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Global trade reforms and income distribution in developing countries

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Abstract*: This paper examines the effects of trade and domestic agricultural policy reforms on the distribution of incomes in six developing countries: Brazil, China, India, Malawi, Mexico and South Africa. The aggregate results from a global trade model are fed into separate national models. The insights available from alternative model types are evaluated. The distributional impacts of reform are found to be complex and to vary between countries. Given that it is typically impossible to reform (or equally not reform) without hurting some households with lower incomes, the conclusion is that it makes sense to help these households with targeted policies.*

Keywords*: trade reform; liberalisation; agriculture; income distribution; poverty; general equilibrium.*

The views expressed are those of the authors and do not necessarily represent those of the OECD or its member countries

This paper synthesises a number of specific contributions. The GTAPEM input was provided by Hsin Huang and Frank van Tongeren at OECD. The China and India analyses were done by Dirk Bezemer. The Brazil and South Africa studies were undertaken by Scott McDonald. In the case of the Brazil, the analysis draws on a Social Accounting Matrix developed by Carlos R. Azzoni, Tatiane A. Menezes, Fernando G. Silveira, Eduardo A. Haddad, Joaquim M. Guilhoto and Heron C. E. Carmo. The Malawi work was undertaken by Andrew Dorward, Colin Poulton, Hardwick Tchale and Peter Wobst; while the Mexico study was provided by Ed Taylor, George Dyer and Antonio Yúnez. The contributions for Brazil, Malawi and Mexico were provided for an OECD project entitled "The Global, National and Household Level Effects of Trade and Agricultural Policy Reforms" (OECD, 2006a). In addition, the analyses for Brazil, China and South Africa each provided stand-alone input into recently published reviews of agricultural policies in these countries (OECD, 2005a; OECD, 2005b, OECD2006b).

1. Introduction

The fundamental rationale for multilateral trade reform is that, by inducing a more efficient allocation of resources among and within countries, it should raise global welfare and, concomitantly, the individual welfare of most countries. Yet global trade reforms remain contentious, partly because there will inevitably be some losers, at least in the short term. At the national level, some net importers of food could see their import bills rise as a consequence of reduced agricultural support and protection worldwide. Likewise, countries benefiting from trade preferences for their exports could see the value of those preferences eroded by global tariff reductions. Moreover, within countries that stand to benefit, there is typically expected to be a losing constituency, notably households remunerated by import-competing sectors that formerly benefited from protection.

In the case of developing countries, there are particular concerns about the effect of reforms on the incidence of absolute poverty and the distribution of income. Even if reform is expected to be on balance poverty-reducing, it is still likely that some poor households will face income losses. The Doha Development Agenda (DDA) arose from a recognition that trade reform cannot proceed on the basis of a laissez-faire approach to poverty, distributional and broader development impacts in developing countries. Both the DDA and the Millennium Development Goals, which include a commitment to halve poverty by 2015, seek to reconcile economic development with the promotion of a more open, rules-based trading system.

This paper examines the links between trade reform and income distribution in a sample of developing countries and so seeks to inform the DDA discussions. The analysis draws on a range of work undertaken by and for the OECD. The starting point is OECD's measurement of the global and aggregate national impacts of multilateral reform, obtained from GTAPEM, a modified version of GTAP, a multi-sector and multi-region computable general equilibrium model widely used for trade policy analysis.[1] The results of this analysis are used exogenously in six national studies, which each trace the aggregate impacts of reform down to the micro (household) level.

The six countries for which specific applications are developed are Brazil, China, India, Malawi, Mexico and South Africa. The sample of countries is naturally too small to provide a

1. GTAP refers to the Global Trade Analysis Project. GTAPEM is the name given to the modified version of the GTAP model that draws on the OECD's Policy Evaluation Model (PEM).

complete picture of distributional impacts in developing countries. However, the countries collectively account for a large share of the world's poor. They are also heterogeneous in terms of both per capita income level (Brazil and Mexico are upper middle income countries, whereas Malawi is among the world's poorest), and economic structure (including both net food importers and net exporters). Accordingly, the studies illustrate a number of the diverse effects that policymakers need to bear in mind when considering the distributional effects of reform. The approach of tracking down the macro impacts of reform to the micro level is similar in nature to that adopted in another major research project, undertaken by the World Bank (Hertel and Winters, 2005a). The broad policy insights are comparable, although methodological differences among the individual case studies make for distinct policy insights.

The structure of the paper is as follows. Section 2 describes the method of analysis, including the policy reform scenario, the way in which results from GTAPEM are passed through to the country models, and the specifics of each national study. Section 3 provides a brief summary of the aggregate results from GTAPEM, while section 4 examines how those aggregate impacts are distributed in each of the six country studies. Section 5 provides a discussion of the results, draws some analytical lessons and suggests some conclusions for policymakers.

2. Method

The global and national effects of multilateral trade reforms and reforms to domestic farm programmes are calculated using GTAPEM. In GTAPEM, the standard GTAP model is adapted to provide a more realistic representation of the structure of the agricultural sector (notably in the allocation of land between alternative uses), and to accommodate a representation of policy interventions that is accurate and consistent with the way in which support is classified and measured by the OECD. In addition, the data used in this analysis take account of the trade preference schemes operated by a number of countries.[2]

The national models each take country-specific results from a GTAPEM liberalisation and reform experiment, and introduce these as exogenous changes. The appropriate method of doing this varies according to the characteristics of the national model. Each model is constructed somewhat differently, according to the economic characteristics of the country, data availability, and the authors' judgements on the appropriate methodology. Nevertheless,

2. For further details on the model, the reader is referred to OECD (2006a).

each traces the implications of a common set of trade reforms and farm subsidy cuts through to the micro (household) level. There are three main methodological approaches. The Brazil and South Africa studies each embed representative household groups in a CGE model. The Malawi and Mexico studies start with models of farm household behaviour (which admit the possibility of market failures), and then specify further economy-wide linkages. In these four studies, changes in export and import prices are taken exogenously from GTAPEM, with all other changes determined endogenously in the national model. The China and India studies take changes to prices and quantities on output and input markets from GTAPEM, allocate these changes across households, and calculate changes to each surveyed household's revenues, expenditures and net income. The absence of a common template means that comparisons of the results across all six countries can only be made loosely. On the other hand, each approach has its strengths and weaknesses, in terms of the effects it can capture and the insight that it offers, and the contrasting methodologies offer some valuable analytical lessons. The household disaggegations and methodologies are summarised below.

