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Food Security in Brazil

- a study of trade liberalisation in relation to the food security situation in Brazil

Pia Nordström

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Livsmedelssäkerheten i Brasilien
*- en studie av handelsliberaliseringens effekter i förhållande till
 livsmedelssäkerheten i Brasilien*

Pia Nordström

Supervisor: Yves Surry

Acknowledgements

Abstract

The analysis of the experiences of Brazil's rural poor over the period of trade liberalisation reveals a complex picture. The impacts of trade liberalisation on the poor seem not to come only from the reduced tariff barriers, but rather from other policies that have accompanied trade liberalisation. In the liberalisation process there may be some groups of individuals that are likely to be disadvantaged, and additional complementary policies will sometimes be needed to enhance the impact from trade, including on poverty. Trade policy will have implications for food security through the link with incomes and expenditures. Any change in the trade regime will have a direct effect on both rural and urban incomes, and employment, and through these on income distribution. The situation of food insecurity and poverty affects about 44 million people in Brazil. The purpose of this study is to examine how the food security situation for the poor households will be affected by a recent proposal of tariff reductions for market access in the WTO negotiations of the Doha round. The study will also consider how the food security situation for the poor households respond to the Zero Hunger Program, which is a social assistance program and includes a combination of structural policies to tackle the underlying causes of poverty. The modelling approach used in the study is a disaggregated Brazilian social accounting matrix. Several household types are taken into consideration so that welfare implications on different income groups of different policy scenarios can be analysed. The analyses include three different scenarios, and the result of the simulations implies that the poor households will benefit and improve their possibilities for a better food security situation. The member states of the United Nations adopted in 2000 the Millennium Declaration as a renewed commitment to human development. The declaration includes eight Development Goals, each with quantified targets to be reach by each member states in 2015. Brazil's Zero Hunger Program is one step towards these Millennium Development Goals.

Sammanfattning

Perioden under handelsliberaliseringen uppvisar en komplex bild för den fattiga landsbygds-befolkningen i Brasilien och livsmedelsosäkerhet och fattigdom berör omkring 44 miljoner människor. Förändringar i handelsregimen leder till en direkt effekt på både inkomster och sysselsättning och genom dessa även på distributionen av inkomster. Handelspolitiken påverkar livsmedelssäkerheten genom sambandet mellan inkomster och utgifter. De mest betydande förändringarna genom liberaliseringen verkar inte enbart komma från de reducerade tullmurarna, utan snarare från andra politiska förändringar som åtföljt handels-liberaliseringen. Under liberaliseringsprocessen kan det eventuellt vara några grupper av individer som sannolikt kommer att behandlas ofördelaktigt och ytterligare kompletterande politik och handlingsprogram kan ibland behövas för att stärka den effekt av handeln som kan leda till en minskad fattigdom. Syftet med studien är att undersöka hur livsmedelssäkerheten för de fattiga hushållen kommer att påverkas av ett nyligen lagt förslag om tullsänkningar för marknadstillträde i förhandlingarna inom WTO:s Doharunda. Studien tar också hänsyn till hur livsmedelssäkerheten för de fattiga hushållen påverkats av Zero Hunger programmet, som inkluderar en kombination av strukturell politik för att ta itu med bakomliggande orsaker till fattigdom. En detaljerad social räkenskapsmatris (SAM-matris) har använts vid analysen av studien. SAM-matrisen tar hänsyn till flera olika hushållstyper, så att välfärdsförändringar inom olika inkomstgrupper genom olika politiska scenarier kan analyseras. Analysen inkluderar tre olika scenarier och resultatet av simuleringarna antyder att de fattiga hushållen kommer att få en bättre ekonomisk situation, vilket ökar deras möjligheter till en förbättrad livsmedelssäkerhet. Förenta Nationernas medlemsstater antog 2000 en millenniedeklaration, som ett initiativ till en förnyad förbindelse för mänsklig utveckling. Deklarationen inkluderar åtta kvantifierade utvecklingsmål, som medlemsstaterna arbetar för att uppnå till 2015. Brasiliens Zero Hunger program är ett steg närmare dessa mål i millenniedeklarationen.

Acronyms and Abbreviatons

BFP	Bolsa Família Program
BNDES	Brazilian National Development Bank
CCT	Conditional Cash Transfers
CGE	Computable General Equilibrium
FAO	Food and Agriculture Organization
FTAA	Free Trade Area of the Americas
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GTAP	Global Trade Analysis Project
IBGE	Instituto Brasileiro de Geografia e Estatística
IDB	Inter-American Development Bank
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
LAC	Latin America and the Caribbean
MDG	Millennium Development Goals
MESA	Special Ministry of Food Security and Combating Hunger
SAM	Social Accounting Matrix
SAP	Structural Adjustment Program
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
USBIG	U.S. Basic Income Guarantee Network
WDI	World Development Indicators
WTO	World Trade Organization
ZH	Zero Hunger

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1 Introduction

"Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"[1]

In Brazil there is widespread chronic food insecurity, and poverty affects more than a quarter of the population – about 44 million people. This study will consider the food security situation in relation to trade liberalisation. Trade policy will have implications for food security through the link with incomes and expenditures. Any change in the trade regime will have a direct effect on both rural and urban incomes, and employment, and through these on income distribution. A Zero Hunger Program was launched in 2003, and the study will also examine how the food security situation for the poor rural and urban households responds to the implementation of this social assistance program. This program includes a combination of structural policies to tackle the underlying causes of poverty – such as job and income creation, universal social security, and land reform – as well as a set of emergence policies aimed at ensuring immediate access to food for the population at greatest risk, by reducing food prices and promoting self-sufficiency and subsistence production.

In 2000 the member states of the United Nations adopted the Millennium Declaration as a renewed commitment to human development. The declaration includes eight Millennium Development Goals, each with quantified targets, to motivate the international community and provide an accountability mechanism for actions taken to enable millions of poor people to improve their livelihoods. Brazil is working for the implementation of this declaration, and the linkage with agriculture is particularly strong for the first goal – and that is to halving by 2015 the proportion of those suffering from extreme poverty and hunger.

1.1 Problem background

Brazil, with a population of 186 million people is the largest and most densely inhabited country in South America. The poorest Brazilians live in rural areas, working in and around agriculture, with an income lower than US$1 a day. This situation of food insecurity is the reason why people are unable to gain access to enough food of an adequate quality for a healthy life.[2] To raise incomes and increase food security, Brazil's President Lula da Silva has committed to redistributing land to hundreds of thousands of families. According to the government, new policies will also provide incentives for family agriculture, making credit and technical support available and tailoring agricultural research to the needs of small production.[3]

There are findings that may suggest that trade liberalisation has led to divergent results for large versus small agricultural producers. Larger farms have generally benefited from the liberalisation. For small farmers diminishing credit and marketing support have limited their possibility to secure and increase their income.[4] The World Bank statistics show that food prices went out of control with hyperinflation in the early 1990s, and then dropped with the currency stabilization of 1994, but prices have grown steadily from 1994 to 2001. According to a study for the FAO, food consumption fluctuated during the 1990s, and consumption of all

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[1] Rome Declaration on World Food Security (1996).
[2] Food and Agriculture Organization (2003).
[3] Food First/Institute for Food and Development Policy (2003).
[4] Food First/Institute for Food and Development Policy (2003).

staple food items fell for the poor during the transitional period 1987-1996.[5] Reduced domestic production of foodstuffs increases in higher-priced imports, and increases in overall food prices have combined to endanger food security for Brazil's poorest people from the early 1980s and to the present.

Despite a feeble attempt at land reform during the 1990s, land tenure has not become more equitable over the last two decades. In large part, the continuing poor distribution of land is due to liberalisation policies that favour large-scale, technologically advanced, export-oriented agriculture rather than small farmers growing for local markets. The Brazilian government support for its soybean sector has increased from US$393 million in 1980 to US$2.7 billion in 2001. The benefits of this sort of state intervention on behalf of the industry have concentrated the benefits in the hands of large-scale operators, and this resulted in the displacement of smaller farmers. In addition, soybean production is capital-intensive, and thereby it requires very little labour. Contrary to the aims of the government, the expansion of soybean production has actually diminished food security.[6]

1.2 Problem

The liberalisation process

The liberalisation process began with the first structural adjustment programs. As a result of the debt crisis at the outset of the 1980s, Brazil signed its first structural adjustment deal with the International Monetary Fund in 1982. In the agricultural sector, the result was that rural credit, producer price supports, and marketing services virtually disappeared after 1987. In addition, with the removal of regulations on prices, the cost of land soared, making it even more difficult for the poor to acquire and retain land.[7] From 1980-1991 real producer prices for both domestic crops and exports were cut in half.

Prices have continued to drop in the 1990s. Structural aspects of Brazil's development model, such as income concentration, low wages, high unemployment rates and stagnant economic growth are ultimately the root causes of food insecurity in the country.[8] The reforms of the 1990s failed to improve the lot of Brazil's poor. Small farmers were hardest hit by the changes, unable to withstand the price fluctuations that came with trade liberalisation and the elimination of price controls.

Demarcation of the study

This study will consider how the food security situation in Brazil has been affected by the impacts of trade liberalisation and trade policy. Due to limited time to resolve the problem, the main focus will be on the food security situation for the poor rural and urban households in the economy. The study will also examine the progressivity of the Zero Hunger Program in Brazil, which is a social assistance program that aims to reduce poverty and inequality, and to improve the food security situation.

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[5] FAO, Trade and Food Security (2002).
[6] Food First/Institute for Food and Development Policy (2003).
[7] Food First/Institute for Food and Development Policy (2003).
[8] Brazilian Embassy in Washington (2004).

Trade liberalisation and economic growth

By joining the WTO in 1995, Brazil agreed to extend market integration from a regional to a global level. Trade liberalisation increased Brazil's international trade. But it also increased Brazilian farmers exposure to the fluctuations of international prices.[9] While any trade agreement that changes the balance between liberalisation and protection for a good or service in an economy can affect levels of food security, agriculture related reform is especially relevant both via its direct contribution to the availability of food, and indirectly as a key engine of economic development and hence improved access to food.[10] There are arguments that openness to trade contributes to economic growth and that this can, in turn, be beneficial for poverty reduction and food security, are well grounded in conventional economic theory.

Whilst theory may suggest that the liberalisation of trade policies will result in net benefits to the liberalising country, the benefits of liberalisation may not necessarily be achieved, and some groups of individuals within some countries are likely to be disadvantaged. In particular, there are likely to be significant differences between the impacts on small scale and commercial farmers, rural non-farm producers and urban consumers both within and across countries.[11] In a concise paper, Winters argues that although he believes that trade liberalisation aids economic growth, it "may have some adverse consequences for some – including some poor people – that should be avoided or ameliorated to the greatest extent possible". He suggests that rather than using this as a reason for resisting reform, it should "stimulate the search for complementary policies to minimize adverse consequences and reduce the hurt that they cause".[12]

Social assistance program

The Brazilian government has announced its commitment to decentralisation, education, community empowerment and participation, and conditional cash transfer programs for the poor. Complementing this is the effort to promote quality growth, competitiveness and employment.[13] The Zero Hunger Program includes a combination of structural policies to tackle the underlying causes of poverty – such as job and income creation, universal social security, and land reform – as well as a set of emergency policies aimed at ensuring immediate access to food for the population at greatest risk.[14] The World Bank and the Food and Agriculture Organization has approved loan to support the Zero Hunger Program. The United Nations agency will provide technical support for this social assistance program.[15]

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[9] Food First/Institute for Food and Development Policy (2003).
[10] FAO, Trade and Food Security (2002).
[11] FAO, Trade and Food Security (2002).
[12] Winters (2001).
[13] The World Bank (2003).
[14] Brazilian Embassy in Washington (2004).
[15] FAO, "Brazil receives US$1 million for Zero Hunger Project from FAO" (2003).

1.3 Aim

The purpose of this study is to examine *how the food security situation in Brazil can be affected by trade liberalisation and trade policy. The main focus will be on the food security situation for the poor rural and urban households in the economy.* The study will also consider the Zero Hunger Program, and how the combination of structural policies tries to eradicate the underlying causes of poverty.

To fulfil the purpose of this study the following questions will be discussed:

- *What* impacts will trade liberalisation have on the food security situation for the poor rural and urban households?
- *How* does the food security situation for the poor households respond to the implementation of the Zero Hunger Program?

1.4 Structure of the study

The first chapter gives an introduction of the study. In the second chapter of this paper the method is presented. Further, in the third chapter, the theoretical framework is explained. Subsequently the conceptual approaches to food security and trade follow in the fourth chapter.

The fifth chapter contains the background for the empirical study, which is used together with the structure and framework in the analyses in the sixth chapter. Finally the results of the study are presented in the seventh chapter, which is then followed by the conclusions and discussion in the eighth chapter. The structure of the study is also presented in figure 1.
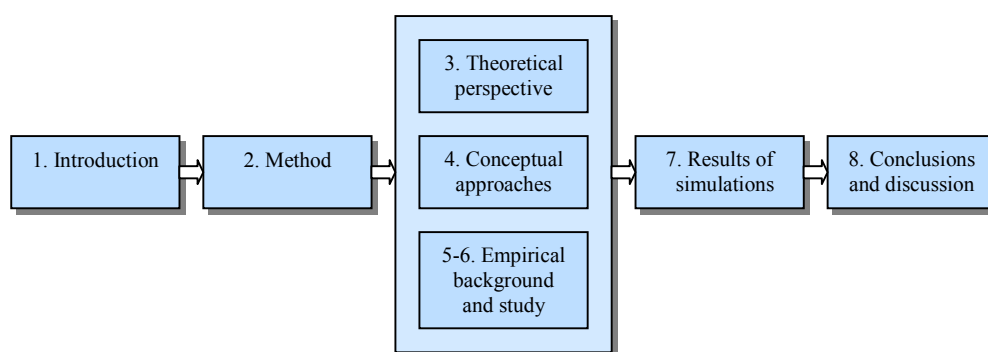

Figure 1. The structure of the study.

