Globalization and poverty changes in Colombia

Maurizio Bussolo

OECD Development Centre

Jann Lay

Kiel Institute for World Economics

April 2003

Abstract. Assessing the final impact of globalization on poverty is a difficult task: (a) globalization affects poverty through numerous channels; (b) some linkages are positive and some are negative and therefore cannot be analyzed qualitatively but require quantitative assessments, i.e. formal numerical models; and (c) trade expansion and growth (key aspects of globalization) are essentially macro phenomena, whereas poverty is fundamentally a micro phenomenon. In this paper we use a new method that combines a micro-simulation model and a standard CGE model. These two models are used in a sequential fashion (as in a recent paper by Robilliard et al (2002)). The CGE model and the micro-simulation model are calibrated using a recent SAM and household survey for Colombia and together they capture the structural features of the economy and its detailed income generation mechanisms. We use this framework to analyze the important income distribution and poverty changes occurred with the great trade liberalization of the 90's. A major policy conclusion is that trade liberalization can substantially contribute to improve the poverty situation. Abstracting from simultaneous additional shocks and labor supply growth, the beginning of the 90s tariff abatement seems to have accounted for a very large share of the total reduction in poverty recorded from 1988 to 1995. This holds in particular for rural areas. Furthermore distributional impacts differ fundamentally between rural and urban areas, and our methodology highlights that aggregate net results, such as the change in the poverty ratio (headcount), conceal important flows in and out of poverty. This framework allows us to capture important channels through which macro shocks affect household incomes and possibly to help in designing corrective pro-poor policies.

1 Introduction

During the last two decades, bilateral and multilateral donors' policy advice to developing countries has been centered on greater market openness and better integration into the global economy. This advice is based on two major assumptions. First, that outward-oriented economies are not only more efficient and less prone to resource waste, but have also performed well in terms of overall development. Second, that raising average incomes benefit all groups within countries, i.e., the notion that as long as inequality is not increasing, economic progress will reduce poverty. However, these assumptions have recently been challenged, and the effects of globalization on poverty are generating growing concern.

To address these concerns and, at the same time, to assist in the formulation of better pro-poor policies, a clearer understanding of the complex relationship between globalization and poverty is needed. This paper's main objective is to determine the sign and strength of the effects of trade liberalization, an important globalization shock, on poverty in the context of a case study for Colombia.

At the beginning of the 90's Colombia abandoned its import substitution industrialization policy and started a process of trade liberalization which culminated with the drastic tariffs cuts of the 1990-91. Colombian trade reform has been one of the most swift import liberalization of Latin America, within a few months tariffs were more than halved and a series of institutions delegated to regulate commercial policy, including the Ministry of Foreign trade, had been created or reformed. In addition to the trade liberalization policy, the government implemented a series of other structural reforms ranging from labor reform and foreign exchange deregulation, to financial markets reforms, including establishing the independence of the central bank, and to the promulgation of a new constitution.

In the same period, poverty recorded some improvements in the urban areas but stagnated in the rural ones, and inequality registered a significant countrywide increase. Identifying the poverty and inequality effects of each of the mentioned reforms, as well as those originating from additional technology and external shocks that affected Colombia in the first half of the 90's is a complex task, even when two well conducted households surveys provide data before and after the reform effort, namely for the years 1988 and 1995.

To tackle this task, this paper follows an approach quite different from that of a large, although not uncontroversial, literature that analyses the links between openness and growth (Rodriguez and Rodrik (2000) and references cited therein), or from those studies that extend these links to include poverty (Dollar and Kraay, (2000)). This literature relies on cross-

national regressions and, although they provide some evidence on the positive relationship linking openness to growth and poverty, in the words of Srinivasan and Bhagwati (1999) "nuanced, in-depth analyses of country experiences […] taking into account numerous country-specific factors" are needed to plausibly appraise the connections between openness and growth. Their arguments apply, even more strongly, to the case of the links between globalization and poverty. In this case, country-specific characteristics – such as: a) the type and duration of globalization shocks, b) the structure of the economy (which can be resource abundant or labor abundant; rural agricultural economy or urban light manufactures exporting country), and c) the poor' socio-economic characteristics – are crucial to assess the final effects of globalization on poverty.

Single country studies have also their own limitations, though. They mainly suffer from having to few degrees of freedom, which makes identifying and separating the effects of simultaneous different shocks almost impossible. The use of detailed household surveys reveals many characteristics of the income distribution but it is not enough to understand whether trade opening improves or worsens income distribution for those countries. Often, together with tariff abatement, other policy reforms are implemented, or other shocks affect the income distribution. Multi-year surveys that follow households for long periods of time overcome these problems by applying panel data techniques; however, these types of survey are still quite rare for most developing countries.

An alternative method allowing the analysis of single well-identified shocks is represented by numerical simulation models. When a shock is applied to these models, they determine sectoral production changes, resources reallocations, and factors and goods price changes. These macro adjustments can then be *translated* into micro effects on the level of individual and households' incomes. This "translation" normally relies on aggregating households in different groups according to the main sources of income or to other important socioeconomic characteristics of the head of the household. Finally, for each household group, a parametric income distribution is assumed, so that the initial shock is translated in changes of the average income of the household heads of each group, and, through the parametric distribution, poverty and inequality effects are assessed.

This method, known in the literature as the representative household group (RHG) approach, can produce insightful results with parsimonious data requirements and straightforward assumptions and it has therefore been applied in numerous cases (Adelman and Robinson (1978), Bussolo and Round (2003)). However it has two mayor drawbacks: firstly, the only endogenously determined income distribution variations are those due to

changes *between* household groups, given that *within* household groups variance is fixed. Secondly, the composition of the household income is also fixed, therefore changes of occupational status, for instance, from formal wage-work to informal self-employment of the household head – or even increased labor participation or other important variations in income-generation processes of other non-head members of the households – are not accounted for. Often though, within groups income changes and alterations in the composition of income, such as the dramatic income shift due to a household member finding a job or becoming unemployed, are the crucial factors explaining poverty and inequality fluctuations.

This paper, following a pioneer study on Indonesia (Robilliard et al. (2002)), attempts to get the best of two worlds by using a novel methodology that links the macro numerical simulation model with a micro-simulation model, and thus it can estimate full sample poverty and inequality effects without the drawbacks of the multi-country or RHG approaches.

Beyond these important methodological innovations, this paper aims at providing policy-relevant results. By clarifying the mechanisms through which important reforms as trade liberalization affect income distribution, policy makers can adopt counter-balancing strategies to assist the poorest or to improve their chances to escape poverty altogether.

Summarizing the main results for Colombia, we find that trade liberalization triggers two types of changes: a) in the labor force composition, from self-employment to more wage-employment, and b) in the levels of income, an increase of agricultural profits. This latter increase in income is found not to be sufficient to lift the poorest peasants out of poverty, moving from self-employment into much higher remunerated wage-employment however may do the job.

Besides these income-generation related changes, increased openness affects the expenditure side as well by altering the relative prices of consumption goods. A useful initial result is that the income channel, namely occupational status and factor prices fluctuations, is more important for the poor than the expenditure channel, i.e. the change in prices of the goods bought by the poor.

Finally, compared to the full sample approach, we find that the RHG approach conceals the distributional impact of this important income channel. More importantly, the sign of the bias due to the RHG assumption cannot be established ex-ante and it entails overestimation of poverty effects for certain households and underestimation for others, thus making the implementation of pro-poor corrective measures very difficult.

Our dual-model methodology clearly illustrates which policy-induced changes are pro-poor, and through which channels the poor are negatively affected. Such detailed insights become essential for a successful pro-poor globalization strategy.

The paper is organized as follows. The next section presents the main economic policy reforms and the simultaneous poverty and inequality changes for Colombia at the beginning of the 1990s, section 3 discusses the methodology more in detail, section 4 presents the results and the final section concludes.

2 Economic Policy, Poverty and Inequality in Colombia

On the 7th of August 1990, Cesar Gaviria was inaugurated as Colombia constitutional president. During the next eighteen months a set of policies aimed at drastically changing the nature of Colombia's economic structure were put into effect. Even before elected, Gaviria was talking about a "revolcon" of the economy.[1] Among the various reforms the most relevant were the so-called "Apertura" or trade liberalization and the labor market reform.

Colombia's trade reform was announced as a gradual and selective process that should have liberalized imports during a five-year period lasting until the end of 1994. It is important to notice that Gaviria' strategy for smoothing the adjustments imposed by the liberalization of imports was to accompany this liberalization with a monetary policy aimed at a real depreciation of the peso. However, in 1990 the real exchange rate was at a most depreciated level in decades, and efforts to further depreciation were contrasted by increasing speculations of an appreciation, which were also fuelled by the discovery of new oil fields. Facilitated by the opening of the capital account (another of the structural reforms implemented in that period), large capital inflows and stagnating imports generated a balance of payment surplus that entailed international reserves accumulation. This situation created increasing difficulties of monetary management and, in September 1991, the government took the brave decision to drastically reduce tariffs almost overnight. Table 1 gives some indications of the magnitude of the "Apertura": in just a few months, nominal average tariffs went from almost 40% to about 10% and the sectoral dispersion of the protection rates also went down as shown by a dramatic reduction of the average effective rate from almost 70% to just 22%. This move finally showed the government's commitment to free trade and imports surged. At a later stage in 1994, vested interests in protected sectors attempted to regroup and change the situation, but they just obtained small exemptions and minor benefits and Colombia's trade liberalization could not be reversed.

Table 1: Trade Liberalization in Colombia

	Nominal Tariff Rates %		Effective rates of Protection %	
Type of Goods \ Year	*1990*	*1992*	*1990*	*1992*
Consumption goods	53	17	109	37
Intermediate inputs	36	10	61	18
Capital goods	34	10	48	15
TOTAL	39	12	67	22

Quantitative restrictions were almost completely eliminated as well. Before Gaviria took office 50 per cent of all imports were subject to import licensing, after one year less than 3 per cent of imports were still under the licensing scheme.[2] As mentioned in the introduction, trade tax reductions were complemented with other measures including: regulation of trade issues, as anti-dumping and other unfair competition; institutional reform, as the creation of a new independent Ministry of Foreign trade; stipulation of International trade treaties, as the free trade area (FTA) with Venezuela in 1991, the contemporary reviving of the Andean Pact, another FTA with Chile in 1993, and the Group of 3 treaty with Mexico and Venezuela in 1994.

The main objectives of the "Apertura" policy package were to stimulate growth and to improve the income distribution. A reallocation of resources towards more productive uses accompanied with a weakening of the oligopolistic structure of the domestic industries was expected to create new growth opportunities, additionally these were enhanced by increased private capital inflows. A specialization towards labor intensive industries of the Colombian economy should also have helped with the income distribution objective; besides a clearer trade policy should have decreased rent seeking activities and their negative income distribution effects.

The second most relevant policy reform at the beginning of the 90s was the labor market reform and, given that this reform has strong influences on a crucial income generation process and may thus directly affect income distribution, it deserve a brief digression. Colombia's traditional labor legislation was extremely rigid and one of its worst features was represented by the prohibitive severance payments that workers with more than 10 years of continuous employment in the same job were granted. These basically gave automatic tenure to workers with more than 10 years on the job, but also reduced the possibility of a worker to achieve that 10-year limit. In fact it has been calculated that only 2.5 workers out of 100 were

[1] This may be translated as "major shake-up".