CGE models with embedded households

The **Brazil** and **South Africa** studies each embed stratified household types, which account for the totality of households, in a CGE model. In the case of Brazil, there are 10 household accounts, comprising four categories of family farm (non-commercial) household, ordered by economic size; one category of "commercial" farm households; one category of wage-earning agricultural employees; and four categories of urban household, ordered by income quartile. For South Africa, households are ordered by region (six), racial group (White, Coloured or Asian, Africa) and education (low, medium and high, with a separate category for African farmers).

The CGE models all follow a standard form in which households groups have demand functions that enable them to respond to reforms by varying their consumption decisions, while production responses are determined at the market level and passed through to the household via changes in factor incomes. A benefit of this approach is that each study provides substantial sectoral detail. In the case of Brazil study there are 30 activities, of which 9 are in primary agriculture and 15 are in agribusiness; and 40 products, of which 17 are agricultural and 19 of the remaining 23 are agribusiness or strongly agriculture related. In the South africa study, there are 47 sectors, including 19 agricultural accounts and 10 food accounts, plus several agriculture-related activities both upstream and downstream from the farmgate.

Farm household models with general equilibrium linkages

The **Malawi** and **Mexico** studies start with models of farm household behaviour which, unlike the CGEs, account for the possibility that farmers may face market failures in product and/or factor markets. These applications further specify a range of market interactions beyond the household level, but fall short of fully embedding farm household models within a national CGE.

In the case of Malawi, seven types of farm household are nested in a model of the rural economy. Households are differentiated first with respect to three agro-ecological zones and second with regard to socio-economic characteristics within each zone. The latter characteristics include off-farm employment income, remittances, value of assets, retained maize stocks, holding size, access to credit and gender of household head. These data were used to define seven household "types": larger farmers, medium sized farmers with assets, borrowers, poor male headed households, poor female headed households, employees and remittance earners. The model allows each household "type" to behave differently, depending on the resource constraints that it faces.

The Malawi study is based on analysis with a farm household level model, calibrated with mathematical programming methods. The approach recognizes explicitly market failures on both labour and product markets and the resulting interdependence of households' decisions on production, consumption and labour supply. The Malawi model also takes account of seasonal constraints, varied activities among households and heterogeneity in resource endowments. By allowing for different maize prices in the harvest and post-harvest periods, the model allows for some embedded risk. Farm households are nested in a model of the rural economy, whereby households interact with each other and with "external" markets for output (maize and tobacco) and wage labour. The model of the rural economy is in turn loosely nested in a national CGE model of Malawi's economy.

The Mexico case study estimates four separate farm household models for each of Mexico's five census regions (i.e. 20 models in total), and these household models are embedded in a separate CGE for each region. The household types are: (1) commercial farms on large landholdings, which behave more like firms than like households; (2) net-surplus producing family farms on medium and small holdings, typical of small owner-operated farms of medium productivity; (3) subsistence and infra-subsistence household farms, typical of small-scale, low productivity agriculture, frequently operating under marginal conditions and incomplete markets; and (4) landless rural households.

For each of five regions, there are four farm households nested within a rural CGE. The household models are estimated separately, to capture the fact that the same household category does not look the same in all regions. The CGE model determines the (net) marketed surplus of tradable commodities as the difference between supply and demand. Prices for 'village' tradables are exogenous, determined by markets outside the village or by policy. Prices of village non tradables (land and hired labour) are endogenous, with local supply equal to demand, and individual household price takers. For households that do not participate in local markets, prices are unobserved shadow prices, and the marketed surplus is zero.

Microsimulation with behavioural responses taken from GTAPEM

For **China** and **India**, information on prices and quantity changes in both output and input markets is used to calculate changes in each household's costs and revenues (the income side) and consumption expenditures. The procedure, which is modified from McCulloch (2003), is applicable to data sets with household-level information on production and consumption.

The Chinese data originate from a November-December 2000 rural household survey among 1 200 households, covering 4 387 people, in 60 townships in six Chinese provinces across the country: Hebei, Hubei, Liaoning, Shaanxi, Sichuan and Zhejiang. In the household survey, information was collected on a range of productive activities, consumption, household members' demographic situation, labour market status, and land use. A parallel village survey collected information on size, infrastructure, agricultural potential, labour flows, access to utilities as well as other information concerning the villages in the sample. Data on both consumption and production were available for a subset comprising slightly less than half the total sample (Chang, 2004).

In the case of India, the analysis makes use of rural household survey data from Bihar and Uttar Pradesh, two relatively poor and rural states situated in the north and northwest of India, respectively. The data are from a 1998 rural household survey covering 2 252 households and 14 493 people - in 134 villages spread out over 25 districts in Bihar and UP. Data from 1 550 of these households was collected on a range of productive activities and consumption patterns. The data also include socio-economic variables such as caste, education, demographic situation, labour market status and land use. As for China, a parallel village

survey collected information on variables such as village size, infrastructure, agricultural potential, household labour flows and household access to utilities.

For each observation the change in household income is calculated in the neighbourhood of its assumed optimum, given endowments. Changes in the prices and quantities of output (most household are agricultural producers), factors (including wages) and consumption goods are taken from the GTAPEM analysis. Thus, both first and second order effects of policy reform are incorporated in the analysis. Rising (falling) producer prices and higher (lower) wages increase (decrease) producers' incomes, while rising (falling) prices increase (decrease) the cost of a household's consumption bundle. The total welfare effect, for each household, is the sum of the consumption and production effects.

3. Aggregate impacts of reform

GTAPEM is used to simulate the effects of a 50% reduction in tariffs for all countries and all sectors, a 50% cut in agricultural export subsidies for all countries, and a 50% reduction in domestic farm support in OECD countries. The results are comparative static and are based on data for 2001. Accordingly, recent policy changes, including the US farm bill and the introduction of the single farm payment in the European Union, are not considered. Policy changes as a result of China's WTO accession are also excluded, with the exception of tariff reductions made on grains and oilseeds.

The global impacts of these reforms are described in detail in OECD (2005a), along with the vectors of policy changes that are fed into the national models. The main results are reported briefly here, in order to situate the sources of welfare gains and losses for the six case country studies, first with respect to the overall impacts on developing countries, and second relative to the global impacts (Table 1).

Table 1. Decomposition of welfare effects by broad policy category, region and country implementing the reforms, equivalent variation, million USD

	Total Welfare	% of GDP	OECD Agriculture	Non-OECD Agriculture	OECD non-Agriculture	Non-OECD non-Agriculture
World	**44 268**	**0.1**	**23 361**	**3 124**	**6 694**	**11 357**
OECD	33 459	0.1	21 407	1 871	-248	10 680
Non-OECD	10 809	0.2	1 954	1 253	6 943	677
Brazil	1 730	0.3	1 178	94	367	96
China	3 739	0.3	-73	-199	3 373	635
India	1 723	0.4	72	544	378	735
Malawi	24	1.4	19	-1	1	6
Mexico	452	0.1	38	-30	463	-15
South Africa	253	0.2	69	25	23	137

Note: Agriculture includes primary and processed food.
Source: GTAPEM simulation results.