2 Method

In the standard approach to computable general equilibrium (CGE) models one first distinguishes between different agents, such as producers, consumers, and government, and then between goods and factors and the associated markets through which agents interact. The behavioural assumptions of agents are rooted in conventional microeconomic theory: producers maximize profits subject to certain technological constraints while consumers maximize utility subject to budget constraints, all within the framework of competitive markets. A set of prices and levels of production such that the market demand equals supply for all commodities characterize equilibrium in this type of model. Factors are either fully utilized with flexible market-clearing wages or rent, or alternatively, the wage of a factor has a lower bound below which there is excess supply of that factor.

Factor incomes generated by production activities are divided among households in factor-specific shares representing factor ownership. Total household income is used to pay taxes, save, and consume. Government revenue comes from the collection of ad valorem direct taxes and indirect taxes. Government transfers income to households, and expenditure is a fixed share of total absorption. The rest of the world supplies imports and demands export goods.

The macro system constraints determine the manner in which the accounts for the government, the rest of the world, and savings and investment are brought into balance. On the spending side of the savings-investment balance, nominal aggregate investment is either a fixed share of total absorption, or it adjusts according to the households' savings rate. On the savings side, if investment is fixed, the average household saving rate adjusts to achieve the level of savings that matches the exogenously specified level of investment. In the government account, total nominal government expenditure is a fixed share of total absorption, and government saving is endogenously determined by the model. Foreign savings is exogenous and the exchange rate adjusts the current account balance. Central to the database, and commonly used in CGE modelling, is the development of a social accounting matrix.[16]

2.1 The Social Accounting Matrix

A social accounting matrix (SAM) represents flows of payments between the various actors in the economy. It integrates sectoral, institutional, and national income and product accounts into a unified framework that can be used to analyze the important economic links between factors of production, sectors, and macroeconomic variables.

The structure of a simple SAM is that each cell represents a payment from a column account to a row account. Activities pay for intermediate inputs and factors of production and receive payments for exports and sales to the domestic market. The commodity account buys goods from activities (producers) and the rest of the world (imports) and sells commodities to activities (intermediate inputs) and final demanders (households, government, and investment). In this simple SAM, sectoral specification, interregional flows, tariffs, indirect taxes, and subsidies are left out. The matrix of column coefficients from such a SAM provides raw material for much economic analysis and modelling. The intermediate-input coefficients correspond to Leontief input-output coefficients. Column coefficients provide the starting point for estimating parameters of nonlinear, neoclassical production functions, factor-demand functions, and household expenditure functions.

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[16] Cattaneo, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

The Brazilian SAM used in this study is disaggregated version from 1995. The SAM starts with a large amount of detail on the production side. With agricultural categories, differentiated by small farms or large estate production for each of the four regions adopted in the model, and also the food-processing activities are represented. Several household types are taken into consideration so that welfare implications on different income groups of different policy scenarios can be analysed. In addition to the producers and the households, the other actors in the economy are the government, investors, and foreign demanders or suppliers.[17]

3 A theoretical perspective

Countries engage in international trade for two basic reasons, each of which contributes to their gain from trade. First, countries trade because they are different from each other. Nations can benefit from their differences by reaching an arrangement in which each does the things it does relatively well. Second, countries trade to achieve economies of scale in production. That is, if each country produces only a limited range of goods, it can produce each of these goods at a larger scale and hence more efficiently than if it tried to produce everything.

Several different trade theory models have been proposed to predict patterns of trade and to analyse the effects of trade policies. This chapter will give a theoretical base for explaining the Heckscher-Ohlin Model of international trade. Part 3.1 in this chapter are built upon the trade theory from the book International Economics by Paul Krugman and Maurice Obstfeld (2003).

3.1 The Heckscher-Ohlin Model

The Heckscher-Ohlin model shows that comparative advantage[18] is influenced by the interaction between nations' resources (the relative abundance of factors of production) and the technology of production (which influences the relative intensity with which different factors of production are used in the production of different goods). Because the Heckscher-Ohlin theory emphasizes the interplay between the proportions in which different factors of production are available in different countries and the proportions in which they are used in producing different goods, it is also referred to as the factor-proportions theory.

A country that has a large supply of one resource relative to its supply of other resources is abundant in that resource. A country will tend to produce relatively more of goods that use its abundant resources intensively. The result is the basic Heckscher-Ohlin theory of trade: Countries tend to export goods that are intensive in the factors with which they are abundantly supplied. This model is especially useful as a way to analyze the effects of trade on income distribution.

3.1.1 Assumptions of the Model

For example the economy analysed can produce two goods: cloth (measured in yards) and food (measured in calories). Production of these goods requires two inputs that are in limited supply: labour, which is measured in hours, and land, which is measured in acres. In the model L is defined as the economy's supply of labour, and T is the economy's supply of land.

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[17] Cattaneo, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).
[18] Comparative advantage is the comparison among producers of a good according to their opportunity cost.

In a two-factor economy there may be some room for choice in the use of inputs. A farmer, for example, may be able to grow more food per acre if he or she is willing to use more labour input to prepare the soil, weed, and so on. Thus the farmer may be able to choose to use less land and more labour per unit of output. In each sector, then, producers will face not fixed input requirements, but alternative input combinations that can be used to produce one calorie of food.

What input to choose depends on the relative cost of land and labour. If land rents are high and wages low, farmers will choose to produce using relatively little land and a lot of labour; if rents are low and wages high, they will save on labour and use a lot of land. If w is the wage rate per hour of labour and r the cost of one acre of land, then the input choice will depend on the ratio of these two factor prices, w/r. The relationship between factor prices and the ratio of land to labour use in production of food is illustrated by the curve *FF* in Figure 2.

There is a corresponding relationship between w/r and the land-labour ratio in cloth production. This relationship is shown in Figure 2 as the curve *CC*. As drawn, *CC* lies to the left of *FF* indicating that at any given factor prices production of food will always use a higher ratio of land to labour than production of cloth. When this is the case, you may say that production of food is *land-intensive*, while production of cloth is *labour-intensive*[19].

3.1.2 Factor Prices and Goods Prices

Suppose for a moment that the economy produces both cloth and food. (This need not be the case if the economy engages in international trade, because it might specialize completely in producing one good or the other.) Then competition among producers in each sector will ensure that the price of each good equals its cost of production. The cost of producing a good depends on factor prices: If the rental rate on land is higher, then other things equal the price of any good whose production involves land input will also have to be higher.

The importance of a particular factor price to the cost of producing a good depends on how much of that factor the good's production involves. If cloth production makes use of very little land, then a rise in the price of land will not have much effect on the price of cloth; whereas if food production uses a great deal of land, a rise in land prices will have a large effect on its price. The conclusion will therefore be that because cloth production is labour-intensive while food production is land-intensive, there is a one-to-one relationship between the factor price ratio w/r and the relative price of cloth (P_C/P_F); the higher the relative cost of labour, the higher must be the relative price of the labour-intensive good. The relationship is illustrated by the curve *SS* in Figure 2.

By putting these curves together in a diagram, you may see a linkage of the prices of goods to the ratio of land to labour used in the production of each good. Suppose that the relative price of cloth is $(P_C/P_F)^1$ (left panel of Figure 2); if the economy produces both goods, the ratio of the wage rate to the rental rate on land must equal $(w/r)^1$. This ratio then implies that the ratios of land to labour employed in the production of cloth and food must be $(T_C/L_C)^1$ and $(T_F/L_F)^1$, respectively (right panel). If the relative price of cloth were to rise to the level indicated by $(P_C/P_F)^2$, the ratio of the wage rate to the rental rate on land would rise to $(w/r)^2$. Because land is now relatively cheaper the ratios of land to labour employed in the

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[19] Notice that the definition of intensity depends on the ratio of land to labour used in production, not the ratio of land or labour to output.

production of cloth and food would therefore rise to $(T_C / L_C)^2$ and $(T_F / L_F)^2$. The left panel shows that an increase in the price of cloth relative to that of food will raise the income of workers relative to that of landowners. But such a change in relative prices will raise the purchasing power of workers and lower the purchasing power of landowners, by raising real wages and lowering real rents in terms of both goods.
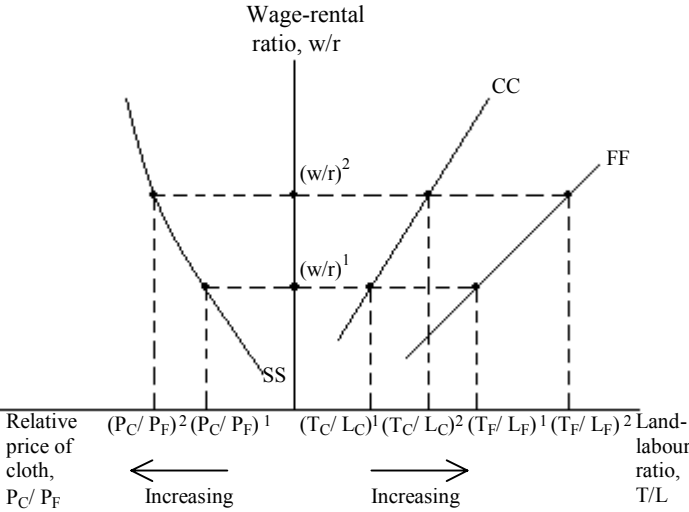

Figure 2. From Goods Prices to Input Choices.
Source: Krugman and Obstfeld (2003).

When (P_C / P_F) increases, the ratio of land to labour rises in both cloth and food production, the marginal product of labour in terms of those good increases – so workers find their real wage higher in terms of both goods. On the other hand, the marginal product of land falls in both industries, so landowners find their real income lower in terms of both goods. In this model changes in relative prices have strong effects on income distribution. Not only does a change in goods prices change the distribution of income; it always changes it so much that owners of one factor of production gain while owners of the other are made worse off.

3.1.3 Resources and Output

Suppose that you take the relative price of cloth as given. Figure 2 show that this determines the wage-rental ratio w / r, and thus the ratio of land to labour used in the production of both cloth and food. But the economy must fully employ its supplies of labour and land. It is this last condition that determines the allocation of resources between the two industries and, therefore, the economy's output.

A convenient way to analyse the allocation of resources in a two-factor economy is to use a "box diagram" like Figure 3. The width of the box represents the economy's total supply of labour; the height of the box its total supply of land. A single point within the box, such as point *1*, can represent the allocation of resources between two industries. The use of labour and land in the cloth sector is measured as the horizontal and vertical distances of such a point from O_C^1; thus at point *1* $O_C^1 L_C^1$ is the labour used in cloth production and $O_C^1 T_C^1$ is the land used in cloth production. When to measure inputs into the food sector one should start from the location of level: $O_F^1 L_F^1$ is the labour, $O_F^1 T_F^1$ the land used in food production. Given the prices of cloth and food and the supplies of land and labour, then, it is possible to determine how much of each resource the economy devotes to the production of each good; and thus

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also to determine the economy's output of each good. Figure 3 shows what happens when the economy's supply of land is increased, holding both goods prices and the labour supply fixed. With the increased supply of land the box is taller. This means that inputs into food production can no longer be measured from O_F^1, but must be measured from the corner of the new, enlarged box, O_F^2, and the original line $O_F^1 F^1$ must be replaced with $O_F^2 F^2$. The resource allocation point must therefore move from *1* to *2*.
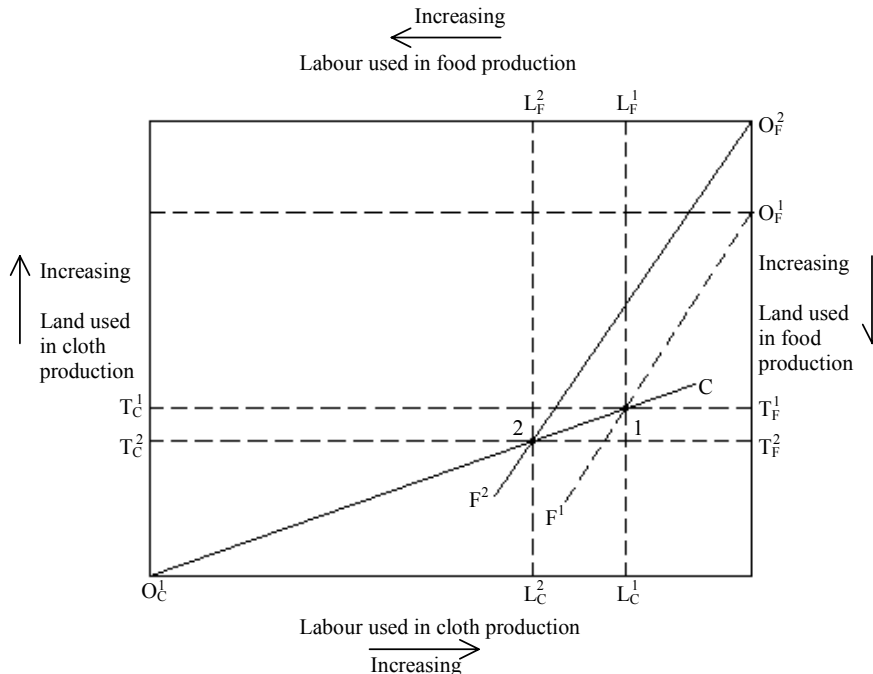

Figure 3. An Increase in the Supply of Land.
Source: Krugman and Obstfeld (2003).

