income inequality has risen as richer households have gained more both in absolute and percentage terms.

Figure 5.2 – Decomposition of the Change in Households' Welfare.



Trade Liberalization and HH welfare: Regional Effects



Source: Nicita (2004)

All the states have benefited from the trade liberalisation process of the 1990s, but to different degrees. The states that have benefited the most from trade liberalisation are the ones near the United States border. Almost all of the states in the central region, with the exception of those immediately surrounding Mexico City, experienced a welfare gain between 2 and 4 percent. Trade liberalisation led to smallest gains for southern states, where welfare effects are in most cases lower than 2 percent.

Additionally, the percentage gains or losses of each household are regressed on a series of variables. The estimation is

$$d v_h = \beta X_h + \gamma C_h + (\psi r + \eta hr)$$

where X is a vector of household and individual characteristics, C is a vector of control variables, and the term in parentheses is a i.i.d error term with states fixed effect. Each additional year of education of the household head increases the gains and urban households are also richer than rural households.

Table 5.1 – Welfare Decomposition by individual and household characteristics
Dependent variable: log of welfare change.

age	0.0000 (0.0000)	AGUASCALIENTES	0.0113*** (0.0039)	GUANAJUATO	-0.0121*** (0.0033)	QUERETARO	-0.0117*** (0.0037)
educ	0.0016*** (0.0001)	BAJA CALIFORNIA	0.0042 (0.0034)	GUERRERO	-0.0166*** (0.0033)	QUINTANA ROO	-0.0495*** (0.0038)
gender	-0.0001 (0.0007)	BAJA CALIFORNIA SUR	0.0159*** (0.0046)	HIDALGO	-0.0116*** (0.0034)	SAN LUIS POTOSI	0.0173*** (0.0033)
hh_size	0.0005*** (0.0001)	CAMPECHE	-0.0412*** (0.0040)	JALISCO	-0.0077** (0.0032)	SINALOA	0.0153*** (0.0034)
logpcexp	0.0046*** (0.0004)	COAHUILA	-0.0075** (0.0034)	MEXICO	-0.0361*** (0.0031)	SONORA	-0.0040 (0.0034)
urban	0.0022*** (0.0006)	COLIMA	-0.0080* (0.0043)	MICHOACAN	-0.0112*** (0.0032)	TABASCO	-0.0456*** (0.0034)
		CHIAPAS	-0.0393*** (0.0031)	MORELOS	-0.0152*** (0.0035)	TAMAULIPAS	-0.0091*** (0.0033)
Obs	8999	CHIHUAHUA	-0.0072** (0.0033)	NAYARIT	0.0028 (0.0038)	TLAXCALA	-0.0101*** (0.0039)
R-Squared	0.798	DISTRITO FEDERAL	-0.0133*** (0.0032)	NUEVO LEON	-0.0060* (0.0033)	VERACRUZ	-0.0127*** (0.0030)
		DURANGO	0.0165*** (0.0036)	OAXACA	-0.0375*** (0.0031)	YUCATAN	-0.0432*** (0.0034)
				PUEBLA	-0.0115*** (0.0031)	ZACATECAS	0.0144*** (0.0037)

Note: White corrected standard errors are shown in brackets. Significance level of 1%, 5% and 10% are indicated by ***, ** and * respectively. State variables are dummies.

Source: Nicita (2004)

Figure 5.4 shows the density function of the log of per capita expenditure as observed in the year 2000 and as it would be if Mexico had kept its tariffs at the level of 1989.

Poverty levels have declined for any poverty line. In 2000 about 43 percent of the Mexican population lived in poverty (poverty line about 880 pesos per month or about 100 US dollars). If Mexico had not liberalised its markets during the 1990s, it would have experienced a poverty level of 46 percent.