[2] It should be noted that, due to data deficiencies, the abolition of quantitative restrictions is not simulated in the current version of the model. For more details on this sort of policy experiments see Bussolo and Roland-Holst (1999).

continuously employed for more than 10 years. This rigidity created serious employment stability problems in the labor market and was eliminated with its reform. This also regulated more clearly the hiring of temporary workers generating new employment opportunities especially for unskilled workers. Kugler (1999) and Kugler and Cardenas (1999) provide empirical evidence that this reform increased the Colombian labor market flexibility and its employment turnover. In particular, due to the reduction of dismissal costs, the *formal* labor market registered an increase in employment exit rate and a reduction of the average job tenure: these effects did not occur in the informal sector given its initial greater flexibility (or larger non-compliance of the labor code).

As already mentioned, the late 80's and the beginning of the 90's witnessed a series of other important structural reforms such as those affecting taxes, housing policy, exchange controls, port regulations, central bank independence, financial (de)regulation, decentralization, social security and privatization. Additionally, international prices for coffee and oil (the most important exports) fluctuated around a lowering trend and other external shocks (mainly capital flows volatility) affected the overall performance of Colombia.

Against this background of economic policy reforms and external shocks, the remaining part of this section summarizes the evolution of poverty and inequality. At first sight, the described economic reforms seem to have brought substantial welfare gains to the Colombians. Between 1988 and 1995, mean per capita income had increased at a yearly rate of approximately 2.3 percent. This increase only partially resulted in poverty reduction, since inequality, particularly between rural and urban populations, worsened. Whereas urban mean per capita income rose by 3.2 percent per annum, rural incomes almost stagnated, growing at a rate lower than 1 percent per annum.[3]

As shown in Table 2, a recent World Bank Poverty report (2002) finds that urban poverty has declined significantly throughout the 1980s and the first half of the 1990s. According to this assessment, rural poverty has remained relatively stable at high levels between 1988 and 1995 after important improvements in the 1980s. A UNDP study (1998) comes to different conclusions. Overall poverty is found to be stable between 1988 and 1995. This stability is mainly due to slightly improving poverty situation in urban areas, whereas rural poverty increases significantly with a headcount ratio up from 63 to 69 percent.

[3] See World Bank (2002, p. 13). It should be noted that 1988 was an exceptionally prosperous year for agriculture due to the devaluation and a higher coffee production combined with higher coffee prices.

The World Bank poverty report (2002) finds extreme poverty to decrease faster than moderate poverty. In both urban and rural areas significant progress can be observed between 1988 and 1995.

Table 2: Poverty Indicators, Colombia 1988 - 1995

	World Bank (2002)		UNDP (1998)	
Indicator	*1988*	*1995*	*1988*	*1995*
		National values		
Poverty incidence	0.65	0.60	0.54	0.54
Poverty gap	0.32	0.29	0.25	0.23
Extreme poverty incidence	0.29	0.21		
		Urban values		
Poverty incidence	0.55	0.48	0.44	0.43
Poverty gap	0.23	0.19	0.15	0.14
Extreme poverty incidence	0.17	0.10		
		Rural values		
Poverty incidence	0.80	0.79	0.63	0.69
Poverty gap	0.43	0.40	0.33	0.36
Extreme poverty incidence	0.48	0.37		

With regard to the trends in inequality, the reviewed studies come to similar conclusions although the magnitude of observed trends varies significantly.[4] They all note a significant increase in inequality in the first half of the 1990s. As might be already inferred from the development of mean per capita incomes discussed above, an important part of the overall deterioration of inequality is due to a widening gap *between* the urban and rural groups' incomes. Nevertheless, *within* group inequality remains the most important determinant of income inequality. All studies confirm opposite trends for *within* inequality in urban and rural areas with a decreasing rural inequality and a worsening urban inequality. It should be noted that the general pattern of inequality trends does not depend on whether one chooses individual earnings or per capita household incomes (Vélez et al., 2001, p.6). Based on Generalised Lorenz curve considerations, Vélez et al. (2001, p.5) conclude that "despite income inequality fluctuations, social welfare in urban Colombia improved substantially and unambiguously […] from 1988 to 1995. In rural areas, welfare improvements are […] somewhat ambiguous."

[4] See World Bank (2002), Vélez et al. (2001), Ocampo et al. (2000), and UNDP (1998).

Table 3: Inequality measures, Colombia 1988- 1995

Indicator	World Bank (2002) 1988	World Bank (2002) 1995	UNDP (1998) 1988	UNDP (1998) 1995	Vélez et al. (2001) 1988	Vélez et al. (2001) 1995
	National values					
Gini	0.54	0.56	0.55	0.56		
Theil	0.54	0.57			0.55	0.75
Theil within	0.50	0.59			0.47	0.63
Theil between	0.10	0.11			0.08	0.11
	Urban values					
Gini	0.49	0.52	0.49	0.52	0.50	0.54
Theil	0.41	0.48			0.50	0.71
	Rural values					
Gini	0.47	0.45	0.51	0.49	0.44	0.41
Theil	0.40	0.36			0.35	0.29

To sum up, improvement in urban areas resulted from a decrease of both extreme and moderate poverty, despite increasing inequality. In rural areas, the poverty situation has not changed significantly between 1988 and 1995 even if all indicators point to a more even rural income distribution.

3 The micro-macro modeling framework

3.1 The micro-simulation model

In the micro-simulation, we model the household income generation process.[5] Individuals make occupational choices and earn wages or profits accordingly. These labor market incomes plus exogenous other incomes, such as transfers and imputed housing rents, comprise household income. The micro-simulation enables us to take individual and household heterogeneity into account. Individual heterogeneity refers to personal characteristics, which influence occupational choices and income generated on the labor market. Occupational choices are subject to a number of factors, which include gender, marital status, or age of children. Important determinants of labor income are education and experience. Household heterogeneity is reflected, for example, in different sources of income and demographic composition. Furthermore, the micro-simulation captures some household heterogeneity in terms of expenditure structure. In order to do so, households are classified into 5 household groups according to household per capita income with different expenditure shares with

[5] The following section borrows heavily from Robilliard et al. (2002). A more detailed discussion of a similar labour market specification can be found in Alatas and Bourguignon (2000).

regard to food- and non-food items. The micro-simulation is based on Colombian household surveys.[6]

Income Generation Model

The components of the income generation model on the individual level are an occupational choice and an earnings model. The individual can choose between inactivity, wage-employment, and self-employment. In rural areas, there is a fourth option of being both wage-employed and self-employed. The occupational choice is assumed to be different for household heads, spouses, and other family members. The labor market exhibits a high degree of segmentation, which runs across different types of activities, sectors, and personal characteristics. As the possible occupational choices imply, earnings are generated either in the form of wages or as profits for the self-employed. Individuals in rural areas can receive a mixed income from both types of activities. This latter option will be ignored in the following illustration of the model. Being self-employed means being part of what might be called a "household-enterprise". All self-employed members of a household pool their incomes. This pooled income is then called profit. The mechanisms of profits earned in agriculture on the one hand side and other activities, such as petty trade, on the other are assumed to be different. Since agriculture plays a negligible role in urban areas, this differentiation is only implemented for rural areas. We also introduce segmentation in wage-employment market. The wage setting mechanisms are assumed to differ between urban and rural areas, for skilled and unskilled labor, and for females and males, which implies that the model has eight wage labor market segments.

Household income comprises the labor income of all active household members and other income. Wages and profits are thus the variable income sources of the household. All other incomes are assumed to be exogenous and constant over time. The resulting total household income is deflated with a household group specific price index, which takes into account the differences in budget shares for food and non-food.

The income generation process, which consists of the occupational choice and the earnings models, is first estimated using data from the Colombian household survey from 1988.[7] The estimated benchmark coefficients are then employed and changed in the micro-simulation.

---

[6] The household survey used for estimation of the micro-simulation parameters is the Colombian Encuesta Nacional de Hogares from 1988 (EH61). After the removal of outliers, removal of individuals with top-coded earnings, and observations with missing data the survey covers 29 729 individuals living in 12 092 households in urban areas, and 15006 individuals in 5384 households in rural areas. The expenditure shares are calculated from an income and expenditure survey and matched with the EH61 based on household groups. For the problems of these datasets see Núñez and Jiménez (1997).

[7] The occupational choice model was estimated using a multinomial logit. The wage equations were estimated by Ordinary Least Squares. Correcting for selection bias in these equations did not lead to major

Link to the CGE

The micro-simulation is linked to the CGE through wages, profits, the shares of different occupational choices, and the vector of consumption prices. The variables passed from the CGE to the micro-simulation include the average wage in each labor market segment, the average profits for different activities, the shares of self- and wage-employed for each segment (labor force composition), and finally the relative price of food and non-food. The micro-simulation now computes changes in earnings and labor force composition. These changes originate in coefficient changes in the occupational choice and the earnings models. Coefficients are adjusted, and occupational choices and earnings change accordingly, until the results of the micro-simulation are consistent with the results from the CGE model.

Elements of the Model

The following set of equations describes the model. Household m has k_m members, which are indexed by i.

$$log\, w_{mi} = a_{g(mi)} + x_{mi} b_{g(mi)} + e_{mi} \tag{1}$$

$$log\, p_m = b_{f(m)} + z_m d_{f(m)} + l_{f(m)} N_m + e_m \tag{2}$$

$$Y_m = \frac{1}{P_m}\left(\sum_{i=1}^{k_m} w_{mi} IW_{mi} + p_m Ind(N_m > 0) + y_0 \right) \tag{3}$$

$$P_m = s_{d(m)} p_f + (1 - s_{d(m)}) p_{nf} \tag{4}$$

$$IW_{mi} = Ind\left[c^w_{h(mi)} + z_{mi} a^w_{h(mi)} + u^w_{mi} > Sup\left(0, c^s_{h(mi)} + z_{mi} a^s_{h(mi)} + u^s_{mi}\right)\right] \tag{5}$$

$$N_m = \sum_{i=1}^{k_m} Ind\left[c^s_{h(mi)} + z_{mi} a^s_{h(mi)} + u^s_{mi} > Sup\left(0, c^w_{h(mi)} + z_{mi} a^w_{h(mi)} + u^w_{mi}\right)\right] \tag{6}$$

The first equation is a Mincerian wage equation, where the log wage of member i of household m depends on his/her personal characteristics. The explanatory variables include schooling years, experience, the squared terms of these two variables, and a set of regional dummies. This wage equation is estimated for each of the eight labor market segments. The index function *g(mi)* assigns individual i in household m to a specific labor market segment. The residual term e_{mi} describes unobserved earnings determinants.[8]

The second equation represents the profit function of household m. Profits are earned if at least one member of the household is self-employed. The profit function is of a Mincer type

---

changes in the results and was hence dropped. In the estimation of the profit functions, the number of self-employed was instrumented. For a more detailed discussion of the estimation methods see Alatas and Bourguignon (2000).