The quantities of labour and land used in cloth production actually *fall*, from L_C^1 and T_C^1 to L_C^2 and T_C^2. Thus an increase in the economy's supply of land will, holding prices constant, lead to a fall in the output of the labour-intensive good. The land and labour that is no longer used in cloth production will now be used in the food sector, whose output must have risen more than proportionately to the increase in land supply.

One way to think about this result is in terms of how resources affect the economy's production possibilities. In Figure 4 the curve TT^1 represents the economy's production possibilities before the increase in land supply. Output is at point *1*, where the slope of the production possibility frontier equals minus the relative price of cloth, $-P_C/P_F$, and the economy produces Q_C^1 and Q_F^1 of cloth and food. The curve TT^2 shows the production possibility frontier after an increase in land supply. The production possibility frontier shifts out to TT^2, that is, the economy could produce more of both cloth and food than before. The outward shift of the frontier is much larger in the direction of food than of clothing, there is a biased expansion of production possibilities, which occurs when the production possibility frontier shifts out much more in one direction than in the other. In this case, the expansion is so strongly biased toward food production that at unchanged relative prices production moves from point *1* to point *2*, which involves an actual fall in cloth output from Q_C^1 to Q_C^2 and a large increase in food output from Q_F^1 to Q_F^2.
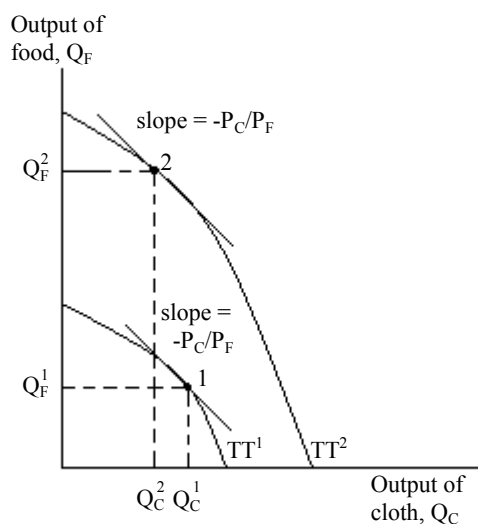
Figure 4. Resources and Production Possibilities.
Source: Krugman and Obstfeld (2003).

The biased effect of increases in resources on production possibilities is the key to understanding how differences in resources give rise to international trade. An increase in the supply of land expands production possibilities disproportionately in the direction of food production, while an increase in the supply of labour expands them disproportionately in the direction of cloth production. Thus an economy with a high ratio of land to labour will be relatively better at producing food than an economy with a low ratio of land to labour. Generally, an economy will tend to be relatively effective at producing goods that are intensive in the factors with which the country is relatively well-endowed.

3.1.4 Relative Prices and the Pattern of Trade

After the description of the production structure of a two-factor economy, follows now the effects of international trade between two-factor economies. Home and Foreign is often similar along many dimensions. They have the same tastes and therefore have identical relative demands for food and cloth when faced with the same relative price of the two goods. They also have the same technology: A given amount of land and labour yields the same output of either cloth or food in the two countries. The only difference between the countries is in their resources: Home has a higher ratio of labour to land than Foreign does.

Since Home has a higher ratio of labour to land than Foreign, Home is labour-abundant and Foreign is land-abundant. Because cloth is the labour-intensive good, Home's production possibility frontier relative to Foreign's is shifted out more in the direction of cloth than in the direction of food. Thus, other things equal, Home tends to produce a higher ratio of cloth to food.

Because trade leads to a convergence of relative prices, one of the other things that will be equal is the price of cloth relative to food. Because the countries differ in their factor abundances, however, for any given ratio of the price of cloth to that of food Home will produce a higher ratio of cloth to food than Foreign will: Home will have a larger relative supply of cloth. Home's relative supply curve, then, lies to the right of Foreign's. The relative supply schedules of Home (RS) and Foreign (RS^*) are illustrated in Figure 5. The relative demand curve, assumed to be the same for both countries, is shown as RD. If there were no

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international trade, the equilibrium for Home would be at point *1*, the equilibrium for Foreign at point *3*. That is, in the absence of trade the relative price of cloth would be lower in Home than in Foreign.

Relative price
of cloth, P_C/P_F

RS*

RS

3

2

1

RD

Relative quantity of cloth,
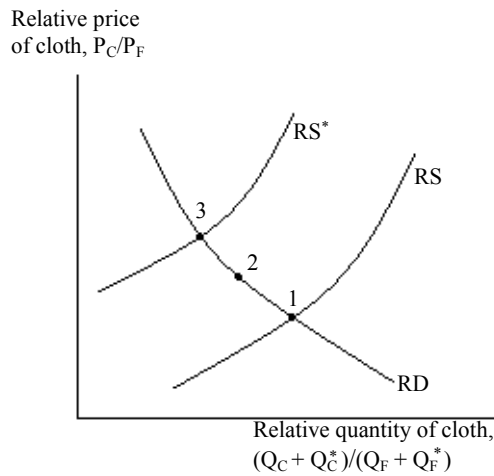$(Q_C + Q_C^*)/(Q_F + Q_F^*)$

Figure 5. Trade Leads to a Convergence of Relative Prices.
Source: Krugman and Obstfeld (2003).

When Home and Foreign trade with each other, their relative prices converge. The relative price of cloth rises in Home and declines in Foreign, and a new world relative price of cloth is established at a point somewhere between the pretrade relative prices, say at point *2*. In Home, the rise in the relative price of cloth leads to a rise in the production of cloth and a decline in relative consumption, so Home becomes an exporter of cloth and an importer of food. Conversely, the decline in the relative price of cloth in Foreign leads it to become an importer of cloth and an exporter of food. The general statement of the result is: Countries tend to export goods whose production is intensive in factors with which they are abundantly endowed.

3.1.5 Trade and the Distribution of Income

Trade produces a convergence of relative prices. Changes in relative prices, in turn, have strong effects on the relative earnings of labour and land. A rise in the price of cloth raises the purchasing power of labour in terms of both goods while lowering the purchasing power of land in terms of both goods. A rise in the price of food has the reverse effect. Thus international trade has a powerful effect on income distribution. In Home, where the relative price of cloth rises, people who get their income from labour gain from trade but those who derive their income from land are made worse off. In Foreign, where the relative price of cloth falls, the opposite happens: Labourers are made worse off and landowners are made better off.

The resource of which a country has a relatively large supply is the abundant factor in that country, and the resource of which it has a relatively small supply is the scarce factor. So, a general conclusion about the income distribution effects of international trade is: Owners of a country's abundant factors gain from trade, but owners of a country's scarce factors lose.

An example of the trade pattern from the United States suggests that compared with the rest of the world the United States is abundantly endowed with highly skilled labour and that low-skilled labour is correspondingly scarce. This means that international trade tends to make

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low-skilled workers in the United States worse off – not just temporarily, but on a sustained basis. The negative effect of trade on low-skilled workers poses a persistent political problem. Industries that use low-skilled labour intensively, such as apparel and shoes, consistently demand protection from foreign competition, and their demands attract considerable sympathy because low-skilled workers are relatively badly off to begin with.[20]

3.2 Openness and growth in theory

The Heckscher-Ohlin theory of trade states that under certain assumptions, countries will export the goods that make intensive use of their most abundant factor. Thus, if developing countries are characterized as 'labour-abundant' and developed countries as 'capital-abundant', then trade liberalisation should encourage a shift of resources towards the production of labour-intensive exports by developing countries. This in turn should increase the demand for labour, generating growth and reducing poverty.

The results associated with the traditional Heckscher-Ohlin model are based on a number of quite restrictive assumptions. In particular the model assumes:

- Two factors (capital and labour): in particular, it makes no distinction between skilled and unskilled labour; neither does it include natural resources.
- Two countries: whereas in reality there are many. This may matter because the previous actions of some countries (for example, in forming trade blocs or obtaining a lead in certain sectors) may affect the benefits from trade liberalisation for subsequent countries.
- Two goods: but in fact there are at least thousands of individual goods. In addition, services are of growing importance in international trade.
- Immobile factors: but capital in particular is now highly mobile and labour can be too in certain circumstances.
- Perfect competition: but in fact, world trade in some sectors is dominated by a small number of very large multinationals, suggesting that monopolistic and oligopolistic behaviour is likely.[21]

3.3 The Lorenz curve

In general, equity or fairness refers to the relative distribution of well-being among the people in an economy. It is useful to distinguish two broad categories of equity concepts: those that relate to outcomes and those that relate to process. Outcome concepts of equity are concerned with the existence in the aggregate of variation in the shares that individuals receive. Process concepts of equity are concerned with whether the rules and methods for distributing the shares among individuals are fair.

The general distribution shows how policies affect the overall distribution of utility in the economy, or measurable proxies for utility like income or wealth. The norm of strict equality means that all people should receive equal shares. There are numerous ways of measuring the degree to which a system attains that standard.

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[20] Krugman and Obstfeld (2003).
[21] McCulloch, Winters and Cirera, Trade Liberalization and Poverty: A Handbook (2001).

One common method is to graph the Lorenz curve and calculate its associated Gini coefficient. To illustrate, Figure 6 shows a hypothetical Lorenz curve for yearly jury duty. The percent of total population (eligible for jury duty) is measured along the horizontal axis and the percent of total annual jury service is measured along the vertical axis (in terms of person-days spent on jury duty). Imagine ordering the population from those with the least jury service to those with the most and plotting the percent of total service supplied by the percent of population who have served the least. As it is drawn, 25 percent of the population provided no service, the next 25 percent provided 10 percent of jury service, the next 25 percent provided 15 percent of jury service, and the last 25 percent provided the remaining 75 percent of jury service.
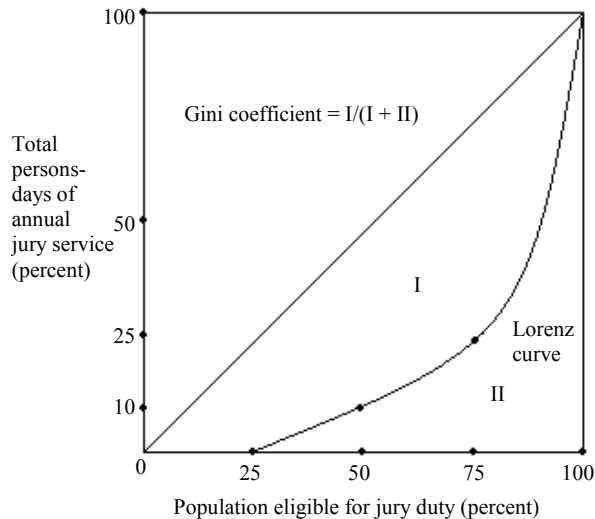

Figure 6. The Lorenz curve, a measure of outcome equality.
Source: Friedman (1984).

The Gini coefficient is defined as the ratio of area *I* to area *I* + *II*. Mathematically, if $d_1, d_2, ..., d_n$ represent the days served as juror by each of the *n* people in the eligible population, the Gini coefficient equals

$$\frac{\sum_{i=1}^{n} \sum_{i=1}^{n} |d_i - d_j|}{2n^2 \overline{d}}$$

where $\overline{d}$ is the mean of the d_i. As an illustrative example, suppose there are only four people and the jury days served by each (ordered from highest to lowest) is 75, 15, 10, and 0. Then there are a total of 100 days of jury service, and the average number of days per person is $\overline{d} = 100 / 4 = 25$. The denominator of the formula for the Gini coefficient is $2n^2 \overline{d} = 2(4^2)(25) = 800$.

The numerator is:

$$\sum_{i=1}^{n} \sum_{i=1}^{n} |d_i - d_j| = |75 - 75| + |75 - 15| + |75 - 10| + |75 - 0| + |15 - 75| + |15 - 15| + |15 - 10|$$
$$+ |15 - 0| + |10 - 75| + |10 - 15| + |10 - 10| + |10 - 0| + |0 - 75| + |0 - 15|$$
$$+ |0 - 10| + |0 - 0| = 460$$

The Gini coefficient is then:

$$\frac{460}{800} = 0.575$$

If each person in the population provided the same jury service, the Lorenz curve would coincide with the 45° line, area *I* would shrink to zero, and the Gini coefficient would be zero. At the other extreme, if one person provided all the jury service, the Lorenz curve would coincide with the outer bounds of area *II* and the Gini coefficient would be 1. Thus the Gini coefficient is a measure of the degree to which strict equality is attained: zero if it is attained exactly, positive if there is any inequality, and increasing to a maximum of 1 as the inequality worsens. If the Lorenz curve for one policy alternative lies strictly within the Lorenz curve for another policy alternative, the first is unambiguously more equal and will have a lower Gini coefficient.[22]

3.4 The Growth Elasticity of Poverty

The total growth elasticity of poverty, ε, may be defined as the relative change in the poverty headcount between two periods for a one percent growth in mean income (assuming that the poverty line remains constant in real terms).

$$\varepsilon_H = \frac{\partial H}{\partial \mu} \frac{\mu}{H}$$

where H is the headcount index and μ is the mean income.[23]

The total growth elasticity of poverty is commonly reported in the development literature as a measure of the poverty efficiency of growth. This is defined as the percentage change in poverty for a given growth rate. A higher level of inequality in a country hampers the poverty-reducing effect of growth, and result in a smaller growth elasticity of poverty.[24]

4 Conceptual approaches to Food Security and Trade

This study will consider the agriculture sector and the impact that trade reform can have on its ability to contribute to improved food security in the context of wider structural changes that result from reforms. This is justified by explaining the multiple avenues by which agriculture can determine and enhance both national and household food security. While any trade agreement that changes the balance between liberalisation and protection for a good or service in an economy can affect levels of food security, agriculture related reform is especially relevant because: (i) both via its direct contribution to the availability of food, and indirectly as a key engine of economic development and hence improved access to food, and (ii) agriculture is one of the most heavily distorted sectors in many countries and has, as a result, received significant attention in recent rounds of trade negotiations.