At the global level, more than half the total gains from the global reform package described previously come from reforms to agricultural policies in OECD countries. The vast majority of the benefits from these particular reforms accrue to OECD countries themselves, largely because they inflict less harm on themselves than before. For non-OECD developing countries as a whole, tariff cuts on manufactures are the most important source of gains, although significant benefits also flow from agricultural reforms in both OECD and non-OECD countries. None of the six country case studies conforms exactly to this pattern, which underscores the danger of extrapolating the average result to individual countries, or even groups of countries.

In the case of Brazil, agricultural reforms account for about two-thirds of the country's total welfare gain of USD 1.7 billion. Most of these benefits derive from agricultural policy reforms in OECD countries, notably in the European Union, which accounts for about 40% of Brazil's agricultural exports. Indeed, Brazil obtains more than half of all the gains to developing countries resulting from agricultural reforms in OECD countries. The benefits deriving from reforms in the manufacturing sector are much less important in relative terms

(just 27% of the total gains), with most of the USD 460 million gain coming from reforms in OECD countries. In this case, the efficiency gains to Brazil from lowering its own tariffs on manufactures are to a large extent offset by rising import prices.

In the case of China, most of the benefits come from lower tariffs on manufactures in OECD countries. These benefits account for almost one-half of all the gains to developing countries stemming from reforms to non-agricultural policies in OECD countries. The results suggest a small net welfare loss from agricultural policy reforms, in both OECD and non-OECD countries (including China itself), with the net benefit from higher world market prices for agricultural goods (*e.g.* accruing to those producing exportable agricultural commodities) marginally outweighed by the higher cost of agricultural imports facing some consumers.

For India, the biggest gains come from non-OECD reforms to the manufactures sector, with reforms by India itself especially important. India levies relatively high tariffs on imported manufactures, and a substantial share of the benefits are expected to come from a reduction in these tariffs. With respect to agriculture, the share of trade to total production is low for both exports and imports (about 4%), which goes a long way in explaining the modest gains relative to the size of the sector.

For Malawi, the gains derive mostly from reforms to OECD country agricultural products (lower tariffs on the product category including tobacco).[3] Mexico benefits significantly from OECD country non-agricultural policy reforms, and slightly from changes to OECD country agricultural policies. However, it loses from non-OECD country reforms to both agricultural and non-agricultural sectors as a result of adverse movements in the terms of trade. South Africa gains from all categories of reform. The biggest source of benefits is non-OECD country tariff cuts on manufactures (including South Africa's own tariffs), but there are also significant gains from reduced agricultural support and protection in OECD countries. In each case, the benefits are driven by improvements in allocative efficiency, which are partially offset by terms of trade losses.

3. Malawi's principle agricultural export is tobacco, which is included among "other crops" in GTAP. Given Malawi's weak integration with world markets for food crops and other products, cash crops are the most important source of impact, but the results should nevertheless be treated with caution. Accordingly, at the national level, a range of scenarios for tobacco price changes in Malawi are simulated.

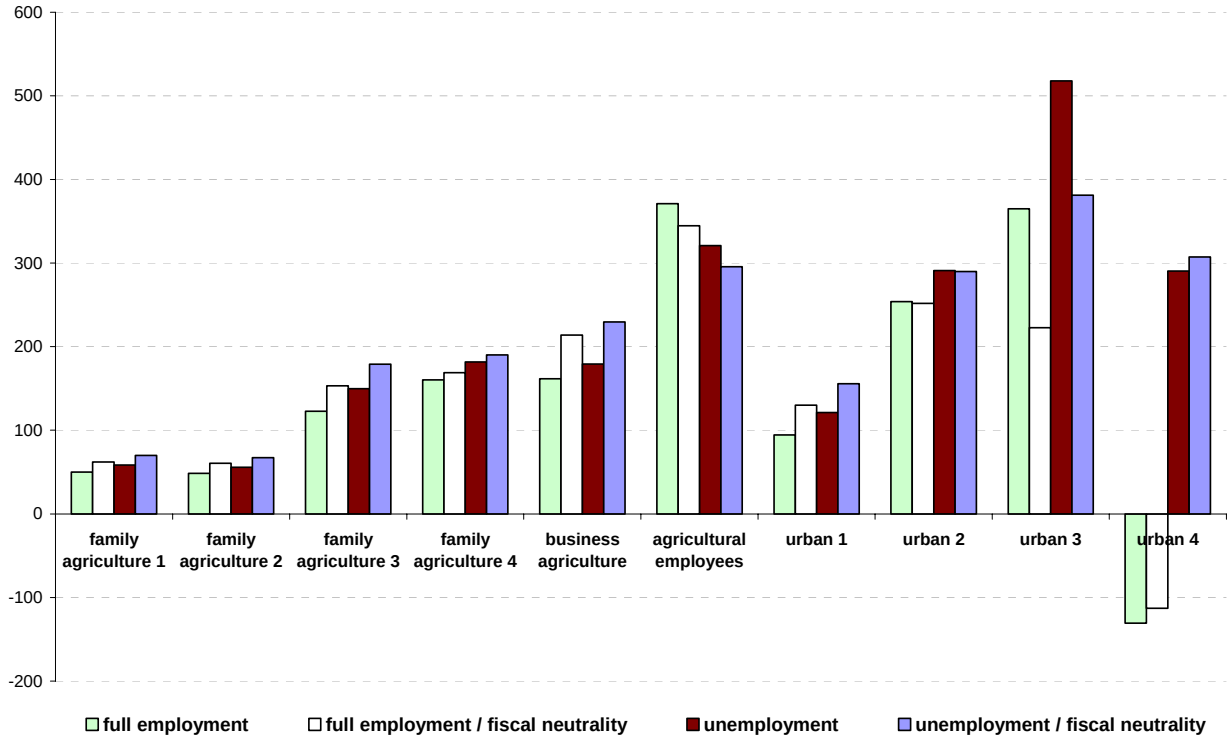
4. Distributional impacts by country

Brazil

The aggregate welfare gains from reform vary from USD 1.5 billion with full employment to USD 2.2 billion under the more realistic assumption of unemployed unskilled labour. (These two estimates bridge Brazil's estimated national welfare gain of USD 1.7 billion obtained in the GTAPEM simulation.) These impacts are ultimately distributed across households, via changes in factor returns. Figure 1 shows the changes in welfare for each household group under alternative closure rules.