[8] It is important to note that the micro-simulation as specified here does not generate a synthetic panel. It rather produces a second cross-section. As will be explained later in more detail, we need to differentiate

and includes as explanatory variables the schooling of the household head, her/his experience plus the squared terms the former two variables, and regional dummies. Of course, profits also depend on the number of self-employed in household m, N_m. The residual e_m captures unobserved effects. The index function *f(m)* denotes whether a household earns profits in urban or rural areas. Furthermore, different profit functions for agricultural, non-agricultural, and mixed activities are estimated in rural areas.

Family income is defined by the third equation. It consists of the wages and profits earned by the family members and an exogenous income y_{0m}. This exogenous income corresponds to "other income" in the survey and may include government transfers, transfers from abroad, capital income, etc.. IW_{mi} is a dummy variable that equals 1 if member i of the household is wage-employed and 0 otherwise. Likewise, profits will only be earned if at least one family member is self-employed (N_m>0). Family income is deflated by a household specific price index.

This household specific price index is defined by equation (4). The parameter s denotes the expenditure shares for food- and non-food. These shares are calculated by household income quintiles. Note that the prices p_f for food and p_{nf} for non-food are generated in the CGE model. The index function *d(m)* indicates to which of the five income brackets household m belongs and which food expenditure share is assigned to the household.

The fifth equation explains the aforementioned dummy IW_{mi}. The individual will be wage-employed if the utility associated with wage-employment is higher than the utility of being self-employed or inactive. The utility of being inactive is arbitrarily set to zero, whereas the utilities of the employment options depend on a set of personal and family characteristics, z_{mi}. These characteristics include gender, marital status, education, experience, other income, the educational attainments of other family members, and the number of children. Unobserved determinants of occupational choices are represented by the residuals.

Equation (6) gives the number of self-employed. Similar to the choice in equation (5), the individual i of household k will prefer self-employment if the associated utility is higher than the utility of inactivity or wage-employment. The self-employed household members form the "household enterprise" with N_m working members. Thus, the last two equations represent the occupational choices of the household members. The occupational choice model is estimated separately for household heads, spouses, and other family members in urban and rural areas. The index function *h(mi)* assigns the individual to the corresponding group.

---

between permanent and transitory components of the residual in order to analyse income mobility or poverty transitions.

The model just described gives the household income as a non-linear function of individual and household characteristics, unobserved characteristics, and the household budget shares. This function depends on three sets of parameters, which are estimated based on the 1988 survey. These parameters include (1) the parameters of the wage equation for each labor market segment, (2) the parameters of the profit function for "household enterprises" in urban areas and different activities in rural areas, (3) the parameters in the utility associated with different occupational choices for heads, spouses, and other family members. As will be explained later in more detail, some of these parameters are changed in order to produce the aggregate results with regard to wages, profits, and employment shares given by the CGE. The CGE also gives the price vector, which in a last step is used to deflate family income.

Remarks on the Labor Market Specification

The specification of the income generation model requires some remarks on the assumptions behind this formulation. Despite the availability of working time we decided to model the occupational choice as a discrete choice. Therefore, the estimated wage equations and profit functions may include a labor supply dimension.[9] Second, our model assumes that the Colombian labor market is highly segmented. The labor market is believed to be segmented along different lines. One line of segmentation results from distinguishing between wage-employment and self-employment. In a perfectly competitive labor market, the returns to labor would be equal for these two types of employment. Yet, a number of reasons justify this segmentation. Income from self-employment is likely to contain a rent from non-labor assets used. Information on these non-labor assets, land in rural areas and at least a small amount of capital in urban areas, is not available for Colombia. Hence, even if the labor market were competitive, we would have to estimate different equations. But there are also a number of reasons to assume that the labor market may be segmented in the sense that returns to labor are not equalized across self- and wage-employment. Wage-employment may be rationed. In this case, self-employment would "absorb" those who do not get a job in the preferred wage work. Conversely, self-employment might exhibit important externalities, for example for families in which children have to be taken care of. Furthermore, we assume segmentation within the wage labor market. This hypothesis of further segmentation of the wage labor market along the lines of different gender, skill, and area is strongly supported by the regression results. The same holds for the estimation of different profit functions for agricultural and non-agricultural activities in rural areas.

[9] However, estimating wage equations based on hourly wages did not make a major difference in the coefficients.

Estimation first

As mentioned above, the occupational choice model and the wage and profits equations are estimated in a first step in order to obtain an initial set of coefficients (a_G, b_G, b_F, d_F, c_H^w, a_H^w, c_H^s, a_H^s) and unobserved characteristics (e_{mi}, e_{mi}, u^w_{mi}, u^s_{mi}). Unobserved characteristics say for the wage equation can of course only be obtained for those who are actually wage-employed. For self-employed or inactive individuals the unobserved characteristics in the wage-equation are generated by drawing random numbers from a normal distribution. In the same way, we generate unobserved characteristics for the profit function for households in which nobody is self-employed. As we estimate wage and profit functions using ordinary least squares, we assume these unobserved characteristics to be normally distributed. Additionally, unobserved characteristics need to be generated for the occupational choice model. These residuals are assumed to be distributed according to the double exponential law since we estimate a multinomial logit model. They were drawn randomly consistent with the observed occupational choice, i.e. the utility a wage earner relates to wage-employment has to be higher than the utility associated with inactivity or self-employment.

Macro-Micro Link in Detail

In the following, we explore the link between the micro-simulation and the CGE. The link is easy to understand if the sequential character of the model is remembered. The globalization shock simulated in the CGE causes wages, profits, employment shares and prices to change. The CGE results of these changes are then passed on to the micro-simulation, which has to produce a population, whose aggregate characteristics in terms of wages, profits, and employment match with those given by the CGE. Therefore, consistency or equilibrium requires that (1) the changes in average wages in each segment, (2) the changes in average profits in each activity, (3) the changes in employment shares in each segment, i.e. the shares of wage-earners, self-employed, and inactive individuals per segment, and (4) the price changes must match the changes of these variables in the CGE.

The CGE is calibrated in such a way that it is consistent with the benchmark micro-simulation. This benchmark micro-simulation can be produced by using the set of initial coefficients and unobserved characteristics obtained through the estimation work just described.[10] The following constraints describe the consistency requirements.

[10] By doing this, we simply reproduce the original dataset.

$$\sum_{m} \sum_{i,g(mi)=G} \hat{IW}_{mi} =$$

$$\sum_{m} \sum_{i,g(mi)=G} Ind\left[\hat{c}^{w}_{h(mi)} + z_{mi}\hat{a}^{w}_{h(mi)} + \hat{u}^{w}_{mi} > Sup\left(0, \hat{c}^{s}_{h(mi)} + z_{mi}\hat{a}^{s}_{h(mi)} + \hat{u}^{s}_{mi}\right)\right] = E_G \quad (7)$$

$$\sum_{m} \sum_{i,g(mi)=G} Ind\left[\hat{c}^{s}_{h(mi)} + z_{mi}\hat{a}^{s}_{h(mi)} + \hat{u}^{s}_{mi} > Sup\left(0, \hat{c}^{w}_{h(mi)} + z_{mi}\hat{a}^{w}_{h(mi)} + \hat{u}^{w}_{mi}\right)\right] = S_G \quad (8)$$

$$\sum_{m} \sum_{i,g(mi)=G} exp\left(\hat{a}_G + x_{mi}\hat{b}_G + \hat{e}_{mi}\right)\hat{IW}_{mi} = w_G \quad (9)$$

$$\sum_{m,f(m)=F} exp\left(\hat{b}_G + z_m\hat{\delta}_G + \hat{e}_m\right)Ind\left(N_m > 0\right) = p_F \quad (10)$$

Equation (7) states that the number of wage-employed individuals has to be equal in the CGE (E_G) and the micro-simulation for each labor market segment. Remember that G stands for the eight labor market segments, i.e. urban male skilled and unskilled, urban female skilled and unskilled, rural male skilled and unskilled, rural female skilled and unskilled labor. The same holds for the number of self-employed in each segment, which is specified in equation (8).

Total wages paid in segment G in the CGE, w_G, have to be equal to the sum of wages over families and wage-employed individuals in the micro-simulation, as indicated by equation (9). This has to be fulfilled also for the profits in activity F as in equation (10). Thus, p_F denotes the total profits for self-employment activity F given by the CGE. The different self-employment activities include urban self-employment, rural agricultural, rural non-agricultural, and rural mixed activities. Note that ^ indicates that the coefficients, residuals, and indicator function values result from the estimation described above.

The globalization shock now produces changes in E_G, the number of wage-employed, S_G, the number of self-employed, w_G, the sum of wages paid in segment G, p_F, the sum of profits paid in activity F, and q, the price vector. The result is a new vector of these variables, which will be identified by an asterisk (E^*_G, S^*_G, w^*_G, p^*_F, q^*). For the above constraints to hold, we now need a vector of coefficients and prices (a_G, b_G, b_F, d_F, c_H^w, a_H^w, c_H^s, a_H^s, p). For the price vector this is trivial, as p equals q. For the coefficients, many solutions exist. Therefore, we have to introduce additional constraints. As in Robilliard et al. (2001) our choice is to vary the constants (a_G, b_F, c^w_H, c^s_H) and leave the other coefficients unchanged. We hence assume that the changes in occupational choices and earnings are dependent on personal and household characteristics only to a limited degree. Changing the intercept in one of the wage equations implies that all individuals of the respective segment experience the same increase in log earnings. This increase does not depend on individual characteristics. The same holds for the profit functions. With regard to the occupational choice, it should be noted that the

CGE does not allow for distinguishing between the choices of heads, spouses, and others. The changes are thus the same across these groups.

Consistency of the micro-simulation and the CGE requires the solution of the following system of equations. The right hand side variables are those through which the macro model communicates with the micro-simulation. Additionally, the prices for food and non-food items are given by the CGE. However, the price vector is only finally applied in order to deflate household income.

$$\sum_{m} \sum_{i,g(mi)=G} \hat{IW}_{mi} = \sum_{m} \sum_{i,g(mi)=G} Ind\left[c^{*w}_{h(mi)} + z_{mi}\hat{a}^{w}_{h(mi)} + \hat{u}^{w}_{mi} > Sup\left(0, c^{*s}_{h(mi)} + z_{mi}\hat{a}^{s}_{h(mi)} + \hat{u}^{s}_{mi}\right)\right] = E^{*}_{G} \quad (11)$$

$$\sum_{m} \sum_{i,g(mi)=G} Ind\left[c^{*s}_{h(mi)} + z_{mi}\hat{a}^{s}_{h(mi)} + \hat{u}^{s}_{mi} > Sup\left(0, c^{*w}_{h(mi)} + z_{mi}\hat{a}^{w}_{h(mi)} + \hat{u}^{w}_{mi}\right)\right] = S^{*}_{G} \quad (12)$$

$$\sum_{m} \sum_{i,g(mi)=G} exp\left(a^{*}_{G} + x_{mi}\hat{b}_{G} + \hat{e}_{mi}\right)\hat{IW}_{mi} = w^{*}_{G} \quad (13)$$

$$\sum_{m,f(m)=F} exp\left(b^{*}_{G} + z_{m}\hat{\partial}_{G} + \hat{e}_{m}\right) Ind\left(N_{m} > 0\right) = p^{*}_{F} \quad (14)$$

Equations (11) and (12) require the number of self-employed and wage-employed (and both self-employed and wage-employed in rural areas) to be consistent with the CGE results for each of the eight segments (G). This also holds for the wage equation for each of the segments and the profit function for each of the four activities, as indicated by equations (13) and (14). Hence, the above system contains 28 restrictions. The system has eight unknown constants in the wage equations, four in the profit functions, and 16 in the occupational choice model.[11] Thus we have 28 unknown constants and 28 equations. We obtain the solution by applying standard Gauss-Newton techniques.