Figure 5.4 – Density Function

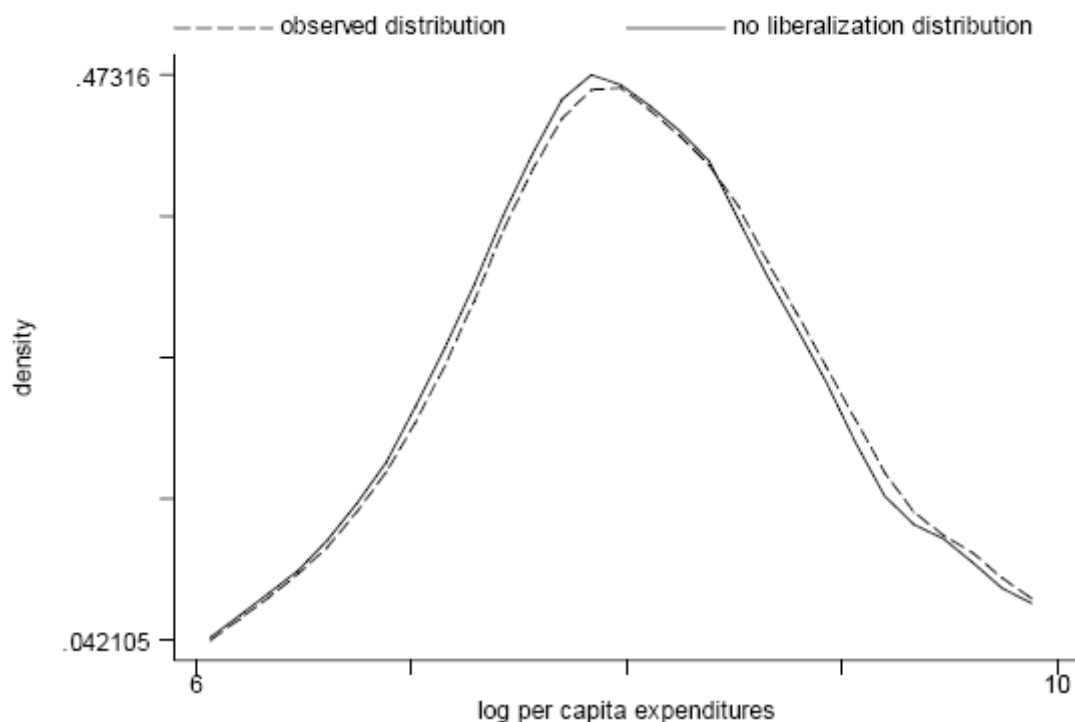


Table B.1 – The Effect of Trade Liberalization on Prices

Product	Country Average	Border	North	Region Center	Mexico City	South
Cereals	-0.1%	-0.3%	0.0%	0.0%	0.0%	0.0%
Dairy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fruit	-11.0%	-9.8%	-10.7%	-11.5%	-10.0%	-12.6%
Pulses	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Meat Products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Oils and Fats	-6.9%	-6.1%	-6.5%	-7.4%	-6.1%	-8.5%
Sugar	-6.0%	-5.9%	-6.0%	-6.0%	-5.9%	-6.2%
Vegetable	-9.4%	-7.3%	-8.1%	-10.4%	-7.5%	-12.8%
Food Products	-9.9%	-11.3%	-10.5%	-9.3%	-11.2%	-7.4%
Households Appliances	-7.1%	-8.6%	-8.0%	-6.4%	-7.5%	-4.8%
Other Manufact.	-5.0%	-6.4%	-5.8%	-4.4%	-5.8%	-2.8%
Textiles and Apparel	-4.2%	-5.3%	-4.8%	-3.6%	-4.8%	-2.3%

Note: This table shows the effect on prices due to the trade liberalization from 1989 to 2000.

Table B.2 – The Effect of Trade Liberalization on Wages

Wages	Country Average	Border	North	Region Center	Mexico City	South
Skilled	3.2%	3.5%	5.3%	2.9%	4.4%	0.0%
Unskilled	-0.2%	0.6%	4.4%	1.1%	-3.8%	-2.8%

Note: This table shows the effect on skilled and unskilled earnings due to the trade liberalization from 1989 to 2000.

Source: Nicita (2004)

⇒ Conclusion

- Trade liberalisation has affected domestic prices and labour income differently both across income groups and geographically across the country.
- Trade liberalisation has lowered relative prices of most non-animal agricultural products. The cost of consumption has fallen, but agricultural income has stagnated. Thus, the gap between urban and rural areas has widened.
- Skilled worker wages have risen as a result of trade reform – whereas unskilled wages fallen in many regions. These results are consistent with the findings of Hanson and Harrison (1999).
- All income groups have benefited in terms of welfare, but richer households have benefited more in both absolute and percentage terms - 6 percent increase in disposable real income for richer households and 2% for poorer.
- Households in states closest to the United States border gained much more.
- The trade liberalisation reduced poverty by about 3 percent. But also trade reform has contributed to rising inequality.