In general, the welfare gains are widespread across household types. With the poorer categories of both urban and rural household better off, the incidence of poverty falls. At the same time, inequality among agricultural producer households increases, with larger (and richer) family farm households gaining more than smaller ones. This is because larger farms tend to be more specialised in export products, for which price increases are relatively large. On the other hand, the *total* gains to agricultural employees are more than for any other type of agricultural household. The benefits to this group derive from the increased demand for farm labour from commercial farm households. Because agricultural employees are relatively poor, this impact counteracts the increase in inequality among agricultural producers. Urban households also gain, and their benefits generally increase with income level. For these households, the benefits attributable to increased redistributed profits and wage earnings from the agro-food sector outweigh the costs of food price increases. An exception is the richest quartile, which gains less than the second richest group, and in fact loses when there is full employment (because they end up paying more for goods that use unskilled labour). The tax burden, while assumed to remain constant globally is shared among the household types differently following reform. Higher tax costs fall disproportionately on the third urban quartile. This reflects a relatively flat income tax structure for the richest 50% of urban households and greater cost of living increases for the second richest group.

Figure 1. Distributional effects of global policy reform in Brazil - Equivalent Variation in total Household Welfare (USD million)



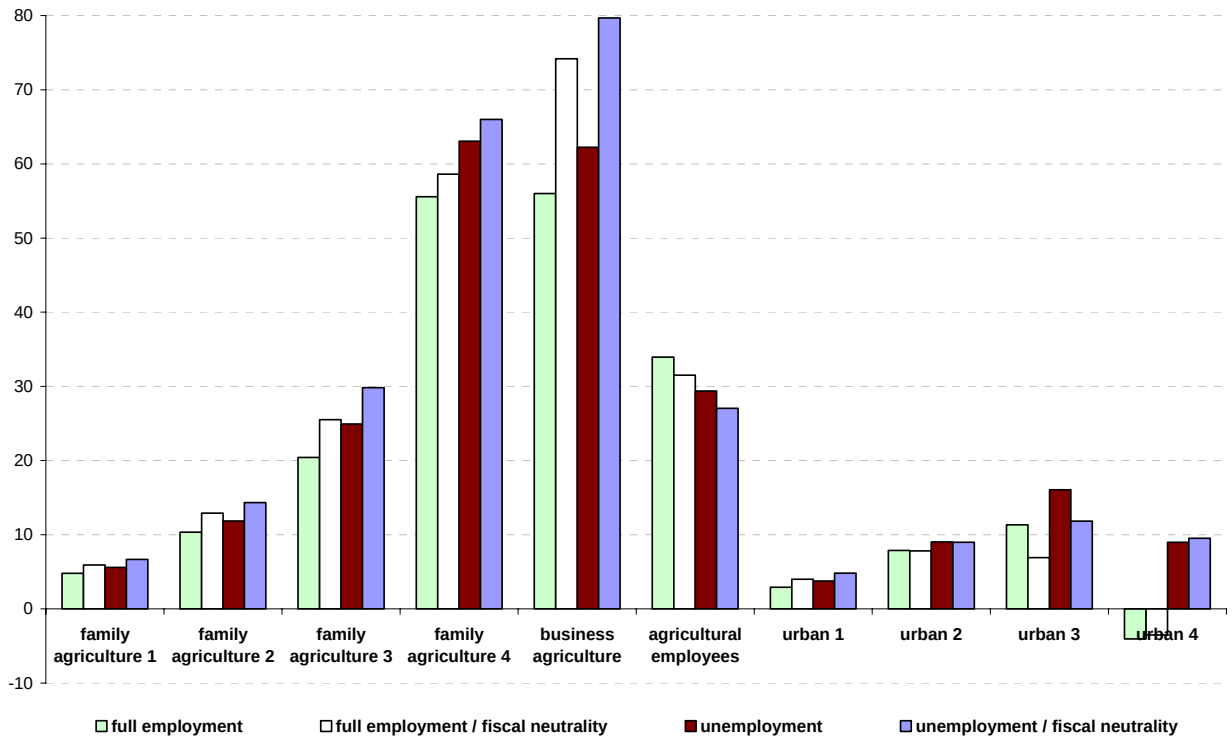
Source: McDonald (2005a).

Given that the above categories contain different numbers of households and persons, further insight can be obtained from the annual changes in welfare per 'person' that are reported in Figure 2. These estimates confirm that, for agricultural households, the welfare gains increase with income, and that the benefits to agricultural households are generally greater than for urban households.[4]

4. The number of members per household tends to decline as income increases. Hence the tendency for richer individuals to gain more than poorer ones (in both rural and urban categories) is more pronounced than the tendency for richer households to benefit more than poorer households.

Figure 2. Distributional effects of global policy reform in Brazil - Equivalent Variation in Welfare per Person

(USD)



Source: McDonald (2005a).

In overall terms, real incomes are expected to rise by between 2% and 4% for agricultural producers, by around 3% for agricultural employees, and by about 1% for urban households. These income gains lead to a modest decline in the incidence of poverty. Because commercial farmers gain more than smallholders, inequality among producers is expected to increase. But the wider gains to agricultural employees and urban households (who account for about 80% of the population) imply that the overall impact on income inequality is likely to be broadly neutral.[5]

China

In China, global reforms provide an average welfare gain of 2.8%, varying between 2.2% in Shaanxi and 4.0% in Hubei province (Table 2). This welfare impact is the sum of

5. For further details on these results the reader is referred to OECD (2005a). In particular, these model results are situated relative to actual changes in household incomes and inequality through the 1990s, an evaluation that underscores the importance of not confusing the specific impacts of trade reform with the more general impacts of structural change.

consumption and income effects. On average, the former is close to zero because of offsetting price changes resulting from GTAPEM. In contrast, the income effects are positive, due to increases in both the revenues from the goods and factors the households sell, and the wages that they earn.

Only 9% of the sample households experience welfare losses. While the share of households gaining increases continuously over consumption levels, poor households gain significantly more in relative terms than non-poor households, with an average welfare increase of 4.6%, compared to 2.6% for non-poor households. This is due almost exclusively to the income effect; the tiny consumption effect tends to increase inequality only slightly.