Solving the above system gives us a new set of constants (a^{*}_{G}, b^{*}_{F}, c^{*w}_{H}, c^{*s}_{H}), which is then used to compute occupational choices, wages, and profits. The resulting household incomes are deflated by the household group specific price index derived from the CGE results for food and non-food prices.

Linking the CGE and the micro-simulation in the way described above goes beyond simply rescaling various household income sources or reweighing households dependent on the occupation of its members. Rescaling and reweighing is what the representative household approach does. On the contrary, the simulation takes the different sources of household

[11] Note that the constants of the occupational choice model – though estimated separately for heads, spouses, and others – are changed separately across the eight labour market segments. Therefore, we have 16 unknown constants in the occupational choice model, two occupational choices in each of the four urban labour market segments, and three in each of the four rural segments.

income into account, which represents a more accurate method than just rescaling household incomes of certain household groups. Furthermore, the simulation of occupational choices is a more complex operation than just reweighing occupational household groups. Occupational choices are made on an individual level and they are based on a wide range of characteristics of the individual.

Synthetic Panel?

At first sight, one may be inclined to think that our method generates a kind of synthetic panel, which would be most helpful and interesting from an analytical point of view. If we want to analyze poverty dynamics, we need to trace individuals and households across time. However, for producing a synthetic panel we need to introduce further assumptions as will be shown in the following. We will illustrate the arising problems based on the wage equation, but they apply to all the simulated relationships. In a dynamic context, the wage equation contains three components. Wages in period 0 consists of observed permanent earnings, i.e. the share of the earnings that can be explained by our model, unobserved permanent earnings e^p and unobserved transitory earnings e^t_0 in period 0.

$$log\, w_0 = a + xb + e = a + xb + e^p + e^t_0 \qquad (15)$$

From period 0 to period 1, the constant a is modified due to the policy change that triggered the changes in the CGE, so that in the next period we have a^*. If we assume that the distribution of the transitory component is the same in both periods, we know that among the people with characteristics x and an unobserved permanent component, e^p, there will be *somebody* with a transitory component equal to e^t_0. This implies that to any individual in period 0 with earnings given by (15) we may associate *somebody* with earnings given by the following equation.

$$log\, w_1 = a^* + xb + e = a^* + xb + e^p + e^t_0 \qquad (16)$$

The individual with earnings given by (16) is not the same as the individual whose earnings were represented by (15). Since this is what we do in the micro-simulation, as set up to this point, we do not generate a synthetic panel, but two cross-sections. Based on two-cross-sections it is of course not possible to trace individuals through time. Yet, there is no problem if we compute aggregate inequality and poverty indicators, which we compare across time. In order to study poverty dynamics though we would have to make sure that we could identify the individuals of the households who cross the poverty line. It is therefore not sufficient to associate somebody with unobserved earnings, but a specific individual.

The reason why we cannot simulate a panel arises from the fact that we cannot differentiate between the two unobserved components. However, introducing a set of assumptions with regard to these two terms helps. First, we assume the transitory component to be independent and identically distributed across time. Second, we have to make an assumption about the proportions of the variance of the entire residual term e that is due to the respective components. There are though a number of difficulties related to this method, in particular to the specification of the variance proportions. Some empirical estimates of these proportions can be found in Atkinson et al. (1992) where a number of empirical studies on earnings mobility are surveyed. They find the proportions of the three components in an earnings panel model to differ substantially across different studies. Of course, the total unobserved component is smaller the better the model explains log earnings. The proportion of the transitory component in log earnings covariance varies between less than 10 and 30 percent over long time horizons of more than 10 years. We are not aware of empirical work on earnings mobility in developing countries, which would analyze these issues in detail. There is scope for further research on earnings mobility as some panel datasets have become available. Assuming a small proportion of transitory earnings in developing economies in general may be justified by a number of arguments. Social mobility is generally lower in developing countries.[12] From this, we may infer that transitory earnings account for a smaller proportion of earnings. Additionally, recent research has shown that income shocks remain after a considerable period of time, which also would imply less importance of a transitory component, at least in the short run.[13] On the other hand, the transitory component may be particularly important for small farms, which are exposed to a number of transitory, primarily natural, risks.

For the purpose of the poverty transition analysis, we simulated a panel based on the aforementioned assumptions. These panel-based results are of a preliminary character and should be treated with caution, as further research in this field is needed. Experimenting with different proportions in the micro-simulation had a substantial impact on the results. Reducing the proportion of the variance of the residual term e, which is due to the transitory component, to 10 percent produced results in the historical simulation, which were close to those of the original simulation of two cross-sections. Using higher proportions due to the transitory component resulted in considerable increases in inequality indicators. The poverty transition

[12] For social mobility in Latin America see Andersen (2000).

[13] See Newhouse (2001) who studies the persistence of transient income shocks to farm households in rural Indonesia. He finds, for example that “about 40 percent of household income shocks remain after four years.”

analysis is thus based on the assumption that only 10 percent of the unobserved effects are transitory.[14]

3.2 The CGE model

The 1988 Social Accounting Matrix (SAM) has been used as the initial benchmark equilibrium for the CGE model. The SAM, which includes 36 sectors, 20 commodities, 9 factors (8 labor categories and 1 composite capital), 2 households (urban and rural), and other accounts (government, savings and investment, and rest of the world), has been assembled from various sources incorporating data from the 1988 Input Output table, the 1988 households surveys and from a 1994 SAM.[15]

The CGE model is based on a standard neoclassical general equilibrium model; however, to take into account special features of the Colombian economy, it differs from the typical specification in two important aspects: production sectors are distinguished between formal and informal activities, and the associated labor markets present structural imperfections with different clearing mechanisms for the formal and informal sectors.[16]

Production

Output results from nested CES (Constant Elasticity of Substitution) functions that, at the top level, combine intermediate and value added aggregates. At the second level, on the one hand, the intermediate aggregate is obtained combining all products in fixed proportions (Leontief structure), and, on the other hand, value added results by aggregating the 9 primary factors. Formal and informal activities differ primarily by employing different labor types, with the former using exclusively wage-workers and the latter using exclusively self-employment. Additionally, informal activities are, on average, less capital intensive. These features, together with the disaggregation of 8 labor categories, allow to model in a more realistic way the segmented Colombian labor markets and to capture the dualistic nature of the economy of this country. On the demand side, each commodity is represented by a composite which includes outputs from formal and informal activities. Imperfect substitutability between formal and informal components of the same commodity is assumed

[14] As mentioned before, aggregate inequality indicators increased under the synthetic panel approach. This increase was more pronounced the higher the share of the transitory component. Apparently, we "redistribute" income from the poor to the rich if we substitute these unobserved earnings or a portion of it by generated normally distributed unobserved earnings, thereby increasing inequality.

[15] For more details on the SAM see Bussolo and Correa (1999).

[16] The CGE model used here is the result of merging the CGE model built for Colombia and described in Bussolo et al (1998), and that constructed for the Indonesia case study mentioned in Robilliard et al (2001) and more fully discussed in Löfgren et al (2001).

and flexible domestic prices adjust to reach equilibrium between domestic demand and supply.

Income Distribution and Absorption

Labor income and capital revenues are allocated to households according to a fixed coefficient distribution matrix derived from the original SAM. Private consumption demand is obtained through maximization of household specific utility function following the Linear Expenditure System (LES). Household utility is a function of consumption of different goods. Income elasticities are different for each household and product and vary in the range 0.20, for basic products consumed by the household with highest income, to 1.30 for services. Once their total value is determined, government and investment demands[17] are disaggregated in sectoral demands according to fixed coefficient functions.

International Trade

In the model we assume imperfect substitution among goods originating in different geographical areas.[18] Imports demand results from a CES aggregation function of domestic and imported goods. Export supply is symmetrically modeled as a Constant Elasticity of Transformation (CET) function. Producers decide to allocate their output to domestic or foreign markets responding to relative prices. As Colombia is unable to influence world prices, the small country assumption holds, and its imports and exports prices are treated as exogenous. The assumptions of imperfect substitution and imperfect transformability grant a certain degree of autonomy of domestic prices with respect to foreign prices and prevent the model to generate corner solutions; additionally they also permit to model cross-hauling a feature normally observed in real economies. The balance of payments equilibrium is determined by the equality of foreign savings (which are exogenous) to the value for the current account. With fixed world prices and capital inflows, all adjustments are accommodated by changes in the real exchange rate: increased import demand, due to trade liberalization must be financed by increased exports, and these can expand owing to the improved resource allocation. Price decreases in importables drive resources towards export sectors and contribute to falling domestic resource costs (or real exchange rate depreciation).

Factor Markets

Labor is distinguished into 8 categories: Urban Male Skilled, Urban Male Unskilled, Urban Female Skilled, Urban Female Unskilled, Rural Male Skilled, Rural Male Unskilled, Rural Female Skilled, and Rural Female Unskilled. These categories are considered imperfectly

[17] Aggregate investment is set equal to aggregate savings, while aggregate government expenditures are exogenously fixed.

substitutable inputs in the production process; additionally, to take into account the fact that the labor market for self-employment and that for wage-employment adjust differently, the model assumes that labor markets are segmented between formal and informal sectors. In particular, given that wage-employment enjoys *formal* protection, such as unions wage setting and minimum wages, a certain degree of formal wage inflexibility is implemented in the model through a wage curve. The equilibrium in the formal market is thus determined by the intersection of the firms' labor demand and this wage curve. The informal labor market adjusts residually so that, for each of the eight mentioned categories, total supply (formal plus informal labor) is kept fixed. Capital is an aggregate factor and includes fixed capital as well as land; formal sectors show higher capital intensities than informal ones.

To take into account the medium term horizon of the model, i.e. the time period considered necessary to a trade shock to work through the economy, both labor and capital are perfectly mobile across sectors but their aggregate supplies are fixed.

Model Closures

The equilibrium condition on the balance of payments is combined with other closure conditions so that the model can be solved for each period. Firstly consider the government budget. Its surplus is fixed and the household income tax schedule shifts in order to achieve the predetermined net government position. Secondly, investment must equal savings, which originate from households, corporations, government and rest of the world. Aggregate investment is set equal to aggregate savings, while aggregate government expenditures are exogenously fixed.

4 Simulations and Results

In the analysis of the links between trade and poverty, the labor market represents a key transmission channel. The urban poor generate their incomes almost exclusively on the labor market. For rural populations, the income generation process is more complex; however, due to the lack of data on the quantity and quality of land, the current version of the model implements similar income generation mechanisms for rural and urban areas. Occupational choice behavior and related labor income are the main determinants of the income distribution, in particular in the lower tails. This is supported for Colombia by the World Bank poverty report (2002).