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[22] Friedman, Microeconomic Policy Analysis (1984).
[23] The World Bank, The Growth Elasticity of Poverty (2007).
[24] The World Bank, Poverty Reduction and Growth: The Relative Roles of Growth and Inequality for Poverty Reduction (2006).

This section seeks to link the concerns of developing countries with respect to trade, food security and economic policy in the context of the Doha Round negotiations. It defines the changing conceptual basis of food security and presents some indicators and estimates of trends in aggregate food security status. This is then followed by a review of approaches to food security at the household level, and of frameworks for investigating the wide range of factors influencing food security status at this level of disaggregation. There is also a section that will concern with the links of the two issues of food security and of trade liberalisation.[25]

4.1 Household Food Security

The ability to ensure adequate food security hinges on the ability to identify vulnerable households. Vulnerability refers to the full range of factors that place people at risk of becoming food insecure. The degree of vulnerability of an individual, household or group of persons is determined by their exposure to the risk factors and their ability to cope with or withstand stressful situations. Generally, vulnerable households will constitute three groups:

- those which would be vulnerable under any circumstances: for example, where the adults are unable to provide an adequate livelihood for the household for reasons of disability, illness, age or some other characteristic;
- those whose resource endowment is inadequate to provide sufficient income from any available source;
- those whose characteristics and resources render them potentially vulnerable in the context of social and economic shocks: e.g. those who find it hard to adapt to sudden changes in economic activity brought about by economic policy. A significant increase in the consumer price of staple foods might be an example.

Although no definition of "vulnerable" is complete, a useful starting point is estimates of income. It can be assumed that the first two categories will be relatively poor both in terms of income and assets, and it is also likely that the third category will have a fragile resource base and other characteristics, which make its income sources uncertain. An appropriate proxy, therefore, in identifying vulnerable households, is how poor is a particular household measured against some established criterion.[26]

Having defined who the poor are, the second step is to identify their household characteristics:

- location: rural/urban; small village/large village; remote province/near to capital city etc.;
- composition: size, age and dependency ratios; male/female head;
- sources of income: production, employment, trade, remittances and other transfers.

Household activity or transfers do not directly result in access to food, for there are a number of different stages that mediate the process. Both governments and agencies concerned to increase household food security intervene in order to mediate between potential and reality. The resource endowment of the household will determine its capacity to produce or trade. Events such as civil unrest or climatic disasters can seriously deplete households' resource potential, and increase the likelihood of structural food insecurity. If what might have appeared as a temporary problem is not to become chronic, the replenishment of productive capability should be a necessary part of programmes aimed at revering this process. Physical

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[25] FAO, Trade and Food Security (2002).
[26] FAO, Trade and Food Security (2002).

recourses by themselves, may be inadequate, and the upgrading or changing of the range of skills possessed by household members may be a necessary component of any programme. Consequently, training in new agricultural techniques, or in the necessary skills required by local industries or trades, can form a component of food security interventions.[27]

4.2 The impact of Trade Liberalisation in Developing Countries

There are arguments that openness to trade contributes to economic growth and that this can, in turn, be beneficial for poverty reduction and food security, are well grounded in conventional economic theory and have been supported by a number of empirical studies. However, some commentators caution that in studying the correlation between more trade and higher economic growth, researchers need to be careful about implying causality.

At the same time, the potential gains from trade liberalisation are not guaranteed and will not necessarily be reflected in improved food security status of all groups within society.[28] The poor cannot always take advantage of the opportunities that liberalisation creates because they lack either the skills or capital. Farmers' inability to cope with fluctuating prices restricts the advantage they can take of liberalisation.[29] In particular, there are likely to be significant differences between the impacts on small scale and commercial farmers, rural non-farm producers and urban consumers both within and across countries. These need to be considered in identifying the food security implications of trade liberalisation.[30] Market segmentation seems likely to prevent the benefits of liberalisation from spreading as widely as possible. There is evidence of labour markets that despite an almost unlimited supply of unskilled labour, demand shocks partly impact wages in the formal sectors in which they occurred rather than being dispersed over the whole labour market. Given that formal wages already appear to exceed poverty levels, while many informal ones do not, greater integration that would allow shocks to be entirely absorbed by employment change would be better for poverty alleviation.[31]

A paper by Saprin presents a standpoint that argues that liberalisation has resulted in growth in imports exceeding growth in exports, and that this increased exposure to imports is associated with a reduction in domestic productive capacity and in the purchasing power of consumers. The authors also suggest that an absence of domestic market reform can result in reduced competitive advantage as trade reform proceeds, because the costs of production increase relative to those in countries that have successfully implemented domestic reform programmes. This may be reflected in trade patterns.[32]

Whilst theory may suggest that the liberalisation of trade policies will result in net benefits to the liberalising country, and whilst there may be a growing collection of empirical studies to support the theory, it is also suggested from the preceding discussion that the benefits of liberalisation will not necessarily be achieved, and even where they are, some groups of individuals within some countries are likely to be disadvantaged.[33] In a concise paper, Winters argues that although he believes that trade liberalisation aids economic growth, it "may have some adverse consequences for some – including some poor people – that should be avoided or ameliorated to the greatest extent possible". He suggests that rather than using

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[27] FAO, Trade and Food Security (2002).
[28] FAO, Trade and Food Security (2002).
[29] Winters (2000).
[30] FAO, Trade and Food Security (2002).
[31] Winters (2000).
[32] SAPRIN (2002).
[33] FAO, Trade and Food Security (2002).

this as a reason for resisting reform, it should "stimulate the search for complementary policies to minimize adverse consequences and reduce the hurt that they cause".[34]

4.3 The relation between Trade Reform and Food Security

For many developing countries the relationship between trade reform and food security is likely to provide the foundation of one of the most critical debates of the Doha Round of international trade negotiations. The international dimension is significant, since trade policy influences both global food availability (in the case of a major importer or exporter), and national food availability (through both imports and production). The effect on food imports will be mediated by any implications of trade policy for foreign exchange earnings. Trade policy will also have implications for food security through the link with incomes and expenditures. Any change in the trade regime will have a direct effect on both rural and urban incomes, and employment, and through these on income distribution. In addition, there will be an effect on government revenues through, for example, a change in the level of revenue from import levies. Both national food availability and government revenues impact at the household level, affecting household access to food directly and indirectly through household incomes.[35]

There is every presumption to believe that the key to sustained poverty alleviation is economic growth. Recent evidence suggests that on average the incomes of the poor grow proportionately to the overall average. There is plenty of theory to suggest a positive link, based on factors such as technology flows, the prices of capital goods, and access to specialist tools and inputs. The link from openness to growth operates at least partly via technical progress, for example by making new inputs, new technologies, or new management techniques available to local producers. Such flows could arise from trade – either imports or exports – or from direct flows of technology from abroad.[36]

Trade liberalisation implies a change in the relative prices of traded and non-traded goods and factors in a previously protected sector or economy. The change in relative prices will induce changes in the allocation of resources to different activities and hence changes in both subsectoral and aggregate levels of production. In turn, changes in income levels (which are expected to increase in aggregate as resources are used more efficiently) have the potential both to reduce poverty levels and in doing so, to improve the food security status by increasing the access of the poor to food. In the short-run, agricultural sectors in poor economies are often not well placed to benefit from trade liberalisation even when this has had a significant impact on both income levels. This is because of the inflexible structure of production and trade in this sector, often manifested in limited market access and weak institutional development, as well as limited capacity to respond to improved incentives.[37] Trade liberalisation is generally held to have long-run benefits, but it requires adjustment in a country's output bundle to achieve them. If adjustment is costly this could lead to periods of decline and poverty before things get better.[38] Although aggregate food security has improved markedly over the past half century, thanks to increasing global food availability per capita and decreasing real food prices, hunger, malnutrition, and food insecurity remain widespread. The impulse to action and resolve the problem is strong, and most nations have implemented food assistance programs of some sort.[39]

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[34] Winters (2001).
[35] FAO, Trade and Food Security (2002).
[36] Winters (2002).
[37] FAO, Trade and Food Security (2002).
[38] Winters (2002).
[39] Barrett, Gardner and Rausser (2002).

4.4 Zero Hunger: a Food Security Policy for Brazil

The Special Ministry of Food Security and Combating Hunger (MESA), under the Office of the President, was specifically created to implement a set of social program initiatives in Brazil: the Zero Hunger Program is a multifaceted set of policies for food security. Involving nearly all ministries, all three levels of government (federal, state and local) and all of Brazilian society.[40] The Zero Hunger Program also include conditional cash transfers (CCT)[41] known as the Bolsa Família Program (BFP) and was launched in 2003.[42] The BFP is an emergency income transfer program for poor families. The Zero Hunger Program seeks to help:

- reduce current poverty and inequality, by providing cash transfers to poor families

- break the inter-generational transmission of poverty by conditioning these transfers on beneficiary compliance with requirements such as school attendance, vaccines, and pre-natal visits

Most of the very poor Brazilians live in small villages and medium-sized towns in the countryside (about 20 million people) and in large metropolitan areas (9 million people). Poverty also affects around 15 million people in rural areas of Brazil. Although there is a heavy concentration of poverty in the less developed Northeast region (50%), even the Southeast, Brazil's most industrialized region, has a high proportion of poor people (11.5 million). The Zero Hunger Program, seeks to ensure the fundamental right to food for every Brazilian, as an essential condition for enjoying the full benefits of citizenship, by means of a permanent Policy for Food and Nutritional Security.[43]

4.4.1 The Structural Causes of Food Insecurity

Structural aspects of Brazil's development model, such as income concentration, low wages, high unemployment rates and stagnant economic growth are ultimately the root causes of food insecurity in the country. Millions of families with extremely low purchasing power are trapped in a vicious cycle of hunger, aggravated by weak income and job creation policies, as well as insufficient farm policies. As a consequence, the poorest people are excluded from the food consumption market, which causes further drops in food production, with consequent declines in employment opportunities, social exclusion and economic marginalisation.

The Zero Hunger Program includes a combination of structural policies to tackle the underlying causes of poverty – such as job and income creation, universal social security, and land reform – as well as a set of emergency policies aimed at ensuring immediate access to food for the population at greatest risk, by reducing food prices and promoting self-sufficiency and subsistence production.[44]

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[40] Brazilian Embassy in Washington (2004).
[41] Conditional cash transfer, or CCT programs aim to reduce poverty by making welfare programs conditional upon the receivers' actions. The government only transfers the money to persons who meet a certain criteria. These criteria may include sending children to school regularly, getting regular check-ups at the doctors's office, vaccinations, etc.
[42] The World Bank, "Lifting Families Out of Poverty in Brazil" (2005).
[43] Brazilian Embassy in Washington (2004).
[44] Brazilian Embassy in Washington (2004).