Table 2. Proportional welfare effects of price changes

	Consumption effect a (%)	Income effect b (%)	Welfare effect =a+b (%)	% of households gaining
Total	0.0	2.8	2.8	91
...by province				
Hebei	0.2	2.7	2.9	93
Hubei	0.1	4.0	4.0	96
Liaoning	0.1	2.4	2.5	89
Shaanxi	0.0	2.2	2.2	90
Sichuan	-0.3	2.7	2.4	87
Zhejiang	0.0	3.3	3.3	89
...by poverty status				
Non-Poor	0.0	2.5	2.6	91
Poor	-0.2	4.8	4.6	89
…by quintile				
1st quintile (poorest)	-0.2	4.6	4.5	89
2nd quintile	-0.1	3.8	3.7	88
3rd quintile	0.1	2.6	2.7	90
4th quintile	0.1	2.3	2.3	90
5th quintile (richest)	0.1	1.4	1.5	95

Source: Survey data and OECD Secretariat's calculations.

The survey data were used to construct a profile of the 9% of households who do not gain from reforms. Compared to households who do gain, these are found to live in communities which on average are smaller (1 160 compared to 1 220 inhabitants); have less arable land (one third less); live further from the nearest paved road (1.4 compared to 1.2 km) and from the nearest town (30 km compared to 25 km); and are less mobile, with fewer emigrants and

immigrant per 1 000 population (19% and 25% less, respectively). This suggests that households in communities poorly endowed with agricultural potential, infrastructure and human capital are more vulnerable to any negative side effects of reforms.[6]

India

The average welfare increase for India is, at 0.84%, much smaller than for China. This is despite GTAPEM results suggesting that the aggregate welfare gains for India are, as a percentage of GDP, slightly greater than for China. The most likely reason is that the Indian analysis focuses on two relatively poor rural states. Two-thirds of sample households gain from reform, implying more losers than in the case of China.

The consumption effect is small, at only a fifth of a per cent of present household incomes. This can be explained by small and mutually offsetting exogenous price changes coming from GTAPEM. Relatively speaking, the largest consumption effects occur in non-food consumption, where prices decline on average. This is partially counteracted by price increases for most food products.

The income effect accounts for two-thirds of the total welfare gain across households. The most important income source is household agricultural production, and includes the balance of costs and revenues for a number of agricultural products. There are many offsetting effects, with rice revenue increasing, but the average revenue across other crops declining. The net income effect for agriculture is a gain of just over 1% of household consumption expenditures. This is partly offset by a negative income effect on own non-farm enterprises, as a result of revenue decreases for both manufactures and services and a slight decline in the wages of unskilled labour in the non-agricultural sector.

These aggregate figures hide considerable geographical and distributional variation. Fewer households in Bihar experience welfare decreases than in Uttar Pradesh, even though the former state is poorer (Table 3).

6. For further analysis of these results, see OECD (2005b).

Table 3. Welfare effects and beneficiaries: differences by state

	Income effect a (%)	Consumption effect b (%)	Welfare effect =a+b (%)	% households who gain
Bihar	0.86	0.33	1.19	76
UP	0.51	0.12	0.62	58
Whole sample	0.64	0.20	0.84	65

Sources: Survey data, GTAPEM output and author's calculations.

The two states have similar income structures, as disaggregated by the six income categories. The difference in income effects must therefore be due to within-category differences, with the two states employing different types of unskilled labour and having different agricultural production structures. Similarly, the differences in consumption effects cannot be attributed to a simple difference in the relative importance of food and non-food expenditures. Households in Bihar consume significantly more rice and less wheat - which shields them more from the comparatively large increase in the consumption price of wheat. Similarly, a higher demand for meat enhances the welfare benefits of a large decrease in meat prices. These results underline the importance of having detailed information on consumption and income structures.

From a policy perspective, such heterogeneity implies that using simple disaggregations such as large income categories or the food share in total consumption may yield misleading results. Detailed information on consumption bundles and income structures is needed to develop more robust and nuanced predictions of the welfare impacts of price reforms.

The results are broken down by per capita consumption quintile in Table 4. The bottom two quintiles correspond approximately to those households falling below the official poverty line. The simulated price reforms are on balance pro-poor, but they raise inequality. The reason for this is that poor households have negative consumption effects, while there are only small differences in income effects between quintiles, with no evident bias towards either poorer or richer households.

Table 4. Welfare effects by quintile

Pc consumption Quintile	Pc consumption level (INR)	Income Effect a (%)	Consumption effect b (%)	Welfare Effect =a+b (%)	Households Gaining from reform (%)
Poorest	1 900	0.66	-0.30	0.36	47
2	2 666	0.75	0.01	0.76	64
3	3 444	0.59	0.16	0.75	69
4	4 591	0.70	0.44	1.14	73
Richest	7 569	0.54	0.58	1.12	71
Whole sample	4 197	0.64	0.20	0.84	65

Source: Bezemer (2005).

The negative consumption effect on poor households reflects their different consumption basket. In particular, poor households spent close to a fifth of their income on staples (rice and wheat), which have large price increases. This contrasts with a budget share of one-tenth for the richest quintile. An implication of this finding is that while non-agricultural policy reforms are the most important source of aggregate benefits for India, agricultural reforms are the biggest determinant of poverty and distributional outcomes. Given that the results are based on a sample survey of households from two of India's poorest states, they can be seen tentatively as illustrative of a worst case scenario of the distributional impacts of global reforms.

Malawi

The vast majority of Malawian households are poor. Commercial producers of the dominant cash crop, tobacco, who are less poor, gain from higher prices. GTAPEM suggests price increases of less than 5% for the principal cash crop (tobacco) from a 50% global reform scenario, which will raise tobacco farmers' incomes by less than 1%. The resulting increase in tobacco farmers' demand for labour benefits poor non-commercial households who cannot grow tobacco, but lowers the incomes of poor farm households that hire in labour. The simulations suggest it is actually the poorest households (farm wage-earners) who gain most from tobacco price increases. In contrast, the domestic price of maize, the main staple, may be only weakly linked to international market prices. Moreover, the effects of maize price increases/decreases are very context specific, depending on the range over which price increases occur, whether the household has a net surplus or deficit, and the relationship between maize prices, wages and fertiliser prices.

The effects of policy reforms in Malawi depend fundamentally on the extent of interactions that are considered, and the original values for which the model is calibrated. Under the simplest farm household model (with no outside market interactions), all households lose from increases in maize prices from a very low base where all households are net buyers of maize. At higher prices, however, some households gain and some lose from price increases, depending on whether they are, or have the scope to become, net sellers. Poorer households lose because cash and land constraints prevent them moving to a profitable net surplus. In this case, higher maize prices can actually induce a perverse supply response. This occurs because an increase in the maize price raises the cost of food expenditures, which tightens the cash constraint, reducing households' ability to buy inputs with which to grow maize, and, for the poorest households, requiring them to allocate labour from maize production to wage employment which delivers immediate (if lower) income. Similarly, increases in wages can cause these households to supply less labour to the market. In the case of tobacco, the benefits of higher prices accrue to larger smallholder farms, owners of more assets, borrowers, non-agricultural wage earners and remittance earners. The poorest households do not benefit, as they do not grow the crop due to lack of cash to buy inputs.