The next subsection provides an overview of the poverty situation at the beginning of the 90s and presents, at the *macro* level, the major changes in labor markets for two alternative

[18] See Armington (1969) for details.

scenarios: the overall historical scenario and the trade liberalization scenario. The former is derived from the 1995 household survey and the latter corresponds to the general equilibrium model results. The second subsection is devoted to the discussion of the *micro* results.

4.1 Poverty and its recent evolution, 1988-95 trends and trade shock

A closer look at the poor and their income sources should facilitate the interpretation of the micro-simulation model results. Based on the labor market specification chosen for the model, we describe in which labor market segments and in which occupations the poor can be found. Their incomes sources are identified and contrasted with those of non-poor households. This poverty profile is based on the 1988 household survey.

In our reduced and reweighed sample the rural population accounts for 54.9 percent of the population.[19] As Table 4 indicates, the rural poor constitute 60 percent of total poverty; however, with a headcount of 60 percent, urban poverty should not be overlooked.

Table 4: Poverty in rural and urban areas, 1988

Area	Headcount	Contribution to national poverty
Urban	60	37
Rural	81	63
Total	72	100

Source: Authors' calculations based on the Colombian household survey

Table 5 shows a poverty profile according to the occupational choice of the household head. Particularly high poverty incidence is observed in households headed by inactive or self-employed individuals. Still, wage-employed and self-employed headed households under the poverty line contribute equally to total poverty. Noteworthy is the relatively large group of poor household headed by inactive individuals.

[19] This rural population also includes people living in "cabeceras", i.e. towns in rural areas, which are typically classified as urban. This is why the rural population share appears to be too high. However, the "cabecera" dummy turned out to be insignificant in wage and profit estimates, which is why we feel comfortable to include the population of "cabeceras" in rural areas.

Table 5: Poverty by occupational choices of household heads, 1988

Occupation of household head	Population shares	Headcount	Contribution to national poverty
Inactive	10	77	10
Wage-employed	48	65	44
Self-employed	40	78	43
Both	3	83	3
Total	100	72	100

Source: Authors' calculations based on the Colombian household survey.

Assessing poverty incidence according to labor market segment, as shown in Table 6 yields the expected results. Poverty incidence is higher among households headed by the unskilled. Gender differences appear to be of minor importance in urban areas. In rural areas, however, female-headed households seem to be better off. Rural unskilled male headed households contribute more than 50 percent to overall poverty. However, they also account for a major part of the total population.

Table 6: Poverty by labor market segment of the household head, 1988

Segment	Population shares	Headcount	Contribution to national poverty
Urban Unskilled Male	16	76	17
Urban Skilled Male	19	46	12
Urban Unskilled Female	5	76	6
Urban Skilled Female	4	45	2
Rural Unskilled Male	43	84	50
Rural Skilled Male	6	60	5
Rural Unskilled Female	6	82	7
Rural Skilled Female	1	57	1
Total	100	72	100

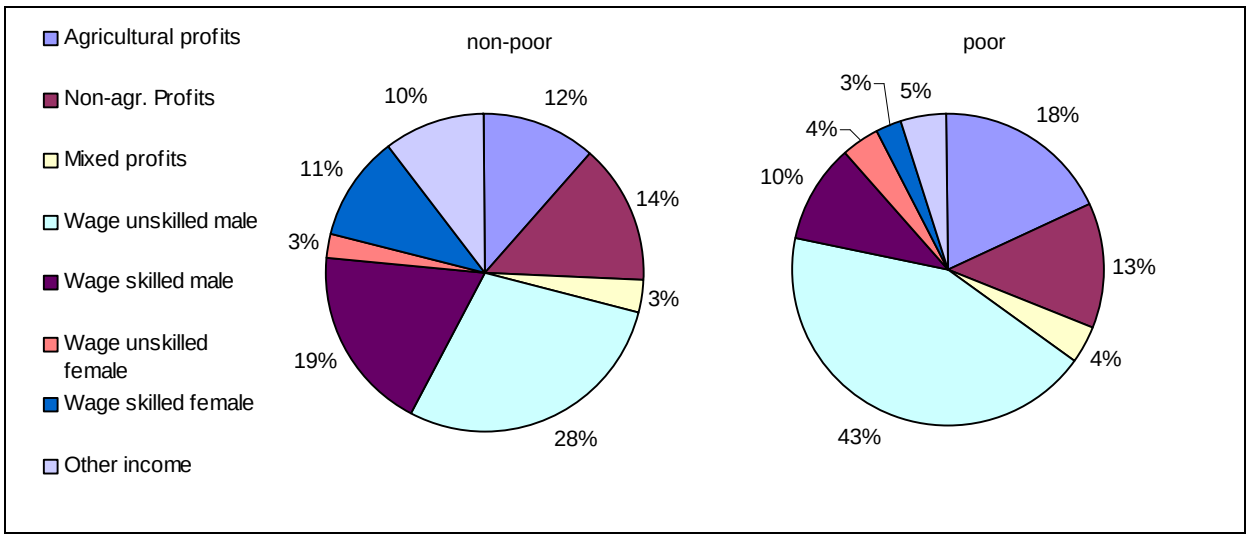
Source: Authors' calculations based on the Colombian household survey.

Figure 1 and Figure 2 assess the income sources of the poor and contrast them with those of the non-poor. They represent simply the shares of different income sources averaged over all poor and non-poor households and hence give us an approximate idea of the relative importance of these sources. A more detailed analysis distinguishing the poor in different sub-groups would probably reveal important channels through which the income generation process and poverty are interlinked. However, such an assessment is beyond the scope of this paper.

As indicated in Figure 1, wages of the unskilled male account for a major portion of income earned by the poor. For the non-poor, male wage income is also important, but generated also by the skilled. Together with male skilled wages they account for more than 50

percent of total income earned. Female wages are almost negligible for the poor in rural areas with 7 percent. This share is only half of the share that we observe for non-poor households. Other income, which includes transfers and imputed housing rents as major components, plays a more prominent role for the non-poor. It should be noted that this income portion is exogenous in the micro-simulation. Finally, agricultural profits constitute a major income source of the rural poor.

Figure 1: Income sources of the poor and the non-poor in rural areas, 1988

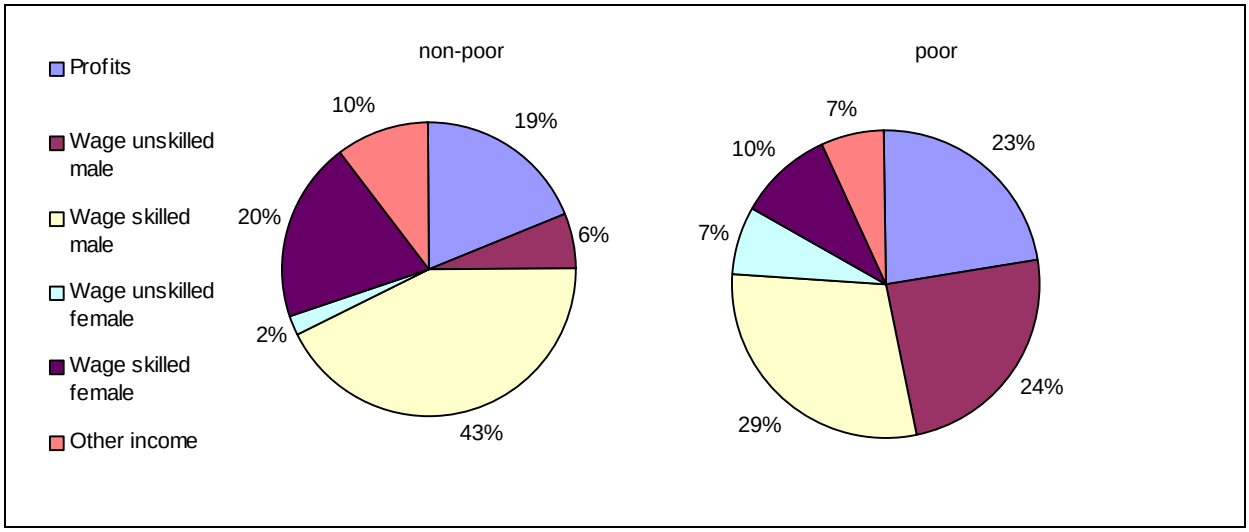


Source: Authors' calculations based on the Colombian household survey.

The historical scenario

In urban areas, we also observe that male wage income accounts for a large share of both poor and non-poor households. This is illustrated in Figure 2. The Colombian urban labor force is quite skilled, which is why even for poor households a large share of wage income comes from skilled individuals. Female wages play a more important role for urban households than they do in rural areas. Again they are less important for the poor than for the non-poor. Other income is an important income source in urban areas, which is due to the imputed housing rents included. Self-employment income is a main urban income source especially for the poor.

Figure 2: Income sources of the poor and the non-poor in urban areas, 1988



Source: Authors' calculations based on the Colombian household survey.

The micro-simulation is based on a survey from 1988. This starting point is then compared to the 1995 survey, which includes data collected after most of Gaviria's structural reforms had been implemented. The 1988-95 comparison is summarized in Table 7 and Table 8. Remarkable differences in labor market trends between urban and rural areas are recorded and they are consistent with former studies, although the comparability of the results is limited due to the different segmentation chosen.[20]

Table 7: 1988 labor force composition and its recent evolution

	1988 initial shares				1988-95 change in shares			
	Inactive	**Wage-work**	**Self-empl.**	**Both**	**Inactive**	**Wage-work**	**Self-empl.**	**Both**
Urban Unskilled Male	6.5	61.2	32.3		-0.5	-12.7	24.2	
Urban Skilled Male	7.6	72.9	19.5		-6.1	-5.9	24.3	
Urban Unskilled Female	64.3	21.8	13.9		-8.7	2.6	36.1	
Urban Skilled Female	48.6	42.1	9.3		-12.8	5.9	40.1	
Total Urban	32.5	50.2	17.3		-11.1	-1.6	25.6	
Rural Unskilled Male	4.7	45.9	45.8	3.6	-6.8	14.2	-13.5	-1.3
Rural Skilled Male	24	47.5	27.8	0.7	2.1	0.1	-3.6	59.2
Rural Unskilled Female	72.4	6.1	21.2	0.3	-4.8	42.6	3.4	53.9
Rural Skilled Female	66.9	22.1	10.8	0.2	-9.4	18.4	20	39.8
Total Rural	39.3	28.7	30.4	1.6	-5.9	17.1	-8.6	2.1

Source: Authors' calculations based on Colombian household surveys. Note: The right panel of the table displays the percent change of the initial occupational category shares.

Table 7 illustrates the development of the composition of the labor force between 1988 and 1995. In urban areas, self-employment rises substantially across all labor market segments

[20] For an overview of labour market indicators for 1988 and 1995 see Vélez et al. (2001). Ocampo et al. (2000) additionally consider the sectoral composition of employment.

and the share of male wage-workers declines for both unskilled and skilled. Female labor market participation increases considerably, especially in self-employment activities.