There will be a gradual implementation of measures. One of them is the Food Card that will provide R$50.00 (approximately US$15.00) per month to families that have less than ½ minimum wage per capita (R$90, approximately US$44) and other social limitations and that were chosen in those municipalities by a Managing Committee in which members of the community are present. This benefit of R$50.00 are provided to be spent on basic food in the locality where the family lives. The government does not intend to make the beneficiaries dependent of the Zero Hunger Program. The program is being created to help people overcome their exclusion situation. There is also a program of distribution of emergency basic baskets to families that are in a food risk situation, and may prefer receiving basic baskets instead of the food card like for the encamped families waiting to be settled in the Agrarian Reform Program.[45]

4.4.2 Projects and Operations

The Brazilian government has announced its commitment to decentralization, education, evaluation, community empowerment and participation, and conditional cash transfer programs for the poor. Complementing this is the effort to promote quality growth, competitiveness and employment.[46]

The World Bank has approved loan to support the Zero Hunger Program. Total project cost is US$6194.9 millions, with the Ministry of Social Development and Eradication of Hunger in Brazil as the implementing agency.[47] Major sectors in consideration of the loan are:

- Health and other social services (97%)
- Public Administration, Law, and Justice (Central government admin.) (2%)
- Public Administration, Law, and Justice (Sub-national government admin.) (1%)

Brazil also receives US$1 million for the Zero Hunger Program from FAO. The UN agency will provide technical support for the program. FAO Director-General Dr. Jacques Diouf and President Lula da Silva have discussed means of further strengthening the close collaboration between FAO, the government and other sectors involved in the struggle against hunger.[48]

5 Background for the empirical study

The poorest Brazilians live in rural areas, working in and around agriculture. The liberalisation process began with the first structural adjustment programs. As a result of the debt crisis at the outset of the 1980s, Brazil signed its first structural adjustment deal with the International Monetary Fund in 1982, followed by another in 1988. In the agricultural sector, the result was that rural credit, producer price supports, and marketing services virtually disappeared after 1987. Despite efforts to stabilize the economy without raising interest rates, both inflation and interest rates went out of control for much of the decade. In addition, with the removal of regulations on prices, the cost of land soared, making it more difficult for the poor to acquire and retain land. World prices for Brazil's major crops, including its principal exports coffee and sugar, have been falling during the liberalisation process since the early 1980s. Poor farmers who attempted to enter the agro-export markets alongside profitable large producers were hit hardest by this trend because of their vulnerability to loss. In

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[45] USBIG Discussion Paper No. 63, President Lula's Zero Hunger Program and the trend toward a citizens' basic income in Brazil (2003).
[46] The World Bank (2003).
[47] The World Bank, "Projects & Operations, Bolsa Família" (2004).
[48] FAO, "Brazil receives US$1 million for Zero Hunger Project from FAO" (2003).

addition, prices for crops on the domestic market have fallen almost as drastically. From 1980-1991 real producer prices for both domestic crops and exports were cut in half. Prices have continued to drop in the 1990s. Over the last thirty years, rice prices have declined 53% and maize prices by 60%. Again the rural poor suffered, as rice and maize are two of their principal crops cultivated.[49] In 1991, Brazil entered MERCOSUR[50], or the Southern Cone Common Market. It called for all members to eliminate tariff and non-tariff barriers to trade by 1994, with a few exceptions granted for vital commodities. The agreement also specified reductions in support for agricultural production. Brazil and Argentina, the regional giants, pushed for its formation and have been its principal beneficiaries. Brazil's exports have grown significantly since its implementation, and it is by far the largest exporter in the group. At the same time, competition from Argentina in certain sectors, most notably wheat, has driven Brazil almost entirely out of the market. Since the inception of MERCOSUR, Brazil has begun importing more food.[51]

Brazil joined the World Trade Organization (WTO) upon its formation in 1995. The WTO was formed out of the former General Agreement on Tariffs and Trade (GATT) as a governing body over international trade rules. The Uruguay Round of the GATT, 1986-1994, gave rise to the formation of the WTO and mandated major reductions in tariffs, export subsidies, and domestic price supports. Developing member countries, including Brazil, were to reduce import tariffs and export subsidies by 24% and to reduce domestic price supports by 13%, both over a period of ten years. By joining the WTO, Brazil agreed to extend market integration from a regional to a global level. The Uruguay Round contained a specific Agreement on Agriculture that required unprecedented liberalisation of agricultural markets. Trade liberalisation increased Brazil's international trade. But it also increased Brazilian farmers exposure to the fluctuations of international prices.

Conditions of the poorest Brazilians remain problematic. While estimates for poverty in Brazil range from the World Bank's 20% to UNICEF´s 32%, with rural poverty twice as high as urban poverty, authorities agree that the reforms of the 1990s failed to improve the lot of Brazil's poor. Small farmers were hardest hit by the changes, unable to withstand the price fluctuations that came with trade liberalisation and the elimination of price controls. In addition, despite the fact that Brazil is a food exporter and enjoys the world's 10th largest economy, about 25% of Brazil's people live in extreme poverty. In a study of the impacts of the Uruguay Round of WTO negotiations and its Agreement on Agriculture, the FAO found a trend of larger farms dominating, with the consolidation of maize and soybean farms, import substitution of wheat, rice, and cotton production, and increased firm failure in the dairy industry, while larger farms and foreign companies take hold.

The Brazilian government support for its soybean sector has increased from US$393 million in 1980 to US$2.7 billion in 2001, and Brazil is now the second largest producer of soybeans in the world. The benefits of this sort of state intervention on behalf of the industry have concentrated the benefits in the hands of a few; soybean producers tend to be large scale operators, and this resulted in the displacement of smaller farmers. In addition, soybean production is capital-intensive, and thereby it requires very little labour. A 1000-hectare soybean farm employs only three people. One consequence of this type of production is that growing profits from soybean production remain in the hands of relatively few producers. The government's stated aim in its initial subsidy of soybean production was to bolster food security by providing an inexpensive component of poultry feed, which would in turn make

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[49] Food First/Institute for Food and Development Policy (2003).
[50] MERCOSUR, or MERCOSUL, is a customs union between Brazil, Argentina, Uruguay, Paraguay and Venezuela. Its purpose is to promote free trade and fluid movements of goods, peoples, and currency.
[51] Food First/Institute for Food and Development Policy (2003).

chicken a more affordable source of animal protein for consumption. There was a problem with this; officials apparently overloaded the fact that soybeans would compete with food crops for land use, and the farmers who grow them. In the first years of soybean production (1970-1973), 90% of soybean expansion displaced other crops such as rice, manioc, potatoes, and corn. While later expansion often involved cultivating new land, soybeans have continued to compete with production of staple food crops.[52]

Since President Lula da Silva's inauguration in January 2003, Brazilian agricultural policy has shifted to a two-track approach to development. In accordance with his alliance with Brazil's business community, President Lula da Silva is extending the policies of his predecessors by encouraging the growth of the agro-export sector and pursuing deals in the FTAA and the WTO that will open foreign markets to Brazil's soybeans, frozen orange juice concentrate, and sugar. To raise incomes and increase Brazil's food security, President Lula da Silva has committed to redistributing land to hundreds of thousands of families. According to the government, new policies (including the Zero Hunger Program) will also provide incentives for family agriculture, making credit and technical support available and tailoring agricultural research to the needs of small production. In one innovative approach, the government plans to utilize only local production for food service in state institutions such as schools, hospitals, and prisons.[53]

5.1 Economic History of Brazil

Brazil has long been regarded as a land of opportunity, with a large agricultural frontier and immeasurable plant and mineral wealth. Brazil experienced tremendous growth from 1960-1980 (figure 7 in appendix, gives an overview of the annual GDP per capita growth), a period over which average per capita income grew 141%. The growth was not well distributed, however, and inequality remained a serious problem. The 1980s were a period of difficult transition. By the late 1970s, Brazil had become the world's most indebted country, and the debt crisis that infected all of Latin America in the 1980s hit Brazil hard. The government responded to the crisis by seeking stabilization loans from multilateral financial institutions. These loans came with conditionality, which involved the implementation of a moderate structural adjustment program in 1982, followed by a more severe SAP in the late 1980s.

By the 1990s, Brazil was tightening its budget and cutting social services, maintaining high interest rates, and aiming to increase foreign investment in trade. Due to hyperinflation, then Finance Minister Fernando Enrique Cardoso designed the Real Plan to stabilize the currency by pegging it loosely to the dollar and further limiting government spending. In 1998, Brazil entered into economic crisis after major currency devaluation and accepted a "bailout" from the International Monetary Fund, conditioned on its implementation of IMF-recommended policies. Despite these narrow recoveries from crisis, the 1990s remained a decade of low growth in Brazil, with GDP per capita growth generally hovering between –2% and 2%.[54]

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[52] Food First/Institute for Food and Development Policy (2003).
[53] Food First/Institute for Food and Development Policy (2003).
[54] Food First/Institute for Food and Development Policy (2003).

5.2 The development of Trade Liberalisation

While the complexity of factors at play makes it impossible to directly link changes in the welfare of Brazilian people to a particular policy, it is possible to track the development of trade liberalisation and trends in the welfare of the poor as parallel and related processes. The available data indicates that trade liberalisation may not have led to reduced poverty or inequality. A primary argument behind trade liberalisation has been that it stimulates economic growth, which is in turn said to be the key to resolving poverty and hunger.[55]

5.2.1 Poverty and Inequality

While estimates for poverty in Brazil range from 20% (World Bank) to 32% (UNICEF), with rural poverty twice as high as urban poverty, diverse sources agree that the reforms of the 1990s failed to improve the lot of Brazil's poor. These studies point out that small farmers were hardest hit by the changes, unable to withstand the price fluctuations that came with trade liberalisation and the elimination of price controls.

The UNDP's Human Development Report in 2003 found that Brazil had the greatest inequality among middle-income countries. Inequality is commonly measured by the Gini coefficient on a scale from 0 to 1, with 0 being perfect equality in the distribution of income and 1 being perfect inequality. For the past twenty-five years, throughout the period of trade liberalisation, Brazil's Gini coefficient has held fast at around 0.59 or 0.60, settling at 0.61 in 2003. The data show that the poorest 10% of the population receives just 0.7% of total income, while the richest 10% receives almost half.

This situation is particularly severe for Brazil's rural population. Rural workers include independent small farmers, sharecroppers, tenant farmers, and agricultural day laborers. They are Brazil's poorest and most vulnerable sector, and they depend upon the land to produce the crops that are their livelihood. Despite an unsuccessful attempt at land reform during the 1990s, land tenure has not become more equitable over the last two decades.[56]

5.3 Winners and Losers in Agricultural Trade Liberalisation

This section will give an explanation how liberalisation policies have shaped the rural landscape in Brazil. The findings may suggest that liberalisation has led to divergent results for large versus small agricultural producers. Larger farms have generally benefited from the opening of South American economies and the subsequent expansion of export markets, although low world prices have capped profits. For small farmers diminishing credit and marketing support may have limited their possibilities to secure and increase their income.[57]

5.3.1 Macroeconomic changes in Agricultural Trade Patterns

Since the signing of the MERCOSUR agreement in 1991, international trade in agricultural products has expanded significantly, with soybean exports driving growth. MERCOSUR facilitated the flow of goods by reducing tariffs and other barriers to trade. Agricultural exports have more than doubled since MERCOSUR's inception, from US$7.9 billion in 1991 to US$16 billion in 2001. Yet these values are deceptive. Unfortunately, revenues from exports did not increase nearly as fast as did export-oriented production. With the exception

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[55] Food First/Institute for Food and Development Policy (2003).
[56] Food First/Institute for Food and Development Policy (2003).
[57] Food First/Institute for Food and Development Policy (2003).

of soybeans, the prices of many of Brazil's primary exports fell during the 1990s. For example, Brazil is the world leader in sugar production. While the amount of sugar exports increased almost 700% 1991 to 2001, the total dollar value of sugar exports increased only 270%. Brazil also holds the world's largest share of the coffee market, but the coffee crisis led coffee revenues to decline while export amounts increased. Due to falling prices, Brazil's overall growth in agriculture during the 1990s was disappointing relative to expectations. Brazil therefore gained in growth, although not as much as hoped.[58]

5.3.2 Policies favor Rich Agricultural Producers

The trade liberalisation measures mandated by the MERCOSUR agreement and membership in the World Trade Organization fall into two main categories: removing tariff barriers to trade and eliminating state support for domestic production. Many of the changes in the structure of the agricultural sector can be connected to this second condition. In terms of agriculture, governments must eliminate or significantly reduce price supports, low-interest rural credit, input subsidies, controls on land prices, and any other financial assistance provided to farmers. In Brazil, these supports had largely disappeared even before the signing of MERCOSUR. Structural Adjustments Programs starting in 1982 removed them as part of budgetary tightening. Under privatisation, rural credit was only available through private banks, and after 1987 price supports and marketing assistance for farmers had also dried up.

The free trade policies of the 1990s accelerated this process. Moreover, Brazil's governments in the 1990s chose to reduce such support to farmers for beyond what was mandated by trade agreements as part of a domestic policy effort to eliminate state interference in markets. Small farmers rarely had the disposable income to invest in seeds, fertilizers, and other agricultural inputs during planting season; they often rely heavily upon affordable credit, which was not forthcoming in Brazil in the 1990s. With the loss of support offered by the public sector, only large-scale agro-exporters could afford to access these support services from the private sector. Only large producers have the property and resources to provide the collateral necessary for loans.[59]

5.3.3 Experiences of the Rural Poor

The poorest in Brazil tend to be small family farmers producing crops for subsistence or local sale. A survey of farmers in 1996-1997 yielded the following complaints from small farmers themselves:

- Insecure land title
- Reduced access to agricultural land in the 1990s
- Contamination by pests and weeds from nearby single crop farms
- Lack of access to credit and technical assistance
- Difficulty in accessing markets and obtaining fair prices for crops
- Political exclusion

Two FAO reports reveal similar findings. One confirms that there was "simple no flow of credit for small farmers" after implementation of the Uruguay Round. Another paper acknowledges but does not examine in depth the post-liberalisation incidence of "high social costs in several cases. High rural indebtedness, growing income disparity between small and large farmers, and the persistence of poverty and food insecurity are some of the transitional

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[58] Food First/Institute for Food and Development Policy (2003).
[59] Food First/Institute for Food and Development Policy (2003).

costs of the reform measures".[60] These studies tend to agree that the benefits of trade liberalisation and related policies are measured in aggregate monetary terms, while its fallout is measured at the level of nearly invisible family farmers in terms of human welfare.

Poor food producers are not the only ones being adversely affected be the advent of agricultural trade liberalisation. Evidence demonstrates that food consumers are also losing out. While theory predicts that unregulated competition will lead to lower food prices, the contrary has in fact been true. World Bank statistics show that food prices went out of control with hyperinflation in the early 1990s, and then dropped with the currency stabilization of 1994, but prices have grown steadily from 1994 to 2001. According to a study for the FAO, food consumption fluctuated wildly during the 1990s, and consumption of all staple food items fell for the poor during the transitional period 1987-1996. Reduced domestic production of foodstuffs increases in higher-priced imports, and increases in overall food prices have combined to endanger food security for Brazil's poorest people from the early 1980s and to the present. The analysis of the experiences of Brazil's rural poor over the period of trade liberalisation reveals a complex picture. The impacts of trade liberalisation on the poor have stemmed not from the reduced tariff barriers, but from other policies that have accompanied trade liberalisation, namely the elimination of credit, marketing, and price supports.[61]

5.4 The Millennium Development Goals

In 2000 the member states of the United Nations adopted the Millennium Declaration as a renewed commitment to human development. The declaration includes eight Millennium Development Goals (MDGs), each with quantified targets, to motivate the international community and provide an accountability mechanism for actions taken to enable millions of poor people to improve their livelihoods. The MDGs are as follows:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat human immunodeficiency virus/acquired immune deficiency syndrome, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development.