4. Trade liberalisation and poverty in India (Topalova, 2005 or 2007, 2010)

Topalova examines the Indian trade liberalisation and analyses whether inequality and poverty increased more (or less) in Indian districts that were affected more by trade liberalisation. The timing and degree of liberalisation varied across industries. In her regression analysis she interacts the share of a district's population employed by various industries at the start of the reform with tariffs for these industries. This captures the district's exposure to foreign trade. She does not study the effect of trade liberalisation on (overall) poverty in India but the relative impact on areas more or less exposed to the reform

Given that industrial composition is predetermined and trade liberalisation was sudden and externally imposed (see also Topalova 2004), she is able to interpret the correlation between poverty (and inequality) and trade exposure as causal.

1. Endogeneity of trade policy:

- a) Was the initial decrease in tariff a continuation of a secular trend? Did policymakers perceive the domestic industry mature enough to withstand international competition?
- b) Were changes in tariffs reflecting economic and political factors? Where less productive industries concentrated in more poverty areas so as to be a correlation between tariff protection and poverty?

Topalova argues that there are several reasons that mitigate the concerns of endogeneity of trade openness:

- Changes in trade policy were sudden and IMF imposed because IMF loans and conditionality. It did not allow the consolidation of political opposition .
- Movements in tariffs were very uniform until 1997 but not after. This tells, that after 1997, policymakers were more selective in reducing tariffs and trade policy endogeneity might be a potential problem.
- No evidence that policymakers adjusted tariffs according to perceived productivity. She found no correlation between future and current productivities, and future tariff and current productivity growth. Moreover, she finds no evidence of correlation between tariff changes and pre reform characteristics of Indian firms (e.g. real wage to test if policymakers protect more low skilled, low wages; employment to test for large labour force, more popular support; average factor size as proxy for industrial concentration, etc.)

2. Data, empirical specification and results

She uses household survey data for 1983-84, 1987-88, 1993-94 and 1999-2000 for roughly 75,000 rural and 45,000 urban households. She uses these to construct district level measures of poverty (measured as headcount ratio and poverty gap) and inequality (measured as the standard deviation of the log of per capita expenditure and the logarithmic deviation of per capita expenditure). She uses the Indian Census of 1991, which reports the industry of employment at the 3-digit National Industrial Classification (NIC) code for each district in India, to construct the share of employment in each industry per district. There are about 450 industry codes of which about 190 are traded agricultural, mining or manufacturing industries. She is able to construct a data base for annual tariff data 1987-2001 across six digit level industrial classification. However, although non tariff barriers (NTBs) have been very important in India, there is no available disaggregated time series data to construct NTBs cross sectors,

The measure of district trade exposure is the average of industry-level tariffs weighted by the workers employed in that industry in 1991 as a share of all registered workers. Because tariffs may be sensitive to the district share of workers involved in non-traded industries (usually poorer households), she used “non-scaled” tariffs, which ignore the workers in non-traded industries. This weighs industry tariffs with employment weights that sum to one for the share of people in traded goods in each district.

The basic model takes the form

$$y_{dt} = \alpha + \beta \text{Tariff}_{dt} + \gamma t + \delta d + \varepsilon_{dt}$$

where y_{dt} is district level outcome such as measures of poverty and inequality, and Tariff_{dt} (Tr Tariff_{dt}) is the district exposure to international trade. β captures the average effect of trade protection on regional outcomes. The models include district fixed effects (δd) and year dummies (γt). The model is estimated with data for 1987, 1993 and 1999. In the 2010 version, the basic specification takes the form:

$$y_{dt} = \alpha + \beta \text{Tariff}_{dt} + \gamma \text{Post} + \delta d + \varepsilon_{dt}$$

where Post is a post liberalisation dummy.

Poverty: Poverty rate (% of population below the poverty line) and poverty gap (aggregate shortfall of poor people’s consumption from the poverty line).