In rural areas, females also increase their labor market participation although to a lesser extent and more in wage-work activities than in self-employment. The data suggests that, in rural areas, there is a general trend across almost all segments towards more wage-employment, in particular for the unskilled. More than 50 percent of the rural male unskilled labor force was wage-employed in 1995. This implies a significant increase between 1988 and 1995, whereas self-employment declined correspondingly.[21]

Table 8 sketches the evolution of average wages for different labor market segments and average self-employment income for different activities between 1988 and 1995. The differences across the labor market segments and between wage- and self-employment are striking. Surprisingly, income from self-employment exhibits the highest increase in urban areas. With regard to wage-employment, the figures appear to confirm that the unskilled lose whereas the skilled gain. This is also true for rural areas, where wages seem to decline in all segments, but to a larger degree for the unskilled categories. Self-employment income from agricultural and mixed activities increases significantly, although this may have seasonal reasons. This is one reason why these results should be interpreted with caution, in particular for rural areas, as they are just based on two surveys.

Table 8: Wages and self-employment income, 1988 and 1988-95 evolution

	Initial values	1988-95 change
Wage		
Urban Unskilled Male	37,185	2.1
Urban Skilled Male	61,560	7.6
Urban Unskilled Female	26,784	-4.6
Urban Skilled Female	45,131	8.3
Rural Unskilled Male	28,320	-11.3
Rural Skilled Male	40,311	-4.6
Rural Unskilled Female	21,591	-8.6
Rural Skilled Female	36,523	-6.3
Self-empl. Income		
Urban	40,443	11.4
Rural Agricultural	17,628	13.1
Rural Non-Agricultural	19,969	-6.1
Rural Mixed	16,142	8.1

Source: Authors' calculations based on Colombian household surveys. Note: the second column shows percent changes.

[21] As the occupational choice of being *both* self- and wage-employed in rural areas is of minor importance, we do comment on it.

The trade liberalization scenario

The 1988-95 historical evolution described above serves as a benchmark against which a trade liberalization scenario can be compared. As described in section 2, the 1988-95 period witnessed numerous policy reforms and other shocks, so that to identify whether increased openness is pro-poor and improves income distribution, a counterfactual scenario that includes just trade policy is needed. Simulating in the CGE model tariff abatement as that of Table 1 provides this counterfactual scenario.

Table 9: Trade liberalization induced changes in employment shares and incomes

	Employment		Income	
	Wage-work	Self-empl.	Wage	Self-empl.
Urban Unskilled Male	0.5	-1.1	1.1	
Urban Skilled Male	0.5	-2.6	0.9	
Urban Unskilled Female	0.3	-0.8	0.5	
Urban Skilled Female	0.5	-6.1	1.1	
Rural Unskilled Male	1.7	-0.5	3.4	
Rural Skilled Male	1.0	-1.8	2.1	
Rural Unskilled Female	1.2	-0.5	2.4	
Rural Skilled Female	0.7	-5.4	1.4	
Urban				3.8
Rural Agricultural				6.6
Rural Non-Agricultural				5.1
Rural Mixed				5.8

Table 9 summarizes the aggregate changes in employment and income levels resulting from the CGE model runs. First of all it can be noticed that wage employment increases across all segments at the expenses of self-employment. This, at first, may seem surprising given that for many models the standard prediction is that trade openness leads to a rise in informality. The typical argument to justify this is that when formal firms are exposed to increased foreign competition they are forced to release employees, who then move to the informal sector, or to hire temporary workers (coming from the informal sector), or, still, to sub-contract activities to establishments in the informal sector. In all cases, informal employment grows.[22] However, in the model used here, a different adjustment mechanism is at work. As it was described above, formal and informal labor markets adjust to a new equilibrium differently, with the formal one showing a certain degree of wage rigidity. Accordingly – and due to the Colombian labor endowment, the initial shares of formality and informality across activities and their different labor inputs – the trade shock results in a shrinking informal employment. In particular, while both *formal* and *informal* import

[22] An alternative approach explaining the link between trade liberalization and increasing informality is presented by Goldberg, P. K. and N. Pavcnik (2003).

competing activities contract to a similar degree, *formal* export oriented activities expand considerably more than *informal* ones.

Figure 3: Formal and Informal Labor markets

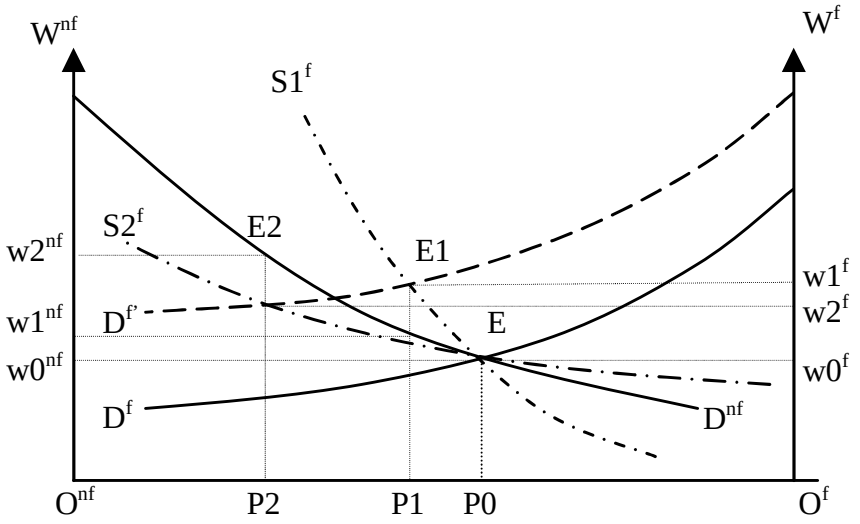


Figure 3 illustrates the general equilibrium adjustment mechanism at work in the model. The sum of formal (wage-work) and informal (self-employed) labor endowments is fixed and represented by the horizontal segment $O^{nf} – O^{f}$. Two labor demand curves are depicted for the formal (D^{f}) and for the informal (D^{nf}) employment and they are negatively sloped with respect to the wages W^{f} and W^{nf}. The graph also shows two alternative wage curves for the formal market ($S1^{f}$ and $S2^{f}$) with different slopes reflecting a low and a high degree of stickiness. The initial equilibrium is at point E where wage w0 is equal for the formal and informal segments and where formal and informal employments are measured by the distances $O^{f} – P0$ and $O^{nf} – P0$ respectively. The trade shock is represented by an upward shift of the formal labor demand and, depending on the rigidity of the formal wage, the new equilibrium can be at points E1 or E2. Illustrating the case for E1, the new equilibrium of the formal market is found at the intersection of the formal labor demand and the wage curve: the new wage is set at $w1^{f}$ and formal employment increases from $O^{f} – P0$ to $O^{f} – P1$. Informal employment adjusts residually and decreases symmetrically to $O^{nf} – P1$; the informal wage is found on the labor demand (D^{nf}) at $w1^{nf}$. It can finally be noticed that the mechanism just described works in a very similar way to a rural-urban migration framework where, instead of considering movements from one region to another, flows between informal and formal market segments are taken into account.

The significant rises (shown in Table 9) of wages for unskilled workers, particularly in the rural area, and of income levels for rural agricultural self-employed are easily rationalized by

the standard comparative advantage theory. Tariff abatement induces resources to move out of contracting import competing sectors and into expanding export oriented ones. These use intensively Colombian most abundant resources – unskilled (especially rural) wage and self-employed workers – which thus enjoy increasing returns.

In summary, implemented in isolation from any other shocks, the Colombian tariff abatement of the beginning of the 90's would have produced significant employment gains for wage workers and a slight reduction of informal self-employment; more in details, these gains would have been greater for the unskilled categories and more pronounced in the rural area. Correspondingly, wages for these categories would have recorded important increases. These results rest on two important assumptions: that the formal labor market shows a certain degree of wage rigidity and that labor supplies are fixed.

4.2 Income distribution and poverty results

The aggregate variables on employment, wage and income levels for the 1988-95 historical shock and for the trade liberalization shock, as described in the above section, were used as inputs for the micro-simulation model. This then produces new income distributions that can be compared with the initial distribution or among themselves. This section describes in detail these micro-results.

Table 10 shows the change in a series of poverty and inequality indicators resulting from the trade and historical shocks. First of all it should be reiterated that the trade shock is of quite smaller proportions than the historical one and that explains why it produces, almost always, smaller effects. However, considering the headcount (P0), it can be stressed that a pure trade shock accounts for a large share of overall poverty reduction: for the whole population the P0 is reduced by 1.8 percent with increased openness, more than half of the total decrease of 3.1 percent. For the rural poor trade seems to be particularly beneficial given that it reduces the headcount more than in the historical case; the reverse is true for the urban poor. This result should not be too surprising given that trade liberalization induces specialization in agricultural exports and other activities requiring rural labor inputs and that this increased demand is reflected in increased wage and income levels (see Table 9).

Table 10: Poverty and Inequality, percent changes with respect to 1988 benchmark

	Trade Liberalization			1988-95 Historical Change		
	Country-wide	Urban	Rural	Country-wide	Urban	Rural
Per Capita Income	2.4	1.6	4.0	6.6	9.5	0.6
General Entropy (0)	-1.7	0.2	-1.6	0.5	-0.2	-8.7
General Entropy (1)	-1.2	0.1	-1.2	5.3	6.7	-6.8
Gini	-0.6	0.1	-0.6	2	2.4	-3.6
P0	-1.8	-1.3	-2.1	-3.1	-7.8	-0.2
P1	-2.7	-1.8	-3.1	-3.8	-7.3	-2.2
P2	-3.6	-2.2	-4.1	-4.2	-3.6	-4.4

Trade also scores well when the poverty severity (P2) index is examined. Even for the urban areas, trade-induced reduction of P2 is close to the overall historical reduction. This positive distributional effect is confirmed by looking at inequality indicators. The whole population' Gini is reduced with the trade shock, whereas it increases with the historical shock. Once again, the standard trade theory embedded in the CGE model can be used to explain this positive effect: unskilled labor, the main income source for the poor, records increased demand and raising wages (especially for the rural areas, see Table 9) and that helps to close the gap with higher wage earners, and, given that this is more pronounced for the rural area than for the urban, also *between* groups inequality is reduced.

These general distributional and poverty results of the trade liberalization shock and their interpretation may seem somewhat too obvious and straightforward. One may be tempted to ask why such a complex empirical model needs to be constructed to produce just these results. In fact, the micro-simulation approach allows analyzing income distribution changes in a much more detailed way than alternative methodologies and, to make this point convincingly, this sub-section illustrates some of the exclusive contributions of the micro-simulation approach. In particular, four contributions are discussed: a) more precision in the assessment of poverty and inequality effects of the trade and historical shocks, b) decomposition analysis, c) poverty transition analysis, and d) expenditure side - relative prices analysis.