But even a relatively limited extension to the basic household model to accommodate wage changes can fundamentally alter (and in some cases reverse) estimates of how the poor will be affected by policy reform. In response to small increases in maize prices, wages fall, but with larger maize price increases wages rise, with the extent of the response depending on changes in on-farm labour use, total labour supply, and the demand for non-tradable goods and services (and hence for non-farm labour used in their production). Very low maize prices lead to larger areas under tobacco which requires more farm labour than maize. As maize prices rise, real incomes fall (increasing total labour supply, and decreasing demand for non-tradable goods and services), and farm labour is also released by the transfer of land from tobacco to maize. Larger maize price rises lead to less poor households finding it worthwhile to become surplus maize producers, so their incomes begin to rise again (reducing their family labour supply and increasing demand for labour to produce non-tradables). They also begin to adopt more intensive maize technologies, which demand more on-farm labour. This tightening of the labour market leads to increased wages, which may offset some of the losses to the poorest households which lose from higher maize prices.

The introduction of inter-sectoral and international linkages, together with dynamics, further complicates the results. For example, higher international maize prices can stimulate technological change and drive up productivity, which then serves to drive down domestic prices. Higher international tobacco prices also induce competing effects on maize prices. On the one hand, higher tobacco earnings lead farmers to switch crops, the reduction in maize supply tending to raise prices. On the other hand, higher tobacco prices improve the balance of payments, strengthen the currency and effectively lower the prices of imported maize.

Mexico

Feeding in results from the GTAPEM reform scenario, estimated real incomes of all agricultural households fall, but the declines are greatest for producers with more than 5 ha of land (-0.4%). There are similar, but much smaller impacts for landless households and smaller producers with less than 5 ha (-0.1%). There are two principal reasons why larger farmers lose more: first, they tend to consume a smaller share of their own output, so declining output prices have a bigger impact on net cash income; second, larger scale producers on balance rent land out to smaller farmers and lose out from declining land rents. The results are summarised in Table 5. These average impacts for Mexico mask regional differences that are potentially important in the case of smaller, non-commercial farm households.

Table 5. Percentage effects of price shocks resulting from multilateral trade reform

Variable	Landless households	Households <2 ha	Households 2-5 ha	Households >5ha
Production				
Maize	0.15	0.20	0.24	1.22
Cash crops	-1.14	-0.28	-0.28	-0.30
Livestock	-0.14	0.01	-0.13	-0.14
Nonag	0.63	0.48	0.13	0.44
Factors				
Wages, urban	***-0.20***			
Wages, rural	-0.26			
Land rents	-1.01			
Prices				
Maize	-0.60	-0.57	-0.52	-0.40
Cash crops	***-0.80***	***-0.80***	***-0.80***	***-0.80***
Livestock	***-0.70***	***-0.70***	***-0.70***	***-0.70***
Incomes				
Nominal	-0.16	-0.24	-0.22	-0.33
Real	-0.13	-0.15	-0.13	-0.40
Migration				
Domestic	0.002			
International	0.03			

Exogenous changes, taken from GTAPEM simulations, are in bold.

Source: Taylor and Yunez (2005).

A series of stylised experiments were performed for each regional to consider these effects. These experiments show, for example, that commercial farm households lose most from lower prices for both maize and cash crops, while the impacts on smaller farm households (less than five hectares) differ significantly from one region to the next.[7] In the North-West, a 10% decrease in the maize price lowers maize production by all household types, with the result that the real incomes of small farm households, after offsetting wage and land rent reductions, fall by up to 2%. In Central Mexico, on the other hand, a lack of integration with commercial maize markets means that small farmers do not suffer from these price reductions; but they still pay less in land rents, with the result that their incomes rise fractionally. In the

7. In the case study, a 10% *increase* in prices is simulated, so the results are the inverse of those reported here. However, since simulated policy effects can safely be assumed to be symmetrical, the presentation of results here was turned around to maintain consistency with the way findings are reported for the other studies.

case of a 10% cash crop price decrease, production falls moderately across all household groups in Central Mexico, lowering commercial farm households' income by 4%, but small farm households' income by less than half as much, due to lower land rents. On the other hand, the same price change causes commercial production to fall in the North-East, with the result that commercial farm households' incomes drop by nearly 5%, while smaller farm households see few, if any, losses.

South Africa

The aggregate results for South Africa indicate that the country's own policy reforms have the biggest impact on welfare and income distribution. These conclusions are robust to alternative closure rules for the model, i.e. whether there is unemployed unskilled labour and whether income taxes offset lost tariff revenues from reduced tariffs. Global reforms are expected to result in a generalised expansion of economic activity with incomes rising across all household groups. There is a small shift in the allocation of resources towards minerals, manufacturing and service activities, which are more heavily concentrated in the inland provinces of South Africa, whereas the modest expansion in food and agricultural activities is primarily a consequence of the general economic expansion.[8] The key reason why domestic policy reforms have the biggest impact is that these reforms contribute to appreciable reductions in intermediate input costs and thereby increase the competitiveness of South Africa production.

These economic reallocations result in a redistribution of welfare between both racial groups and provinces. Coastal provinces (Western and Eastern Cape and KwaZulu Natal) experience small welfare losses (about 0.5%) under all closure combinations, while inland provinces, notably North West and Mpumlanga, show relatively strong gains – over 2% – under all closure combinations (Figure 3).[9] Relatedly, White households lose slightly (about 0.6%), while African households gain, and there are only marginal impacts on Coloured and Asian households. The imposition of fiscal neutrality increases the welfare losses for White households (Figure 4). The implication of these changes is that reform has a slightly progressive impact on the distribution of income.