Inequality: standard deviation of consumption and mean log deviation of consumption

In the 2010 version, the dependent variables are poverty rate and log average consumption per capita.

$Tariff_{d,t} = (\sum_i worker_{d,i, 1990}) Tariff_{i,t} / Total\ worker_{d,1991}$
 which includes workers in the traded and non trade sectors.

Alternatively, she instruments $Tariff_{dt}$ using a) non scaled tariff $TrTariff_{dt}$ which ignores workers in non traded industries- usually in the rural areas and very poor- to avoid spurious correlations between poverty and trade effect and also b) adding a second instrument: the interaction $Post_t \times TrTariff_{dt}$ where $Post_t$ is a post liberalisation dummy to account for higher initial levels of tariff reductions.

Table3. Effect of Trade Liberalization on Poverty and Inequality in Indian Districts

	I. RURAL				II. URBAN			
	Tariff (1)	TrTariff (2)	IV- TrTariff (3)	IV- TrTariff Init TrTariff (4)	Tariff (5)	TrTariff (6)	IV- TrTariff (7)	IV- TrTariff Init TrTariff (8)
	<i>Panel A. Dependent variable: Poverty Rate</i>							
Tariff Measure	-0.287 ** (0.118)	-0.297 *** (0.084)	-0.834 *** (0.250)	-0.687 *** (0.225)	-0.215 (0.190)	-0.065 (0.156)	-0.156 (0.353)	-0.403 (0.275)
Obs	725	725	725	725	703	703	703	703
	<i>Panel B. Dependent variable: Poverty Gap</i>							
Tariff Measure	-0.129 *** (0.038)	-0.114 *** (0.021)	-0.319 *** (0.073)	-0.206 *** (0.075)	-0.084 (0.052)	-0.032 (0.046)	-0.076 (0.101)	-0.131 (0.087)
Obs	725	725	725	725	703	703	703	703
	<i>Panel C. Dependent variable: StdLog Consumption</i>							
Tariff Measure	-0.086 (0.154)	-0.094 (0.082)	-0.265 (0.228)	-0.161 (0.183)	0.092 (0.094)	0.108 (0.115)	0.257 (0.295)	0.213 (0.250)
Obs	725	725	725	725	703	703	703	703
	<i>Panel D. Dependent variable: Log Deviation of Consumption</i>							
Tariff Measure	-0.016 (0.066)	-0.020 (0.042)	-0.057 (0.115)	-0.020 (0.071)	0.034 (0.062)	0.090 (0.066)	0.215 (0.174)	0.172 (0.144)
Obs	725	725	725	725	703	703	703	703

Note: All regressions include year and district dummies. Standard errors (in parentheses) are corrected for clustering at the state year level. Regressions are weighted by the square root of the number of people in a district. Significance at the 10 percent level of confidence is represented by a *, at the 5 percent level by **, and at the 1 percent level by ***.

Source: Topalova (2005)

She finds that trade liberalisation led to a relative increase in poverty and poverty gap in the rural districts where industries more exposed to liberalisation were concentrated. Although with the expected signs, she finds no statistically significance relationship between poverty in urban areas and trade exposure.

The average district experienced a 5.5 percentage point reduction in the “scaled” district tariffs. The estimates suggest that a 5.5 percentage point drop raised the poverty rate by 3.2 to 4.6 percentage points, the poverty gap by 1.1 to 1.8 percentage points. For urban India, although the relation between trade exposure and poverty is negative, the estimated coefficients are smaller and not statistically significant.

There is no statistically significant measure between trade reform and the measures of inequality.

Similar qualitative results are found in Topalova (2010) :

Rural India (Table 3A) : The estimates show that reduction in trade protection increases relative poverty in India (point estimates range from -0.24 to -0.71). In terms of log consumption, IV estimates show a positive relation between trade protection and consumption.

Urban India (Table 3B): Estimates are not precise. They appear to be driven by pre-existing trends in the outcome variables and other reforms.

For this reason, to uncover the mechanism underlying the links between trade liberalisation and poverty, she will concentrate in the rural sample.

3. Why rural areas experienced (at least) lower did declined in poverty and lower consumption growth than urban areas? (Topalova, 2010)

a) Theory

H-0-S: Assumes perfect factor mobility within countries. What will happen if there is short run factor immobility arising either from frictions in the labour market or capital market imperfections? The response of factor returns in the short run and in the long run equilibrium will differ given that changes in output prices will affect factor returns and not factor allocation and output in the short run.