The linkage with agriculture is particularly strong for the first MDG, or MDG 1 – halving by 2015 the proportion of those suffering from extreme poverty and hunger. Improving the productivity of and the economic returns of agriculture will have immediate effects in eradicating extreme poverty and reducing hunger. In addition, subsistence farming households will enjoy immediate benefits from increased food production. But more importantly, increased food production will lead to real reductions in food prices, improving the purchasing power of the poor throughout the economy. A flourishing agriculture sector also facilitates job creation in other areas, such as the food processing and marketing sectors, and creates secondary economic effects in the nonfarm economy.[62] Brazil's Zero Hunger Program is one step towards these MDGs.[63]

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[60] FAO, Agriculture, Trade and Food Security (2000).
[61] Food First/Institute for Food and Development Policy (2003).
[62] The World Bank, Agriculture and Achieving The Millennium Development Goals (2000).
[63] Brazilian Embassy, Zero Hunger: a Food Security Policy for Brazil (2004).

5.5 Redistributing Income to the Poor

A recent regional study by Lindert, Skoufias and Shapiro for the World Bank[64] measures the extent to which publicly subsidized transfers in Latin America and the Caribbean (LAC) redistribute income. The report analyzes how redistributive the public transfers are in LAC. While there are few doubts about the importance of growth for poverty reduction, growth in LAC has been slow over the past decade, and, barring a few exceptions, existing growth has benefited the poor less than proportionally. While investments in access to productive assets – such as education, land, property rights and infrastructure – can reduce poverty and inequality in the long run, asset-based strategies take time to implement and improve welfare. The findings in the report suggest that public transfers can be effective instruments to redistribute income to the poor. Overall, public spending on transfers represents about 5.7% of GDP in LAC. About three quarters of this spending (4.3% of GDP) finance public insurance benefits, with the remainder (1.4%) allocated to social assistance transfers.[65]

The targeting mechanisms used by conditional cash transfers (CCT) have shown impressive rewards for progressivity. The relatively high progressivity of CCTs is likely driven by a clear definition of the poor as the target group and the explicit use of targeting mechanisms to determine eligibility, and not on their conditionalities by themselves. Such design mechanisms could be built into other social assistance programs, for example using a combination of geographic targeting and individual assessment mechanisms to target needs-based scholarships. An adequate mix of instruments is needed to weave a social safety net that promotes other roles of social policy (promotion of human capital, smoothing consumption, and ensuring adequate protection against shocks, in addition to redistribution); and covers a variety of circumstances, including programs tailored to the needs of specific vulnerable groups.

Another factor is the possible perceived "legitimacy" conferred on social insurance programs by the fact that they link benefits to contributions. Even though they are highly regressive and financed to a large part by general tax revenues, social insurance schemes may claim more legitimacy because societies perceive them as "rightfully earned" through contributions. Perceptions of "legitimacy", could at least in some part, explain the emerging popularity of conditional cash transfers, whereby societies perceive that the fact that beneficiaries have to comply with a set of "co-responsibilities" (human capital conditionalities) bestows a greater degree of legitimacy on these transfers than pure cash or in-kind handouts. Conditional cash transfers are promising not only for their redistributive impacts, but also for their demonstrated impacts on human capital and their ability to break the inter-generational transmission of poverty.[66]

In Brazil, several interesting factors come into play in determining the overall resource flows of public transfers. First, compared with other countries, social insurance coverage of the poor is relatively high due to Brazil's push to extend coverage of rural pensions. Second, this higher coverage is somewhat offset, however, by significant differences in net unit social insurance subsidies across quintiles[67]. Third, relatively pro-poor coverage of social assistance is offset by very low unit subsidies. Moreover, unit transfers for Brazil's CCT program (Bolsa Família) have significantly increased during the period since 2003.[68]

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[64] See Discussion paper No. 0605 by Lindert, Skoufias and Shapiro (2006).
[65] Lindert, Skoufias and Shapiro (2006).
[66] Lindert, Skoufias and Shapiro (2006).
[67] The income quintiles are a commonly used measure. With this particular tool of measuring income the total number of households is divided into quintiles, each representing about 20%, according to their income.
[68] Lindert (2005).

6 The empirical study

The first part of this section gives the structure of the Brazilian economy, and in the second part the implementation strategy for the different scenarios is presented.

6.1 Structure of the Brazilian Economy

The original sources used to construct the SAM are the 1995 input-output (IO) table for Brazil and national accounts. These sources are integrated with the agricultural census data for 1995 to yield a regionalized representation of agricultural activities. Household data are obtained from the national accounts and the household income and expenditure surveys. For technology coefficients in agriculture, the SAM relies on information from an Embrapa[69] database with detailed regional specification of technologies by crop type.

Agriculture contributes with 10 percent to net national income (value added) – 14 percent if the food processing sectors (which represent 4 percent) are included. This relatively small share is consistent with the common view that Brazil is an economy with a well-developed industrial sector (21 percent), and services sector (44 percent includes government services). The marketing margins expressed by trade and transports add up to 11 percent of total value added, all these values are shown in table 1. This implies that approximately one-tenth of the market price paid for the average commodity can be ascribed to transportation and transaction costs. This number can be misleading because it is a national average, whereas transportation costs and trade margins are strongly dependent on location.

Table 1. Value-added structure for Brazil, 1995

Sector/region	Value (R$ billion)	Share of GDP (%)
Agriculture:		
Amazon	4.97	0.01
Northeast	8.96	0.02
Center-West	6.14	0.01
South/Southeast	33.37	0.06
Total agriculture	53.44	0.10
Nonagricultural sectors		
Processed food	21.73	0.04
Oil and mining	11.44	0.02
Manufacturing	116.15	0.21
Construction	50.30	0.09
Trade and transportation	61.24	0.11
Services	247.49	0.44
Total nonagriculture	508.35	0.90
Total value added	561.79	1.00

Source: Cattaneo, Research report 129, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

Agriculture (along with services) stands out as the sector with the highest ratio of value added to output (approximately equal to 0.6). This means that it is the sector in which households (as the owners of the factors of production) get the highest return for each dollar of output produced. Agriculture appears then to be a good income-generating sector. However, to notice before drawing conclusions from this ratio is: first, some sectors are subsidized, thereby inflating the value added measure by distorting the price system; second, Brazil is known to

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[69] Brazilian Agricultural Research Corporation. Embrapa coordinates the National Agricultural Research System.

have among the greatest inequality concerning income distribution, and this is particularly true in rural areas where land ownership is concentrated among a few large landowners.

The stucture of the Brazilian commodity markets at a national level shows that more than one-third of the total value of agricultural production occurs in the meat and dairy sectors (R$35 billion). Production of annuals has the same order of magnitude (R$36 billion), the values are represented in table 2. The remaining production is distributed among perennials, logging, and other agriculture (mainly fishing), with coffee standing out as the major perennial crop. The processed food sector is very important in the context of this analysis because it processes the major agricultural export products such as coffee and sugar. These products are exported only after processing (the export of processed foods represents R$11 billion). Soy is the major crop to be exported in part in its unprocessed form, along with products from the other perennials and other annuals categories.[70]

Table 2. Structure of the Brazilian national commodity markets, 1995

Sector/commodity	Sectoral values (R$ billion)				Ratios (%)	
	Output	Exports	Imports	Sales	Export/output	Import/sales
Agriculture:						
Coffee	5.03	…	…	5.03	0.00	0.00
Cocoa	0.53	0.06	0.01	0.48	0.12	0.02
Maize	6.24	0.01	0.13	6.36	0.00	0.02
Rice	3.11	…	0.04	3.15	0.00	0.01
Beans	2.09	…	0.10	2.19	0.00	0.04
Manioc	2.53	…	…	2.53	0.00	0.00
Other perennials	6.57	0.44	0.30	6.43	0.07	0.05
Other annuals	7.65	0.87	1.01	7.79	0.11	0.13
Sugar	8.49	…	…	8.49	0.00	0.00
Soybean	3.83	0.73	0.06	3.16	0.19	0.02
Horticulture	1.98	0.06	0.02	1.94	0.03	0.01
Milk	10.47	…	…	10.47	0.00	0.00
Cattle and swine	17.58	…	0.20	17.78	0.00	0.01
Poultry	7.03	0.07	0.03	6.99	0.01	0.00
Forest extraction	0.41	0.10	0.25	0.56	0.23	0.42
Logging	4.21	0.15	0.07	4.13	0.04	0.02
Deforestation	0.60	…	…	0.60	0.00	0.00
Other agriculture	4.47	0.01	0.83	5.29	0.00	0.16
Agriculture subtotal	92.82	2.50	3.05	93.37	…	…
Nonagricultural sectors:						
Processed food	147.49	11.37	2.55	138.67	0.08	0.02
Oil and mining	35.75	3.19	3.86	36.42	0.09	0.10
Manufacturing	373.13	23.32	37.55	387.36	0.06	0.10
Construction	102.80	…	…	102.80	0.00	0.00
Trade and transportation	118.69	3.59	2.60	117.70	0.03	0.02
Services	397.89	2.34	5.45	401.00	0.01	0.01
Nonagriculture subtotal	1175.75	43.81	52.01	1183.95	…	…
Total	1268.57	46.31	55.06	1277.32	…	…

Source: Cattaneo, Research report 129, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

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[70] Cattaneo, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

On the import side, the import shares seems to be relative small to output, with the exceptions of other annuals, which includes wheat, and forest extraction, which has considerable two-way trade because of the heterogeneity of the goods included under it. Analogous to agriculture, the food-processing sector can be identified as an export-driven sector with small import shares. A description of data sources for the macroeconomic social accounting matrix is explained in table 3 in appendix. One step towards to understand the regional structure of the Brazilian agriculture is to subdivide farms into large and small operations according to whether they exceed 100 hectares (with the exception of the Amazon where a large farm is assumed to exceed 200 hectares).[71]

Animal production plays a prominent role throughout Brazil, cutting across farm sizes. Value added in animal production, depending on the region, accounts for 42 to 62 percent of small-farm value added. For large farms, this ranges from 40 percent for South/Southeast to 86 percent in the Amazon. Other activities, such as annuals and perennials, vary in importance depending on the region and farm size. In the Amazon, production of annuals is important to smallholders but not to large farm enterprises. Quite the opposite is true in Center-West, where annuals are important to large farms (due to soy production) but not to small farms. Production of perennials is economically relevant to both farm sizes in the Northeast and South/Southeast and to small farms in the Amazon.

Production of annuals by smallholders in the Amazon is geared mainly toward manioc, rice, and beans. In the Northeast, smallholders produce those same staple goods, but maize, other annuals, and horticulture also constitute a considerable share of annuals production. The more diversified production in the Northeast relative to the Amazon may be explained by the different soil characteristics or by riskspreading behaviour adopted by small farms in the drought-prone Northeast. The main annual crop for large farms in the Northeast is sugarcane. In the South/Southeast, production of annuals is quite diversified, both at the small- and large-farm levels, with the small farms mainly producing maize, horticultural goods, and other annuals, and large farms producing sugarcane, maize, rice, soy, and other annuals.

With respect to perennials, smallholder production in the Amazon and the Northeast largely consists of other perennials (which include mango, avocado, papaya, coconuts, bananas, citrus, apples, and pears). Coffee, traditionally an important sector in the South/Southeast (for both small and large farms), has become an important product in the Amazon region with the development of coffee-producing areas in Rondônia. Coffee contributes as much as 23 percent of the value of smallholder production of perennials in the region. The remaining tree crop, cocoa, is produced mainly in the Northeast by both small and large farms. Animal product activities on large farms generally focus on beef and pork production, followed by milk production and poultry. Milk's share is larger at the small-farm level than the large. There is also more regional variation in terms of what is produced: for example, poultry constitutes an important share of animal products in the Northeast and South/Southeast but not in the other two regions.

According to data from IBGE[72], approximately 5 million farm enterprises exist in Brazil. Of these, 47.9 percent are in the Northeast, 38.1 percent in the South/Southeast, 9.3 percent in the North, and 4.9 percent in the Center-West. Most of these farms (74 percent) are operated by the owners, while renters and sharecroppers operate 11 percent of farms and squatters the remaining 15 percent. While in all regions a broad majority of producers operate small farms, medium and large farms account for most of the land.[73]

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[71] Cattaneo, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).
[72] Instituto Brasileiro de Geografia e Estatística, Statistical Database.
[73] Cattaneo, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

6.2 Implementation strategy of the different scenarios

Scenario 1: A proposal in the WTO negotiations of the Doha round of tariff reductions for market access submitted by the G-20[74] countries in advance of the ministerial conference in Hong Kong in October 2005. The suggested tariff reductions for the G-20 developing countries range from 40% for tariff rates above 130%, to tariff cuts of 25% for tariff rates from 30% and lower (for more detailed tariff reductions and calculations for the implementation of the proposal see tables 4-7 in appendix).[75]

Scenario 2: An income transfer of US$3 billion to rural and urban poor households, as part of the Zero Hunger Program. This amount represents 0.38% of GDP in the Brazilian SAM. This share of the income transfer represents an amount of R$2.134764 billion, with respect to GDP in 1995 (R$561.7809 billion). The rural and urban poor households respectively represent the shares, the rural poor 9.16% and the urban poor 90.84%, of the total poor households. For the simulation the amount of R$2.134764 billion respectively was divided into the shares of the rural and urban households.