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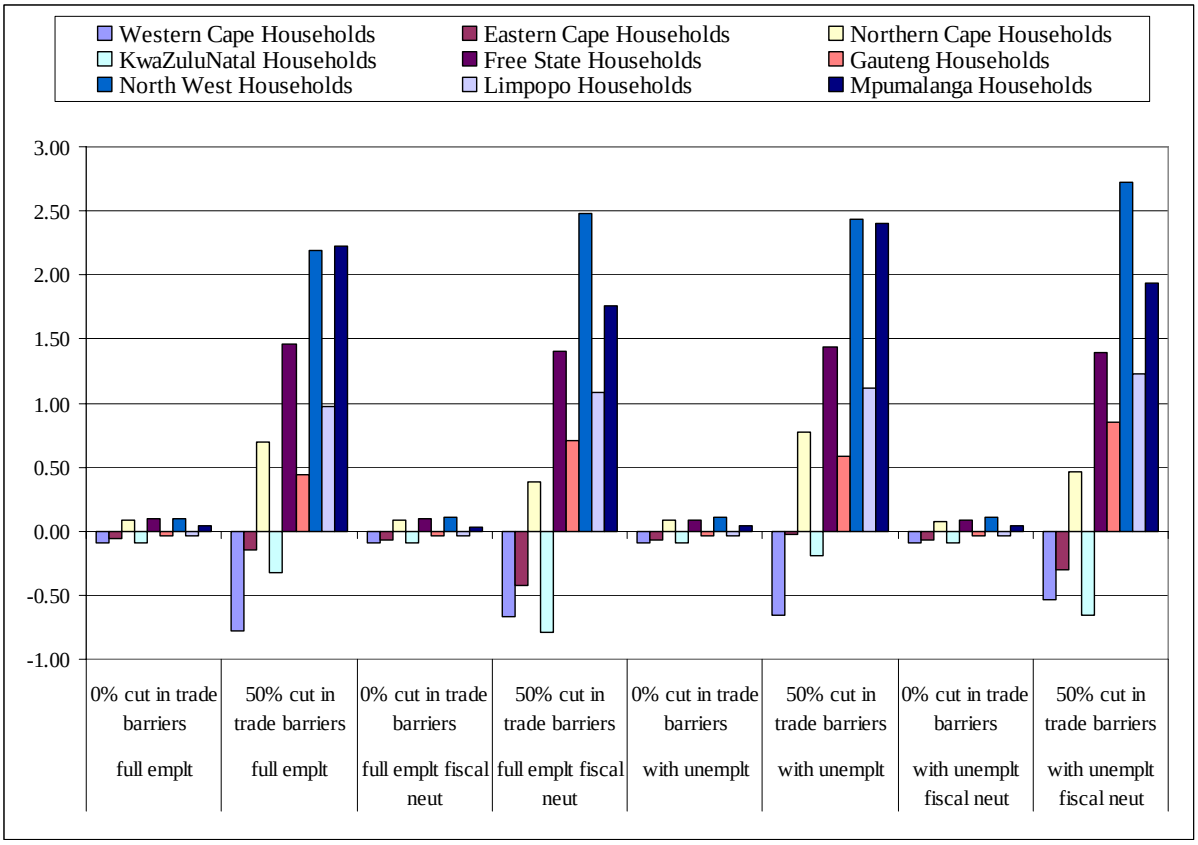
8. The inland provinces are Gauteng, North West, Limpopo, Mpumalanga and Free State.

9. Figures 3 and 4 show the effects of reform across households, according whether or not South Africa itself participates in reform, under different closure combinations.

Figure 3. Equivalent variation in household welfare by province (% change) – based on consumption

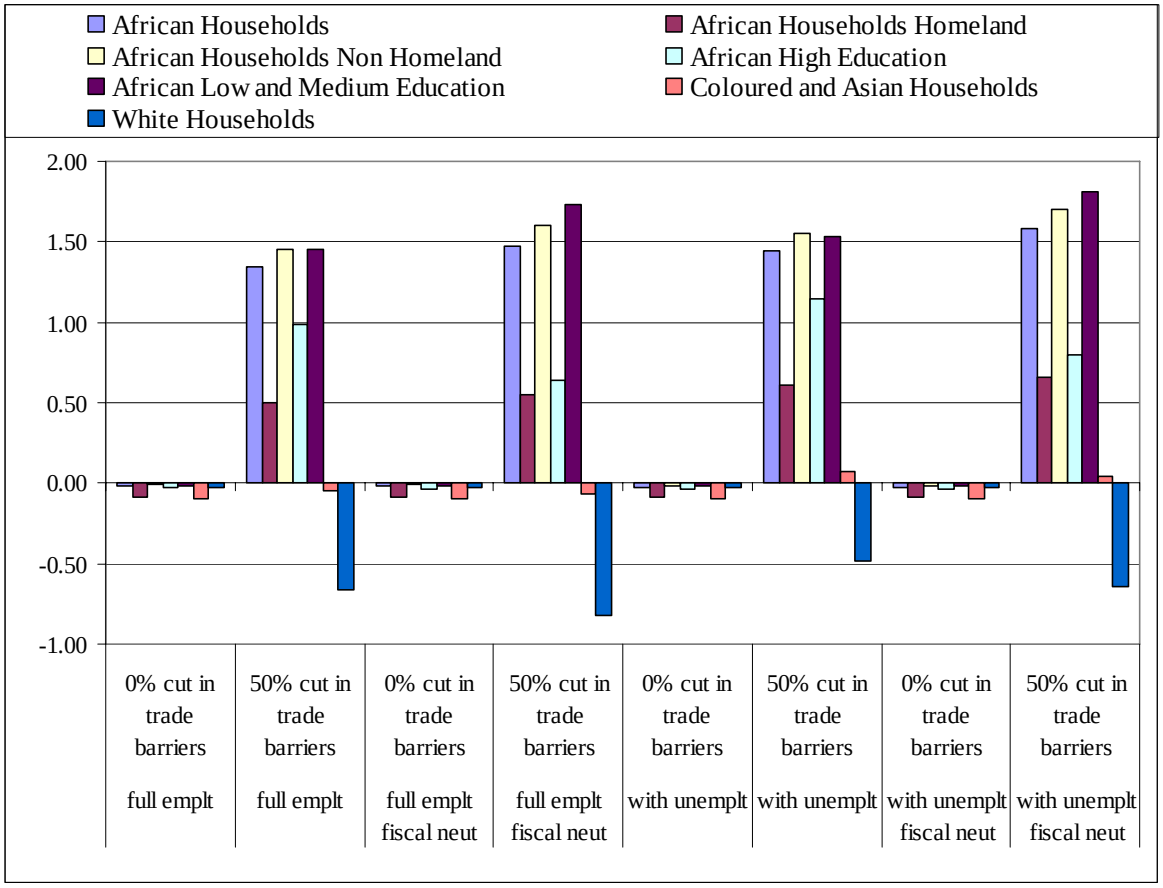


Source: McDonald (2005b).