Precision issue

Often, distributional issues, questions of who wins and who loses from a certain reform, are of major interest to policy makers. However, in standard multisectoral applied models the estimation of distributional impacts relied very much on linking household incomes to factor rewards through the representative household group (RHG) assumption. In many applications of the representative household approach, the composition of household income is taken into account only rudimentarily. It is the average factor endowment of a specific household category that decides upon this composition. Here lies the major drawback of the

representative household approach in distributional analyses as these averages of factor endowments are difficult to specify and ignore important information. If distributional and poverty impacts are to be quantified, then information regarding household heterogeneity cannot be ignored. Household surveys, which contain the necessary information are available for almost all developing countries.

We can take this information into account through different approaches. An easy way to use the survey data to improve distributional impact analysis is to take the survey of the base year and raise individual factor incomes by factors given by a CGE. The modeler only has to make sure that the specification of the factor markets in the CGE meaningfully corresponds to the income information available in the survey. This method would account for household heterogeneity with regard to income sources and can be easily implemented. However, if we allow individuals to switch for example between informal and formal activities, as we do in the above CGE, such developments could not be analyzed within this simple survey based approach. Households could be reweighed to produce the changes in formal vs. informal employment observed in the CGE. Yet, as already explained above, a more accurate method takes into account individual characteristics, which decide upon which individual changes for example from formal into informal employment or vice versa. Furthermore, a different wage or profit setting mechanism may be relevant in the new type of employment. These aspects are considered in the micro-simulation module.

Whether the micro-simulation yields additional insights therefore depends very much on the kind of shock analyzed. If the shock mainly produces income changes, the results of the simple household based approach will not be too different from the full simulation results. However, considering household heterogeneity in terms of income sources by using household surveys as just explained should be imperative in distributional and poverty analysis as the implementation is straightforward. This should be done at least to check the validity of the representative household assumption made.

To illustrate the differences in results under different approaches we compare the results we obtain under the RHG assumption with those obtained using the full sample micro-simulation. In our experiments, the household income under the RHG assumption is calculated by scaling the income of all households belonging to a specific category by a factor estimated by the CGE. In order to keep matters simple, the household categories of the RHG approach are determined by the occupation and skill type of the head of the household. According to the labor market specification in the CGE 12 household groups are identified: households headed by urban unskilled, urban skilled, rural unskilled and rural skilled wage-

workers, urban self-employed, and rural self-employed who are engaged in agricultural, non-agricultural, and mixed activities. It should be emphasized that in the current RHG approach the only occupational choice changes taken into account are those of the household head and not those of the household other members. This means that if, for example, wages for the urban unskilled male increase by 10 percent, in a particular scenario, the income (except the exogenous component) of households *headed* by urban unskilled male wage-workers also increases by 10 percent.

Table 11 Table records the results obtained for the trade shock and the historical simulation under the alternative full sample and RHG approaches. In the case of the trade shock, the two methods produce similar results: changes always show the same sign and are of similar magnitude.

There are two reasons for this outcome. First, occupational choice changes, a major source of income variation, do not play a prominent role, as later decomposition exercises will show. An example may clarify this. The RHG approach does not account for shifts of spouses from, say, self-employment in subsistence agriculture to highly paid wage-employment. However, given that such shifts are of minor importance in the trade scenario, the RHG estimates are not strongly biased.

Second, the full sample and the RHG approaches would yield different results if large differences in income variations were observed across different source of income. In a case, such as the current trade scenario, where both wages of the unskilled and agricultural profits experience similar increases, the effect of accounting for full heterogeneity in sources of income will be less pronounced.

Table 11: Full Sample vs. Representative Household Group

	Full sample			Representative Household Group (RHG)		
	Country-wide	**Urban**	**Rural**	**Country-wide**	**Urban**	**Rural**
	Trade Liberalization					
Per Capita Income	2.4	1.6	4.0	2.7	2.1	3.7
General Entropy (0)	-1.7	0.2	-1.6	-1.0	-0.1	-0.7
General Entropy (1)	-1.2	0.1	-1.2	-0.8	-0.1	-0.7
Gini	-0.6	0.1	-0.6	-0.4	0.0	-0.3
P0	-1.8	-1.3	-2.1	-1.0	-1.2	-0.9
P1	-2.7	-1.8	-3.1	-2.2	-2.2	-2.2
P2	-3.6	-2.2	-4.1	-3.0	-2.8	-3.1
	1988-95 Historical Change					
Per Capita Income	6.6	9.5	0.6	7.3	10.3	1.2
General Entropy (0)	0.5	-0.2	-8.7	3.3	2.1	-2.8
General Entropy (1)	5.3	6.7	-6.8	4.7	2.2	-0.1
Gini	2.0	2.4	-3.6	2.1	1.1	-0.5
P0	-3.1	-7.8	-0.2	-3.0	-7.0	-0.5
P1	-3.8	-7.3	-2.2	-3.6	-9.9	-0.6
P2	-4.2	-3.6	-4.4	-4.5	-12.1	-1.6

Conversely, important differences between the results of the two methods arise for the historical simulation. As indicated in Table 11, many of the poverty and inequality indicators differ significantly. In general, the reasons for these differences are major occupational choice changes, which significantly altered the composition of household income, and large differences in the relative gains and losses across labor income sources. We will concentrate on the differences in poverty indicators.

Interestingly, the deviations between the two approaches appear to be minor on a countrywide level. Looking at urban and rural areas separately however reveals that this is coincidental. The reduction of the poverty gap and the poverty severity index are overestimated under the RHG approach in urban areas, whereas they are underestimated in rural areas. One should also note that the RHG approach does not introduce a systematic upward or downward bias. The bias is specific to the changes produced by the shock.

The overestimation of the decrease of the poverty gap and the severity index in urban areas obviously is due to the large increase of self-employment profits. Under the RHG assumption the entire household income rises by more than 10 percent if the household head is self-employed – no matter if a substantial portion of income is earned by spouses or other household members in wage activities where gains are much smaller. However, decomposition exercises show that another effect is at work. Increased female labor market participation in urban areas is not taken into account under the RHG approach when the women entering the labor market are not household heads. We would therefore underestimate the decrease in poverty if self-employment income had not seen such an important increase.

In rural areas, movement from self-employment into wage-employment is a major reason of rising incomes of the poor as is also the substantial increase in agricultural profits. Under the representative household approach we underestimate the positive impact of the occupational choice change, as we just consider the occupational choice change of the household head.

These few examples show the interplay of occupational choice and labor income changes and their impact on poverty. Depending on the type of shock the representative household approach might conceal the poverty impact of important labor market developments. It is important to note again that, ex-ante, the sign of the bias is unknown and therefore it is not clear whether the two approaches will produce significantly different results.

Decomposition analysis

Above, we have already referred to decomposition exercises. Technically decomposition means that we shock the income distribution only with a subset of the variables that are passed from the CGE to the micro-module. This allows disentangling the distributional impact of occupational choice changes, on the one hand, and wage changes, on the other. It is important to point out that an occupational choice change – of *any* household member – typically implies quite a substantial variation in per capita household income, whereas changes due to income and profit fluctuations are relatively small.

Table 12: Decomposition analysis

	Wage and Profit Change			**Occupational Choice Change**		
	Country-wide	**Urban**	**Rural**	**Country-wide**	**Urban**	**Rural**
	Trade Liberalization					
Per Capita Income	2.3	1.7	3.7	0.1	0.1	0.1
General Entropy (0)	-1.2	0.1	-0.9	0.3	0.3	0.3
General Entropy (1)	-0.8	0.2	-0.6	0.3	0.3	0.3
Gini	-0.4	0.1	-0.3	0.1	0.2	0.2
P0	-1.7	-1.4	-1.8	0.0	0.1	0.0
P1	-2.5	-2.0	-2.8	0.0	0.1	0.0
P2	-3.3	-2.4	-3.6	0.1	0.2	0.1
	1988-95 Historical Change					
Per Capita Income	2.8	5.7	-3.1	-0.4	-3.3	5.7
General Entropy (0)	0.2	-1.3	-7.0	-6.4	-1.3	-6.3
General Entropy (1)	2.1	-1.2	-3.2	-2.7	5.6	-7.2
Gini	0.9	-0.6	-2.3	-1.6	1.9	-3.3
P0	-0.9	-4.9	1.5	-0.6	1.7	-2.1
P1	-1.4	-7.9	1.6	-2.1	6.6	-6.2
P2	-2.5	-9.8	0.3	-2.4	13.5	-8.4

The interpretation of the results of such decomposition analyses has to be carried out carefully. The following example illustrates the difficulties involved. In urban areas, average self-employment profits are higher than average wages of the unskilled. On average, an individual changing from wage-employment into self-employment will hence gain. Since

returns to education are much higher in self-employment than in wage-employment, a well-educated individual will typically win from moving into self-employment, whereas the less educated individual will most likely lose. Even knowing this, the interpretation of occupational choice changes might not be straightforward. Consider a shock that produces a change in wages and profits such that all individuals would gain from moving from wage- into self-employment. Obviously, the impact of the occupational choice change cannot be interpreted without simultaneously considering the income changes. It is the combination of both changes that matters, which is also why the sum of the values for the separate shocks shown in Table 12 does not exactly correspond to the values for the combined shocks shown in the initial Table 10.

Table 12 shows the changes in inequality and poverty indicators of the trade and the historical shock resulting from a decomposition exercise. A striking feature of the trade scenario is that almost only change of wage and profit count for the poverty and inequality improvements; changes of occupational choice seem to be of minor importance. It should also be emphasized that increased trade openness does not cause the deterioration of rural poverty observed in the historical scenario, but, on the contrary, trade seems to be quite helpful in reducing poverty in rural areas due to significant income increases. Additional non-trade-related shocks must then explain the worsening situation of the rural population in the historical scenario.

Consider now occupational choice changes for the historical scenario. As shown in the bottom right panel of Table 12, in urban areas, poverty indicators worsen substantially despite increasing female labor market participation. The positive effect of increased female participation is dominated by the negative effect of the massive movement into self-employment. For the poorer and less educated this occupational switch involves income losses, whereas the more educated may even gain. In rural areas, the historical occupational shock causes all indicators to decrease substantially. This is mainly due to the substantial gains of moving from self-employment in agriculture into wage-employment. The occupational choice effects dominate the overall impact on the poor.

Decomposition exercises can be used to analyze the contribution of developments in particular labor market segments to the overall distributional trends and this may provide valuable insight to policy makers interested, for example, in the effect of female labor market behavior.

Poverty transition

As it was explained in the latter part of section 3.1, the micro-simulation model was modified to allow tracing individuals through time so that poverty transition analyses could be conducted. One of the main advantages of this analysis is that it permits to observe movements in and out of poverty and not only the net final effect as described in Table 10, besides it also allows to study the characteristics of the persistent poor. According to their position with respect to the poverty line before and after the shock, households were grouped in four categories: i) households becoming non-poor, ii) households falling into poverty, iii) households remaining poor, and iv) households remaining non-poor. The first three columns of Table 13 show the size of these four categories for the trade liberalization and historical shock.