Scenario 3: A combination of the proposal in the WTO negotiations of the Doha round of tariff reductions for market access submitted by the G-20 countries, and the income transfer of US$3 billion to rural and urban poor households, as part of the Zero Hunger Program.

7 Results of the simulations

This section discusses the results from the implementation of the different simulations. The results from the impacts are presented more in detail in table 8 in appendix.

7.1 Results of the different scenarios

Scenario 1: The results from the proposal in the WTO negotiations of the Doha round of tariff reductions for market access submitted by the G-20, shows an increase in the incomes for the rural and urban poor households with 0.48%. The total increase in incomes for all the households is 0.52%, and the rural poor households will have the highest increase in their incomes with 1.02%. The urban poor households will have the smallest increase in income of all the different households with 0.43%. The total increase in the activities and production is 0.73%. The GDP at factor cost will increase by 0.62%. The simulation also shows an increase in income associated to arable land with 1.71%. The change in domestic demand, and consumption of commodities was highest for soybeans, which had a considerable increase with 13.56%; followed by an increase in corn with 3.10%, processed food 2.98%, rice 2.92%, and horticultural products with 2.85%. The smallholder annuals will have an increase in the production by 1.77%, and the smallholder perennials will have a decrease in the production with –2.46%. The smallholder farmers (agricultural annuals and perennials included) will have an increase in their production with 0.49%. Smallholder farmers with livestock will have an increase in their production with 2.50%, and the smallholder other agricultural products will have an increase in the production with 1.36%. The food processing activities will have an increase in the production with 2.98%.

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[74] At the time of the proposal, the G-20 included Argentina, Bolivia, Brazil, Chile, China, Cuba, Ecuador, Egypt, India, Mexico, Nigeria, Pakistan, Paraguay, Philippines, South Africa, Thailand, Venezuela and Zimbabwe.
[75] Trade Agreements, Multifunctionality and EU Agriculture (2006).

Scenario 2: The results from the income transfer to rural and urban poor households, as part of the Zero Hunger Program, shows an increase in the incomes for the rural and urban poor households with 2.92%. The total increase in incomes for all the households is 0.93%. The rural poor households will have the highest increase in their incomes with 3.20%, directly followed by the urban poor households with an increase in their incomes with 2.90%. The total increase in the activities and production is 0.61%. The GDP at factor cost will increase by 0.62%. The simulation also shows an increase in income associated to arable land with 1.08%. The change in domestic demand, and consumption of commodities was highest for soybeans, which will increase by 2.74%; followed by an increase in other agricultural products with 1.18%, milk 1.17%, processed food 1.16%, and corn with 1.15%. The smallholder annuals will have an increase in the production by 1.08%, and the smallholder perennials will have an increase with 0.73%. The smallholder farmers (agricultural annuals and perennials included) will have an increase in their production with 0.97%. Smallholder farmers with livestock will have an increase in their production with 1.08%, and the smallholder other agricultural products will have an increase in the production with 1.18%. The food processing activities will have an increase in the production with 1.16%.

Scenario 3: The results from the proposal of tariff reductions for market access in combination with the income transfer, shows an increase in the incomes for the rural and urban poor households with 3.40%. The total increase in incomes for all the households is 1.45%. The rural poor households will have the highest increase in their incomes with 4.22%, directly followed by the urban poor households with an increase in their incomes with 3.32%. The total increase in the activities and production is 1.35%. The GDP at factor cost will increase by 1.24%. The simulation also shows an increase in income associated to arable land with 2.79%. The change in domestic demand, and consumption of commodities was highest for soybeans, which had a considerable increase with 16.30%; followed by an increase in corn with 4.25%, processed food 4.14%, rice 4.00%, and horticultural products with 3.98%. The smallholder annuals will have an increase in the production by 2.86%, and the smallholder perennials will have a decrease in the production with –1.73%. The smallholder farmers (agricultural annuals and perennials included) will have an increase in their production with 1.46%. Smallholder farmers with livestock will have an increase in their production with 3.58%, and the smallholder other agricultural products will have an increase in the production by 2.53%. The food processing activities will have an increase in the production with 4.14%.

7.2 Reduction in rural and urban poverty headcount

The elasticity of poverty headcount with respect to growth in income in Brazil is –2.19 for the rural households and –1.94 for the urban households. The poverty headcount is the proportion of the population that falls below the poverty line. The poverty line represents available data for the rural and urban poverty headcount ratio in percent of respective population group. The elasticity of poverty give information about what the percentage reduction in poverty headcount will be if the incomes in a given stratum rise by 1%.[76] The results from the impact of the three different scenarios show the increase in incomes for both the rural and urban poor households. These changes in incomes are multiplied by respective elasticity of stratum. These values then imply the decline in percentage of the rural and urban poverty headcount stratum of the population, the results are presented in table 9 in appendix.

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[76] Hertel, Keeney, Ivanic and Winters (2006).

8 Conclusions and Discussion

This section presents the conclusions, and a discussion about the different scenarios.

8.1 Conclusions

This study have analysed how the food security situation, for the rural and urban poor households, can be affected by changes in the trade policy, and also by the implementation of a social assistance program. The analyses include three different scenarios: (1) a proposal in the WTO negotiations of the Doha round of tariff reductions for market access, (2) an income transfer to rural and urban poor households, as part of the Zero Hunger Program, (3) and a combination of the proposal of tariff reductions and the income transfer. The analyses are based on a disaggregated Brazilian SAM from 1995. In this respect, the results of the simulations reveal the following points:

- The result of the impact from the simulation of the proposal in the WTO negotiations of the Doha round of tariff reductions for market access shows that the food security situation will improve for both the rural and urban poor households, due to increased incomes, increased production possibilities for the smallholder farmers and new employment incentives. The results also show in general an increased domestic demand for commodities produced by smallholder farmers.

The impact shows a decrease in the smallholder production of perennials, which include other perennials commodities[77]. This result may suggest that the smallholder farmers have to consider changing their production of commodities. Depending on the circumstances of production this change may be to annuals, horticultural products or other agricultural products. The results also shows that the food processing production will increase, and this may make it better off for the urban unskilled labour, which represent a large part of the employees in this sector. The increased domestic demand may reflect an improved economic situation for the households.

- The result from the simulation of the income transfer, as part of the Zero Hunger Program, shows that the food security situation will improve, and increase the incomes for both the rural and urban poor households. The rural poor households will benefit the most, with a higher increase in their incomes. The results show an increase in the production for the smallholder farmers. This response may lead to new employment incentives in this sector. The domestic demand will also increase for commodities produced by smallholder farmers.

Also in this scenario the food processing production will increase, and this can make it better off for the urban unskilled labour with employment opportunities. The increased consumption of commodities may be a result from an improved economic situation for the households.

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[77] For example other perennials include: mango, avocado, papaya, coconuts, bananas, citrus, apples and pears.

- The result from the combination of the proposal of tariff reductions and the income transfer shows that the rural and urban poor households will benefit and be able to improve their food security situation the most in this scenario. The results are similar with scenario 1 and 2, with an increase in the production, increased incomes and an increased domestic demand. But, in this scenario the result[78] from the impact is higher and will benefit the poor households the most.

The impact still shows a decrease in the smallholder production of perennials, but in this scenario the decrease will be smaller. The food processing production sector will increase also in this scenario, and may benefit the urban unskilled labour the most and create employment opportunities. The GDP at factor cost will increase the most in this scenario. To interpret the results from the different simulations, the situation and politics within the country when using the disaggregated Brazilian SAM from 1995 must be considered.

- The results from the reduction in poverty headcount show that the third scenario with the combination of trade liberalisation and the income transfer will reduce the rural and urban poverty headcount of the population the most. For the rural poor the poverty headcount of the population will decline from 51.4% to 46.7% and for the urban poor the decline will be from 14.7% to 13.8%. A comparison between scenario 1 and 2 shows that the income transfer will reduce both the rural and urban poverty headcount in percent of the population more than the trade liberalisation scenario.

8.2 Discussion

The Doha round of the WTO negotiations began in November 2001, and aims to lower trade barriers and permitting free trade between countries of varying prosperity. The proposals concerning market access of the EU, the US, the G-20 and the G-10[79] in advance of the WTO Ministerial Conference in Hong Kong in December 2005, deliver quantitative information on the tariff cuts by taking the four bands and the use of a tiered harmonisation formula into account. The changes in the value of exports used in the study come from the chapter; WTO agricultural negotiations: A comparison of recent proposals for market access in the book Trade Agreements, Multifunctionality and EU Agriculture. The analyses in the chapter are based on a general equilibrium GTAP model. This model provides an elaborate representation of the economy, including the linkages between the farming, agribusiness, industry and service sectors of the economy. The base run conducted represents a projection of the exogenous variables of population, GDP and factor endowment up to the year 2014. Parallel to the base run, a scenario was implemented. It takes account of the same projections and policy shocks, but additionally, the tariff cuts to open market access as proposed by the EU, the US, the G-20 and the G-10 in the negotiations of the Doha round was implemented. Against this background, the changes in the value of Brazil's exports from the G-20 proposal compared to the baseline are used in the implementation of the trade liberalisation scenario in this study.

The third scenario with the combination of the proposal of tariff reductions and the income transfer will include two types of policies; the income transfer with more immediate effects that aims to increase the food security situation in the short-term, and then the trade liberalisation proposal which may have an positive effect on the economic growth, and this in turn can be the key for poverty alleviation and a better food security situation in the medium-

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[78] The result will be a summation of scenario 1 and 2, due to linearity of equations in the model.
[79] The G-10 includes Bulgaria, Iceland, Israel, Japan, the Republic of Korea, Liechtenstein, Mauritius, Norway, Switzerland and Chinese Taipei.

and long-term. The Bolsa Família Program is a conditional cash transfers program (as part of the Zero Hunger Program), which means that in the medium-term the goal is to improve education and health conditions, by conditioning these transfers with requirements such as school attendance and health controls. In the long run this program will promote human-capital accumulation, and this may also lead to economic growth and reduced poverty. The relative higher elasticity of the rural households may be explained with that the rural population density at the poverty line is quite high. The rural poor had a higher increase in their households incomes in the different scenarios compared with the urban poor, and this may also be an explanation for the higher reduction of poverty headcount for the rural poor households. Growth elasticity may be used to reflect the distributional pattern of growth and in the literature there is shown that the growth elasticity tends to be smaller the higher the level of inequality in the country, and this in turn could lead to a more modest poverty reducing effect of growth.

While the Heckscher-Ohlin trade theory suggest that in relatively unskilled-labour-abundant countries trade liberalisation will relieve poverty, in practice other factors may need to be considered. For instance, trade liberalisation may be accompanied by skill-biased technical change, which can mean that skilled labour may benefit relative to unskilled labour. For example, many Latin American countries (like Brazil) have strong endowments of mineral and agricultural resources, and so liberalisation will stimulate these sectors (like the soybean production) rather than labour-intensive ones. The poorer households may be less able to take advantage of positive opportunities created by the trade reform. In such circumstances there may be an important role for complementary policies to accompany trade reform, and to enhance its impact to have poverty reducing effects. These policies may be to make rural credit and technical support available, and provide incentives for family agriculture.

An interesting scenario had been to look at the impacts of a land reform and a redistribution of agricultural land from large farms to smallholders, as part of the Zero Hunger Program. The Brazilian government has worked for to redistribute 20 million acres[80] of agricultural land to 350 000 families, and improve the incentives for family agriculture. But, the land reform is an element of the supply side, and the SAM model is demand-driven. The arable land sector, that would be affected, is endogenous and demand-driven. Therefore, this scenario is not analysed in this study.

Brazil's Zero Hunger Program is one step towards the Millennium Development Goals, adopted in 2000 by the member states of the United Nations. The linkage with agriculture is particularly strong for the first goal – and that is to halving by 2015 the proportion of those suffering from extreme poverty and hunger. Brazil's Minister of Social Development and the Fight against Hunger, Patrus Ananias de Sousa, said in a presentation at the Inter-American Development Bank that the Brazilian experience of the Zero Hunger Program is very valuable, and that similar programs have been undertaken across Latin America, according to local conditions in each country[81].

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[80] 1 international acre is equal to the metric unit of 0.40468564224 hectares. 20 million acres then represents a redistribution of 8.093713 million hectares of land.
[81] The Inter-American Development Bank, Saying no to hunger (2006).