She interprets her results in the context of a specific factor model of trade in which labour is the specific factor in the short run. Assume an economy producing two goods (X, Y) , Y is more capital intensive, each good is produced with two factors (K, L) according to CRS production functions. Assume $P_x = 1$ and $P_y = P$. In the long run (LR) when all factor are mobile, equilibrium implies that returns to the factors across sectors are equalised:

$$(i) L_X + L_Y = \bar{L},$$

$$(ii) K_X + K_Y = \bar{K},$$

$$(iii) w = F_{L_X X} = p F_{L_Y Y},$$

$$(iv) r = F_{K_X X} = p F_{K_Y Y}.$$

In the short run (SR), capital is mobile across sector but labour is not. L_x is specific to the production of X and L_y is specific to the production of Y. In the SR, equilibrium takes the form:

$$(i) L_X = \bar{L}_X, L_Y = \bar{L}_Y,$$

$$(ii) K_X + K_Y = K,$$

$$(iii) w_X = F_{L_X X}(K_X, \bar{L}_X), w_Y = pF_{L_Y Y}(K_Y, \bar{L}_Y),$$

$$(iv) r = F_{K_X X}(K_X, \bar{L}_X) = pF_{K_Y Y}(K_Y, \bar{L}_Y),$$

Assume trade liberalisation \rightarrow \downarrow P of capital intensive good .

This makes production of X more attractive. The return to capital increases (but in a less proportion than the price increase) given that it attracts capital from the Y sector.

Capitalist in

X are better off in terms of P_Y but worse off in terms of good X.

Given that L_X is fixed in SR, the (relative) increase in P_X will increase w_X in a larger proportion than the increase in P_X . It also increases welfare in terms of the both good X and Y.

In sector Y, K_Y can move to sector X but L_Y is fixed. K_Y will experience a less than proportionate fall in its return. Capitalist in Y are better off in terms of Y but worse off in terms of X.

Given that L_Y is fixed, workers in Y will experience a more than proportionate fall in wages. Workers in Y sector will be worse off in terms of good X and in terms of good Y.

Therefore³:

The factor specific to the specific sector whose relative price increases is better off

The factor specific to the sector whose price decreases is worse off

The change in welfare of the mobile factor is ambiguous.

Moreover, if all factor of productions were fully mobile, then labour would have been unambiguously better off and capital would have been unambiguously worse off.

b) Empirical analysis of migration

- Estimates of migration for rural and urban area in India for 1987 and 1999: Migration is not low (23% of rural and 33% of urban has changed residents at least once). However, most migrants are women and reallocating at marriage.
- Short run migration is low : only 3-4% of people living in rural areas reported changing either district or sector (rural to urban and urban to rural) within the past 10 years.
- Applying regression analysis:
 - o Neither migration nor the level of population seems to be associated with trade protection in the 1990s.
 - o The loss of trade protection affected more strongly those that were the least mobile (i.e. those at the bottom of the consumption distribution).
 - o No evidence of labour reallocation (employment shares) across production sectors as a result of cut in tariffs. . But significant pass through of tariff changes to domestic prices (i.e. the larger the tariff cut, the lower the price faced by domestic producers)

³ Samuleson and Jones (1971): Trade will have an ambiguous effect on the country's mobile factors, benefit the immobile factors specific to the export good of the good that has increased and harm the immobile factors specific to the import competing good of the good that has decreased

and positive association between the effect of tariffs on wages. This suggests trade reform adjustment has been borne by factor prices.

- Using an indicator of whether the district (or sector) has flexible labour laws interacted with tariff cuts, suggest that tariff cuts did not have impact on states with flexible labour laws.

Therefore, she argues that her evidence shows that restricted labour mobility as the reason for the observed poverty-trade reform relation.

5. Conclusions

Both papers by Nicita (2004) and Topalova (2005 or 2007, 2010) show that trade reform might help reduce poverty in a country but different regions within a country might experience differential effects of trade liberalisation. Therefore, policy should be oriented to help those who bear a disproportionate share of the burden of liberalisation.