Table 13: Poverty transition results

		1	2	3	4	5	6	7
		Country-wide	Urban	Rural	Country-wide	Urban	Rural	Active hh members / hh size[3]
Before Shock:	**After Shock:**	**Population shares[1]**			**Initial distance from z[2]**			
		Trade Liberalization						
Poor	**Non Poor**	3.7	4.1	3.3	0.145	0.127	0.162	
Non Poor	**Poor**	2.6	3.4	1.9	-0.148	-0.149	-0.147	
Poor	**Poor**	68.0	56.3	77.6	0.544	0.462	0.593	
Non Poor	**Non Poor**	25.7	36.2	17.2	-1.180	-1.359	-0.869	
Total		100.0	100.0	100.0				
		1988-95 Historical Change						
Poor	**Non Poor**	5.6	7.8	3.8	0.225	0.195	0.276	11.9
Non Poor	**Poor**	3.5	3.5	3.5	-0.247	-0.371	-0.145	1.7
Poor	**Poor**	66.1	52.6	77.2	0.548	0.475	0.589	3.9
Non Poor	**Non Poor**	24.9	36.1	15.6	-1.203	-1.339	-0.942	2.3
Total		100.0	100.0	100.0				3.5

Notes: (1) the first 3 columns show the percentages of the total population for each of the four groups, (2) initial distance from the poverty line is equal to: 1- househ. income / povline, (3) the last column shows the percent ratio of active household members on total household members.

It is noticeable that the movements out of poverty of the trade shock are a large proportion of those caused by the overall shock, but, most importantly, it seems that increased openness generates less poverty than the overall shock, especially in the rural area. The group of those who remained poor and especially that of the constantly non-poor show comparable sizes across the two scenarios. Different characteristics of these groups could be examined and columns 4, 5, 6 and 7 of the table show some preliminary results when the initial distance from the poverty line and the household's numbers of active members ratio are considered.

The table's figures show that, looking at countrywide averages, those escaping from and those falling into poverty appear to experience similar gains and losses. This is true for both

scenarios with the only difference that, given the larger size of the historical shock the initial distance from the poverty line is larger in this case. Yet, a closer look at urban and rural areas again yields valuable insights. In the historical simulation, those who become poor in urban areas experience losses that are almost 50 percent higher than the gains of those who become non-poor. In rural areas, the historical simulation produces the opposite result. Here, the gains of the "winners" are higher than the losses of the "losers". Thus the rural-urban disaggregation reveals that historically we observe a highly asymmetric shock. Furthermore, our analysis suggests that trade liberalization may also contribute to this asymmetry as it produces similar results, even if they are of much smaller magnitude.

The last column shows, for the historical scenario, the only one with increasing labor supplies, that the considerable increase, of about 12 percent, in the average number of active members is a distinguishing feature of those households who escape poverty. Notice also that increased participation is a common characteristic for all households, and that for the category of those falling into poverty increased participation is well below the economy-wide average.

The combination of the poverty transition analysis with decomposition exercises yield an important insight. From the above decomposition exercise we have concluded that occupational choice changes are not a major channel through which trade liberalization affects the income distribution. Yet, the poverty transition analysis carried out after shocking the distribution with only the occupational choice changes reveals that changes of occupational choice matter for the poor. Households, which become non-poor, have more members moving into wage-employment than other households. As explained before, this is very likely to be beneficial for the poor in both rural and urban areas. Although this result is somewhat tautological, it shows that the income gains large enough to lift people out of poverty are often related to occupational choice changes.

Expenditure side effects

The last point we want to make refers to the expenditure side effects of the trade and historical scenarios. We should note that expenditure side modeling is rather rudimentary as no substitution is allowed for. Furthermore, we only consider two price indices based on baskets of food and non-food items. Expenditure shares were calculated by income quintiles, thus household heterogeneity is limited. In this framework, the relative price changes after trade liberalization has almost no distributional effect, as indicated in Table 14. The historical simulation, which uses historical relative price changes calculated from consumer price indices, suggests that the relative price decrease of food-items worked for the poor. Additionally, it has a favorable effect on the income distribution in general.

Table 14: Expenditure side effects

	With Relative Prices Change			No Relative Prices Change		
	Country-wide	Urban	Rural	Country-wide	Urban	Rural
	Trade Liberalization					
Per Capita Income	2.4	1.6	4.0	2.2	1.4	3.8
General Entropy (0)	-1.7	0.2	-1.6	-2.0	-0.2	-2.0
General Entropy (1)	-1.2	0.1	-1.2	-1.5	-0.3	-1.6
Gini	-0.6	0.1	-0.6	-0.7	-0.1	-0.7
P0	-1.8	-1.3	-2.1	-1.7	-1.2	-2.0
P1	-2.7	-1.8	-3.1	-2.8	-1.9	-3.2
P2	-3.6	-2.2	-4.1	-3.7	-2.5	-4.2
	1988-95 Historical Change					
Per Capita Income	6.6	9.5	0.6	7.4	10.4	1.3
General Entropy (0)	0.5	-0.2	-8.7	2.1	2.1	-6.8
General Entropy (1)	5.3	6.7	-6.8	7.0	8.9	-4.9
Gini	2.0	2.4	-3.6	2.8	3.5	-2.6
P0	-3.1	-7.8	-0.2	-3.3	-7.5	-0.7
P1	-3.8	-7.3	-2.2	-3.5	-6.5	-2.1
P2	-4.2	-3.6	-4.4	-3.5	-2.4	-4.0

The expenditure side offers could be modeled much more carefully. We focused on the income side, but we believe the expenditure side deserves further analysis. Full household heterogeneity could be considered if expenditure surveys were available. With regard to price changes the maximum level of disaggregation is set by the number of goods in the CGE. Furthermore, changes in expenditure shares could be passed from the CGE to the micro-simulation, or endogenized in the micro-simulation module.

5 Conclusions

This paper employs a novel methodology, pioneered for Indonesia by Robilliard et al (2002), to study poverty and inequality consequences of trade liberalization, a quintessential globalization shock. This methodology entails combining in a sequential fashion a numerical simulation general equilibrium macro model with a micro simulation income distribution model. The former provides counter factual scenarios and estimates aggregate results, the latter evaluates the poverty and inequality micro impacts due to these scenarios. This approach overcomes the main difficulty of single-country case studies based on single year household survey or on multi year surveys where households cannot be identified through time. Namely our method allows to identify the income distribution effects due to a particular shock and to estimate the magnitude of these effects separately from other simultaneous shocks.

When this methodology is applied for Colombia and the particular shock under study is trade liberalization our main results and policy conclusion can be summarized as follows. A

major policy conclusion is that trade liberalization can substantially contribute to improve the poverty situation. Abstracting from simultaneous additional shocks and labor supply growth, the beginning of the nineties tariff abatement seems to have accounted for a very large share of the total reduction in poverty recorded from 1988 to 1995. This holds in particular for rural areas. Furthermore distributional impacts differ fundamentally between rural and urban areas. Structural change and the corresponding occupational choice changes trigger large income gains in particular for the poor. Generating more wage-employment in formal sectors or increasing female labor market participation are identified as important sources of higher incomes. Given their diverting performances, and analysis aggregating rural and urban areas, would only estimate small net effects and potentially mislead policy decisions.

Among the results it should be emphasized that in the case of trade liberalization, the income channel, i.e. employment status and wage levels, is more important to the poor than the expenditure channel, i.e. the variation in the price of consumption goods.

6 Bibliography

Adelman, I. and S. Robinson (1978), *"Income Distribution Policy in Developing Countries: A Case Study of Korea"*, New York, Oxford University Press

Alatas, V. and F. Bourguignon (2000), *" The Evolution of the Distribution of Income During Indonesian Fast Growth: 1980-96"*, mimeo, Princeton University.

Andersen, L.E. (2000), *"Social Mobility in Latin America"*, **IISEC Working Paper**.

Armington, P. (1969), *"A Theory of Demand for Products Distinguished by Place of Production"*, **IMF Staff Papers**, Vol. 16, pp. 159-178.

Atkinson, A. B., F. Bourguignon, and C. Morrisson (1992), "*Empirical Studies of Earnings Mobility*", **Fundamentals of Pure and Applied Economics**, 52, Harwood Academic Publishers, Switzerland.

Bussolo M. and D. Roland-Holst. (1999) "*Colombia and the NAFTA*", **Integration and Trade**, September-December 99, INTAL, Washington D.C.

Bussolo M. and R. Correa (1999), "*A 1994 Detailed Social Accounting Matrix for Colombia*", **Technical Paper no 5,** Fedesarrollo. Bogotá, 1999.

Bussolo M., D. Roland-Holst, and D. van der Mensbrugghe (1998), "*The Technical Specification of FEDESARROLLO's Long Run General Equilibrium Model"* **Technical Paper no 4.** Fedesarrollo. Bogotá, 1998.

Bussolo M. and J. I. Round (2003), *"Poverty Reduction Strategies in a Budget-Constrained Economy: The Case of Ghana"*, Paper presented at the OECD Development Centre Conference on Globalization and Poverty.

Dollar, David and Aart Kraay, (2000), "*Trade, Growth, and Poverty*", World Bank Policy Research Working Paper no. 2615.

Goldberg, P. K. and N. Pavcnik (2003), "*The Response of the Informal Sector to Trade Liberalization*" NBER Working Paper No 9443.

Kugler, A. (1999) "*The Impact of Firing Costs on Turnover and Unemployment: Evidence from The Colombian Labour Market Reform*", **International Tax and Public Finance Journal**, Vol. 6, no. 3, pp. 389-410.

Kugler, A. and M. Cardenas (1999), "*The Incidence of Job Security Regulation on Labour Market Flexibility and Compliance in Colombia*", mimeo.

Loefgren, H.; Harris, R. L. and S. Robinson (2001), *" A Standard Computable General Eqilibrium Model in GAMS"*, **TMD Discussion Paper**, No. 75, IFPRI, Washington D.C:.

Newhouse, D. (2001), *"Do Negative Income Shocks Last Longer, and Do They Hurt the Poor More? Evidence from Rural Indonesia."*, mimeo, Cornell University.

Núñez, J. A. and J.A. Jiménez (1997), *"Correcciones a los Ingresos de la Encuestas de Hogares y Distributcion del IngresoUrbano en Colomia"*, mimeo, República de Colombia, Departamento de Planeación.

Ocampo, J.A., F. Sánchez, and C. E. Tovar (2000) *"Mercado Laboral y Distribución del Ingreso en Colombia en los Años Noventa"*, **Revista de la CEPAL**, No. 72.

Robilliard, A.-S., F. Bourguignon, and S. Robinson (2002), *"Examining the Social Impact of the Indonesian Financial Crisis Using a Micro-Macro Model"*, mimeo.

Rodriguez, Francisco and Dani Rodrik (2000), "*Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence*," in Ben Bernanke and Kenneth S. Rogoff, eds., **NBER Macro Annual 2000**, Cambridge, MA: NBER.

Srinivasan, T.N., and Jadgish Bhagwati, (1999), "Outward-Orientation and Development: Are Revisionists Right?" Yale U. mimeo.

UNDP (1998), *"Informe de Desarrollo Humano para Colombia – 1998"*.

Vélez, C. E., J. Leibovich, A. Kugler, C. Bouillón, and J. Núñez (2001), *"The reversal of inequality trends in Colombia 1978-1995: A combination of persistent and fluctuating forces"*, mimeo, World Bank.

World Bank (2002), *"Colombia Poverty Report"*.