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Appendix

GDP per capita growth (annual %)
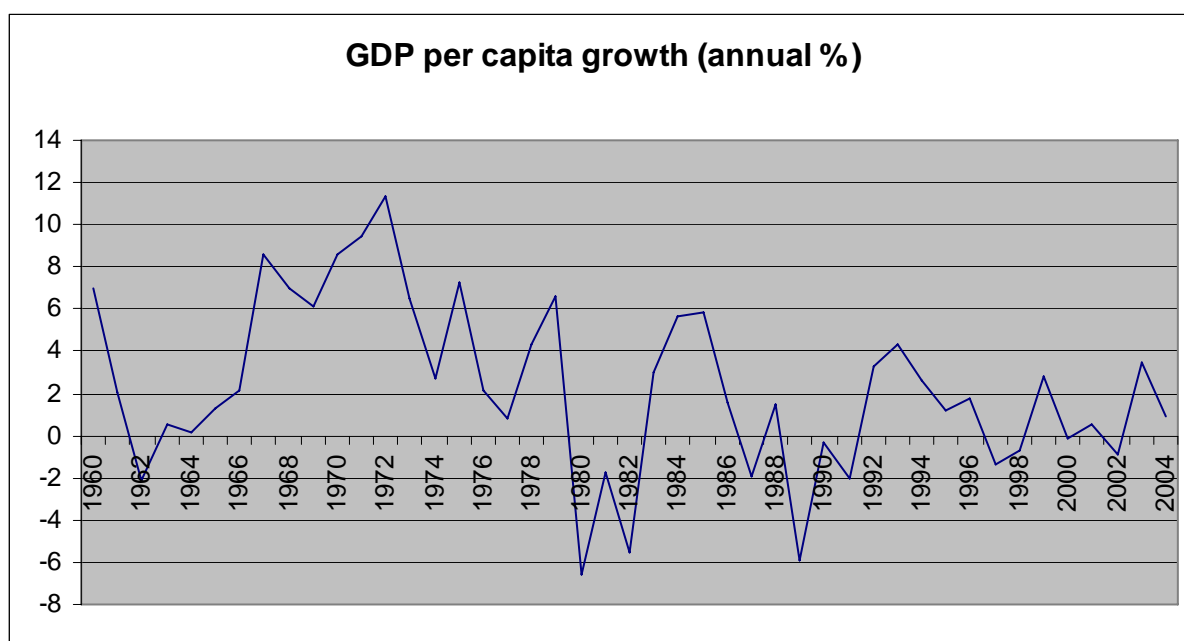
Figure 7. GDP per capita growth (annual %).
Source: The World Bank, the World Development Indicators 2006 (WDI) database.

The macroeconomic social accounting matrix (see table 3 on page 38):
The intermediate consumption represent a value[82] of 615.36 and the sales of marketed production is 1267.96. Value added at factor costs consist of 339.32. The government revenue represent a value of income taxes which amount to 51.86; enterprise taxes 27.92; tariffs paid on imports 5.54; indirect taxes 90.82 and direct taxes 79.78. The expenditures of the government consist of government transfers to private households, social security payments plus interest payments to domestic creditors, which represent a value of 95.66. Foreign remittances to households amount to 3.50 and private savings of the households represent 37.37. Retained earnings for enterprises consist of 102.98 and net capital inflow is 16.29. The government savings is negative and represent a value of −30.00. The gross profits to formal enterprises consist of 222.47 and enterprises transfers to the rest of the world amount to 11.05. Distributed profits from enterprises to the household's represent a value of 80.51 and the returns (rents) of the fixed factors consist of 222.47.[83]

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[82] All values are in R$ current billion.
[83] Cattaneo, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

Table 3. Data sources for macroeconomic social accounting matrix, 1995 (R$ current billion)

Row	Column	Receipts/Expenditures	Description
Activities	Commodities	1267.96	Sales of marketed production at producer prices calculated from gross value of production
Commodities	Activities	615.36	Intermediate consumption
Commodities	Households	429.75	Marketed consumption by households
Commodities	Government	110.48	Total government expenditure including salaries
Commodities	Rest of world	46.31	Total export revenue (includes export taxes)
Commodities	Saving and investment	126.64	Total investment (includes inventory changes)
Labour	Activities	339.32	Labour component of value added at factor cost
Capital	Activities	222.47	Capital component of value added at factor cost
Enterprises	Capital	222.47	Gross profits to formal enterprises
Households	Labour	339.32	Private and public sector wages
Households	Enterprises	80.51	Distributed profits. Equals income of formal enterprises less enterprise taxes, retained earnings, and depreciation
Households	Government	95.66	Government transfers to private households. Social security payments plus interest payments to domestic creditors
Households	Rest of world	3.50	Foreign remittances to households. Net remittances of workers
Government	Commodities	5.54	Tariffs paid on imports
Government	Enterprises	27.92	Enterprise taxes
Government	Households	51.86	Income taxes
Government	Indirect taxes	90.82	Government receipts of indirect tax revenue, equal to output taxes plus import tariffs less export subsidies
Indirect taxes	Activities	90.82	Output taxes. Comprised of per unit output price taxes and interstate production tax
Saving and investment	Enterprises	102.98	Retained earnings plus depreciation
Saving and investment	Households	37.37	Private savings
Saving and investment	Government	-30.00	Government savings. Government expenditure less government receipts.
Saving and investment	Rest of world	16.29	Net capital inflow. This cell ensures balance between foreign exchange availability and imports of goods and nonfactor services
Rest of world	Commodities	55.05	Imports

Source: Cattaneo, Research report 129, Balancing Agricultural Development and Deforestation in the Brazilian Amazon (2002).

Table 4. Proposal for market access by the G-20

Tariff rate (%)	Tariff cut (%)
>130	40
>80≤130	35
>30≤80	30
0≤30	25
Cap: 150%	

Source: Brockmeier et. al., WTO agricultural negotiations: A comparison of recent proposals for market access (2006).

Table 5. Aggregation of sectors in the trade liberalisation scenario

Sectors GTAP	Abbreviations	Commodities SAM
1. Wheat, cereal grain nec	CERE	Corn
2. Oil seeds	osd	Soybean
3. Sugar cane, sugar beet	c_b	
4. Paddy rice	pdr	Rice
5. Vegetables, fruit, nuts	v_f	Other perennials, other annuals
6. Cattle, sheep, goats, horses	ctl	Livestock
7. Animal products nec	oap	
8. Raw milk	rmk	
9. Meat: cattle, sheep, goats, horses	cmt	Processed food
10. Meat products nec	omt	Processed food
11. Dairy products	mil	Processed food
12. Sugar	sgr	Processed food, sugar cane
13. Food products nec, vegetable oils and fats, processed rice	OFOOD	Processed food
14. Other primary sectors: Plant-based fibres, crops nec, wool, silk-worms, cocoons, forestry, fishing coal, oil, gas, minerals nec, wood products, petroleum, coal products	OPRI	Extractivist forest products, logging, mining and oil
15. Industry: Beverages and tobacco products, textiles, wearing apparel, leather products, wood products, paper products, publishing, chemical, rubber, plastic products, mineral products nec, ferrous metals, metals nec, metal products, motor vehicles and parts, transport equipment, electronic equipment, machinery and equipment, manufactures nec	MNFCS	Industrial products
16. Services: Electricity, gas, manufactures, distribution, water, construction, trade, transport nec, sea transport, air transport, communication, financial services nec, insurance, business services nec, recreation and other services, public administration/defence/ health/education, dwellings	SVCES	Services

Sources: Brockmeier et. al., WTO agricultural negotiations: A comparison of recent proposals for market access (2006), and author's aggregation of commodities.
Notes: The analyses are based on the comparative static, multi-regional general equilibrium Global Trade Analysis Project (GTAP) model. The model provides an elaborate representation of the economy, including the linkages between the farming, agribusiness, industry and service sectors of the economy.

Table 6. Changes in the value of exports after the implementation
of the G-20 proposal for market access

Sectors	Value of exports in the baseline (2014) (mn US$)	Change of value of exports after the G-20-proposal simulation (in %)
1.CERE	360.7	308.01
2. osd	5005.9	48.02
3. c_b	0.0	0.00
4. pdr	46.6	-76.18
5. v_f	768.8	-11.60
6. ctl	6.8	-29.41
7. oap	249.9	-12.77
8. rmk	4.8	-43.75
9. cmt	1434.4	501.31
10. omt	5670.3	-44.45
11. mil	57.1	3.68
12. sgr	1787.2	11.40
13. OFOOD	8014.6	-14.84
14. OPRI	13258.4	0.46
15. MNFCS	36243.2	0.88
16. SVCES	8517.4	-1.50

Sources: Brockmeier et. al., WTO agricultural negotiations: A comparison of recent proposals for market access (2006), and author's calculations.

Table 7. The vector of shocks in absolute values used in the trade liberalisation scenario

Commodities SAM	Change of value of exports after the G-20-proposal simulation (in %)	The vector of shocks in absolute values[b]
Coffee	0.00	0.000000
Cocoa	0.00	0.000000
Corn	308.01	0.013898
Rice	-76.18	0.000000
Beans	0.00	0.000000
Manioc	0.00	0.000000
Other perennials	-11.60	-0.449242
Other annuals	-11.60	-0.297077
Sugar cane	11.40	0.000000
Soybean	48.02	0.310171
Horticultural products	0.00	0.000000
Milk	0.00	0.000000
Livestock	-29.41	-0.000108
Poultry	0.00	0.000000
Extractivist forest products	0.46	0.001856
Logging	0.46	0.000467
Deforestation	0.00	0.000000
Other agricultural products	0.00	0.000000
Processed food[a]	21.73	2.382081
Mining and oil	0.46	0.078383
Industrial products	0.88	0.040353
Construction	0.00	0.000000
Trade and transportation	0.00	0.000000
Services	-1.50	0.000000

[a] For processed food 21.73% is a weighted average of sectors 9-13 in table 6 with respect to the change of value of exports after the G-20-proposal.
[b] Multiplication of the change of values in export after the G-20-proposal with the sectoral exports values for commodities in the SAM.
Source: Author's calculations.

Table 8. Percentage change from Base Year in the SAM for variables per simulation

Variables	Simulation 1 Trade liberalisation	Simulation 2 Income transfer	Simulation 3 Trade liberalisation combined with income transfer
Activities:			
Smallholder annuals	1.77	1.08	2.86
Large farm annuals	3.56	1.20	4.76
Smallholder perennials	-2.46	0.73	-1.73
Large farm perennials	-2.04	0.76	-1.28
Smallholder livestock	2.50	1.08	3.58
Large farm livestock	2.47	1.03	3.49
Smallholder other agri. products	1.36	1.18	2.53
Large farm other agri. products	1.36	1.18	2.53
Forest products	0.60	0.46	1.06
Food processing	2.98	1.16	4.14
Mining and oil	0.34	0.13	0.48
Industry	0.49	0.48	0.97
Construction	0.04	0.05	0.09
Trade and transportation	0.94	0.61	1.55
Services	0.39	0.70	1.08
Commodities:			
Coffee	2.71	1.14	3.85
Cocoa	0.31	0.42	0.74
Corn	3.10	1.15	4.25
Rice	2.92	1.08	4.00
Beans	2.26	1.16	3.41
Manioc	1.72	1.12	2.84
Other perennials	-6.23	0.47	-5.76
Other annuals	-2.67	0.68	-2.00
Sugar cane	1.14	0.66	1.80
Soybeans	13.56	2.74	16.30
Horticultural products	2.85	1.13	3.98
Milk	2.52	1.17	3.69
Livestock	2.44	0.96	3.40
Poultry	2.56	1.16	3.72
Extractivist forest products	0.73	0.47	1.20
Logging	0.68	0.52	1.20
Deforestation	0.00	0.00	0.00
Other agricultural products	1.36	1.18	2.53
Processed food	2.98	1.16	4.14
Mining and oil	0.34	0.13	0.48
Industrial products	0.49	0.48	0.97
Construction	0.04	0.05	0.09
Trade and transportation	0.94	0.61	1.55
Services	0.39	0.70	1.08
Factors:			
Urban unskilled labour	0.50	0.64	1.14
Urban skilled labour	0.52	0.62	1.14
Rural unskilled labour	1.30	1.00	2.30
Rural skilled labour	0.59	0.94	1.53
Small farm agricultural capital	1.40	1.03	2.43
Large farm agricultural capital	2.29	1.05	3.34
Non-agricultural capital	0.51	0.54	1.04
Arable land	1.71	1.08	2.79
Grassland	2.48	1.05	3.53
Forested land	0.60	0.46	1.06
Institutions:			
Urban poor	0.43	2.90	3.32
Urban medium	0.44	0.51	0.95
Rural poor	1.02	3.20	4.22
Rural medium	0.84	0.69	1.53
High income	0.54	0.51	1.05
Enterprises	0.61	0.59	1.20

Source: Author's calculations.

Table 9. Percentage reduction in rural and urban poverty headcount

Simulation	Impact	Poverty Indicator	Reduction in poverty	Poverty Indicator
Scenario	Change in income (%)	Rural and urban poverty headcount, (% of population) [base period]	Change in poverty headcount (%)	Rural and urban poverty headcount, (% of population) [post scenario period]
Trade liberalisation:				
Rural poor	1.02	51.4	-2.23	50.3
Urban poor	0.43	14.7	-0.83	14.6
Income transfer:				
Rural poor	3.20	51.4	-7.01	47.8
Urban poor	2.90	14.7	-5.63	13.9
Trade and transfer:				
Rural poor	4.22	51.4	-9.24	46.7
Urban poor	3.32	14.7	-6.44	13.8

Notes: The impacts on poverty headcount indicators have been calculated assuming the following growth elasticity of poverty:
Rural household: -2.19
Urban household: -1.94
Sources: The World Bank, the World Development Indicators 2006 (WDI) database, and author's calculations.

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Distribution:

Sveriges lantbruksuniversitet
Institutionen för ekonomi
Box 7013
750 07 Uppsala

Tel 018-67 21 65

Swedish University of Agricultural Sciences
Department of Economics
P.O. Box 7013
SE-750 07 Uppsala, Sweden

Fax + 46 18 673502