The welfare implications of reform also differ with respect to other factors, such as residential area and education (Figure 4). This is consistent with the fact that household level impacts depend at least as much on changes in production structures, factor prices and incomes as they do on the prices of consumption commodities. It is notable that poorer less educated African households living in the homelands do relatively well, largely through increased demand for unskilled wage labour. Although the detailed results vary appreciably within the averages for province and racial aggregates, they do reveal that if a household is a member of racial and province groups that both do well then that household tends to gain substantially; if a household is a member of racial and province groups that both do poorly then that household tends to lose significantly; and if a household is a member of racial and province groups only one of which does well then the benefits reflect a combination of the two effects. Hence one

consequence in South Africa of trade policy reforms will be an increase in the incentives for (internal) labour migration.[10]

Figure 4 Equivalent variation in household welfare by race (% change) – based on consumption



Source: McDonald (2005b).

5. Summary and conclusions

The distributional effects of global reforms are invariably larger than the aggregate efficiency gains, at least over the short to medium term. The reason is intuitive: policy reform is effectively a reversal of interventions which redistribute money from one group to another and, by distorting the allocation of resources, entail an efficiency loss which is smaller than the size of the policy transfer.

However, the effects are still small, at no more than a few percentage points of current welfare, even for those households most affected by reform. This result is consistent with the

10. For further details, see OECD (2006b).

findings of the Hertel and Winters project, and not surprising given that (a) a large share of world non-agricultural trade is already relatively liberalised, and (b) that trade accounts for a minor share of economic activity in each country, with all six countries having significant portions of society who operate on a semi-subsistence basis (Hertel and Winters, 2005b).

In most cases, given aggregate welfare gains, the majority of households are expected to benefit (rural Mexico being the exception). But there are few clear patterns in terms of poverty or distributional impacts. In the three studies where the focus is on rural areas rather than the whole economy (China, India and Mexico) some poor households gain and some lose. Hence, it is impossible to reform, and equally to *not* reform, without imposing a cost on some of the poor. In the economy-wide studies (Brazil, Malawi and South Africa) there is a similar complexity of non-rural impacts. In some cases, such as Brazil, economy-wide impacts may fully offset the direct incidence of reforms.

At the level of agricultural policy reform, one obvious generalisation is that the biggest immediate impacts tend to be on commercial producers. When domestic protection is low and prices received rise as a result of other countries' reforms, commercial farm households gain the most. Similarly they lose most when confronted with the loss of domestic protection. This result holds in both absolute terms and relative to other types of household.

The reasons that this result holds in relative, not just absolute, terms are threefold. In the first place non-commercial farm households tend to have more diversified income sources, with a greater share of income coming from non-farm activities. This tends to limit the impact of sector-specific reforms. Second, non-commercial farm households (notably subsistence households in developing countries) tend to have significant self-consumption of farm products, which dampens or even reverses the benefits of price increases. Indeed, many poor farm households in developing countries are net consumers of commodities they produce, which means they are likely to lose from higher prices. Third, non-commercial households are likely to incur higher transaction costs than their commercial counterparts. This can further dampen the beneficial effects of price increases, and can lead to factor market impacts (such as higher land rents) dominating. In many cases, therefore, it appears that reforms that benefit commercial producers are likely to have mixed effects *within* the overall category of non-commercial farm households.

The distributional effects of reform among agricultural wage earners and consumers are often important in developing countries, given relatively large numbers of agricultural labourers and the fact that the poorest households often spend a large share of their incomes on food (40% or more). The impacts of reform on agricultural employees depend fundamentally on the hiring decisions of commercial farm households. In many cases, farm workers are relatively poor, even compared with non-commercial households. A rise in wages, or expansion in employment, thus mitigates the rise in inequality from commercial farm households becoming richer. Moreover, wage increases may also benefit semi-subsistence households to the extent that they obtain income from off-farm work.

In developing countries, food price changes can have large impacts on the real incomes of consumers. That said, consumers are less specialised in their consumption patterns than producers are specialised in their income sources, and can switch more quickly to cheaper foodstuffs than producers can adjust their supplies. Hence the effects of any particular price increase will be less acute. In the case of Brazil, the agro-food industry is sufficiently important that the losses to urban households from higher food prices are on balance outweighed by higher redistributed profits and labour income originating from increased agro-food exports. In this study, therefore, the income gains are spread across all groups, and while inequality among agricultural producers increases, poverty declines and there is little economy-wide impact on inequality.

An important finding from the six studies is that the methodological approach determines the insights that are available. In the CGE studies (Brazil and South Africa) macro factors are critical in determining distributional impacts. Yet these factors are only partially accounted for in the other four studies. On the other hand, the farm household model based approach (adopted for Malawi and Mexico) shows how market failures can lead to a number of unexpected effects that are not anticipated in CGE or micro-simulation analyses. Thus, in the Malawi study, farm households that are net buyers of food may lose from a small price increase, but gain from a larger one that enables them to become net sellers. In the case of Mexico, poor farm households in some regions benefit from higher maize prices, but similar households in other regions lose as they are less integrated with output markets, yet pay higher land rents as the expansion in commercial output increases the demand for land. The chief limitation of micro-simulation, the third type of analysis (undertaken for China and India), is that behavioural responses are determined within GTAPEM and applied, in the same

manner, to all households. Yet these two studies calculate welfare changes for every surveyed household, and pick up subtleties that are overlooked in the other studies' use of representative groups. For example, it is likely that some farm households in Brazil will lose from reform, even though each of the five groups gains on average. The implication is that the results of any model need to be treated with caution.

The results of the models are comparative static, i.e. they show the effect of reforms once households and markets have had time to adjust. In excluding dynamics, such as investment and productivity linkages, and household movement between sectors, they ignore factors that are ultimately likely to govern the long-term impacts of reform on poor households. In this respect, it is interesting to note that the micro-simulation analyses (for China and India) and the farm household approaches (for Malawi and Mexico) both reveal how poorer households (in particular farmers) can have the greatest difficulty in adjusting. In other words, if poor households are adversely affected by reform, they will find it more difficult to do anything about it over the longer term. This result also supports a conclusion of Hertel and Winters – that complementary domestic policy reforms are needed in order for developing countries to reap the maximum benefit from global trade reforms.

Given that it is impossible to fine tune trade reforms such that no households lose, a useful focus for Doha discussions would appear to be on facilitating adjustment where possible, and providing effective safety nets for poor households who cannot, or will take time, to adjust. This has more potential than exemptions from trade commitments and delayed implementation of reforms, both of which may increase poverty rather than reduce it. Applications such as these case studies can be helpful in identifying the pressure points of reform, the varying capacities of households for adjustment, and the need or otherwise for supporting policy measures. They also provide valuable information on the effects of changes in the policy mix. For example, if agricultural protection is to be significantly reduced, the adjustment stresses to farm households may be reduced significantly by ensuring that non-agricultural reforms proceed concurrently. More hopefully, if the distributional impacts of reform are made clear to all interests; it may be easier to build political support for those reforms.

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