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RESEARCH REPORT 161

Philippine Agricultural and Food Policies

Implications for Poverty and Income Distribution

Caesar B. Cororaton and Erwin L. Corong

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Foreword

Since the mid-1980s, the Philippines has undertaken a series of trade reforms to enhance domestic producer efficiency and encourage exports. Although the reforms have reduced protection on nonagricultural products significantly, protection on agricultural goods and food items remains high, driving domestic food prices up, much to the detriment of the poor. Similarly, over the past two decades, the Philippines has undergone dramatic structural changes as agriculture's share of the gross domestic product declined considerably, resulting in the country switching from being a net exporter to a net importer of agricultural products.

Using an economywide computable general equilibrium model linked to a household survey, this research report assesses the impact on poverty and economic equality of a continuing trade reform program that emphasizes reducing protection on agriculture and major food items in the Philippines. The report also explores the effects of an agricultural policy aimed at improving the productivity of inbred rice varieties.

To understand better the implications of these policies, the study traces their expected effects up to the year 2020, carefully analyzing the transmission channels from the macroeconomic to the microeconomic level: from gross domestic product to output and factor supplies and demands; from commodity and factor prices to household incomes, levels of poverty, and income distribution. Simulation results show that reducing protection on agriculture and food items reduces poverty and improves income distribution as factor prices increase while consumer prices fall. On the other hand, a higher productivity in rice leads to higher rice output, lower rice imports, and a significant reduction in domestic rice prices. Across all households, it is the first decile that benefits the most, as rice forms a significant part of their consumption basket.

Overall, these simulation results suggest that well-targeted policies could help alleviate poverty and reduce income inequality in the developing world. I hope that this research report will find its way into public policy discussions in the Philippines and elsewhere.

Joachim von Braun
Director General, IFPRI

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Acronyms and Abbreviations

AFMA	Agriculture and Fisheries Modernization Act
AFMP	Agriculture and Fisheries Modernization Program
CA	Census of Agriculture
CES	constant elasticity of substitution
CET	constant elasticity of transformation
CGE	computable general equilibrium
CIF	cost, insurance, and freight
DA	Department of Agriculture
DAR	Department of Agrarian Reform
FGT	Foster, Greer, and Thorbecke
FIES	Family Income and Expenditure Survey
GDP	gross domestic product
GIC	growth incidence curve
GMA	Ginintuang Masaganang Ani ("Golden and Bountiful Harvest")
HRCP	Hybrid Rice Commercialization Program
IFPRI	International Food Policy Research Institute
I-O	input-output
LES	linear expenditure system
LFS	Labor Force Survey
LGU	local government unit
MAV	minimum access volume
MPS	market price support
MV	modern variety (of palay)
NAP	National Accounts of the Philippines
NFA	National Food Authority
NPR	nominal protection rate

OSEC	Office of the Secretary, Department of Agriculture
P0	poverty incidence
P1	poverty gap
P2	poverty severity
PAN AP	Pesticide Action Network Asia and the Pacific
PDAF	Priority Development Assistance Fund
QR	quantitative restriction
SAM	social accounting matrix
SDT	special and differential treatment
SP	special products
SSM	special safeguard mechanism
TFP	total factor productivity
TRP	tariff reform program
TV	traditional variety (of palay)
TWANTR	trade-weighted average nominal tariff rates
WANSTR	weighted applied nominal I-O sectoral tariff rates
WTO	World Trade Organization

Summary

The Philippines has undergone a series of trade reforms since the mid-1980s that have reduced protection on nonagricultural goods. However, protection on key food items is still in effect, and this has led to high domestic food prices. Such high prices have a considerable negative effect on poverty because more than 60 percent of the consumption of poor Filipino households is for food.

The special product arguments of the World Trade Organization increase the pressure to maintain the existing high levels of food protection in the country. Special products treatment provides developing countries with the flexibility to implement tariff reduction programs over an extended period for certain self-designated products. These special product discussions are based on food security, livelihood, and rural development arguments.

This research report assesses the poverty and income distribution implications of trade reform that is focused on agriculture and major food items (rice, corn, sugar, beef, chicken, pork, processed meat products, fruits and vegetables, and processed fruits) in the Philippines. A dynamic-recursive computable general equilibrium model calibrated to the social accounting matrix for the Philippine economy for the year 2000 and a microsimulation model that uses the 2000 Family Income and Expenditure Survey are used to analyze possible policy shifts.

The simulation results indicate that trade reform in agriculture and major food items will have favorable effects on factor prices and bring about a significant reduction in consumer prices. Real household income will increase while poverty and income inequality decline. These findings therefore imply that maintaining existing trade protections on agriculture and major food items—which drive food prices up—will not solve the problem of poverty and income inequality in the Philippines.

In the year 2000 the incidence of poverty in the Philippines was 34 percent. In 2003 it declined to 30.4 percent. The incidence of poverty in rural areas is higher than that in urban areas: 48.8 percent and 18.6 percent in 2000, respectively. Over the past two decades, significant structural changes have taken place in the Philippine economy. The share of agriculture in the total gross domestic product has declined. The country has switched from being a net exporter to a net importer of agricultural products and food items. The widening trade gap in agriculture and food has made the Philippines vulnerable to fluctuations in the world market. For example, the international rice crisis in 2008 has adversely affected the domestic market for rice in the Philippines. The deterioration in the net trade position of the country in food has largely been caused by the high growth in domestic food demand relative to production. Domestic food production lags behind demand because of declining productivity. There is increasing demand for food items with higher income elasticities, and there is also increasing pressure from high population growth.

To address this growing trade gap in agriculture and food, the government has adopted a strategy to improve rice productivity. This is a step in the right direction: based on our rice productivity simulation results, higher rice productivity will increase domestic production and reduce imports of rice. Most importantly it will reduce consumer prices. Most of the benefits of improved rice productivity would

go to the households in the first decile of the population, since rice has the largest share in their consumption basket relative to the rest of the household groups. There is a reduction in poverty incidence and income inequality.

However, implementation of the Philippine government's rice productivity program is costly, inefficient, and ineffective. In 2001 the government introduced a new technology, hybrid rice. Its adoption was aggressively pursued by the government through the Hybrid Rice Commercialization Program (HRCP). Under the HRCP the production of hybrid rice seeds is supported by the government through (1) procurement of seeds at a guaranteed price, (2) distribution of the procured seeds to participating farmers at half the procurement price, and (3) payment of additional money to participating farmers to help defray their fertilizer input costs. The government has devoted significant resources, through a system of subsidies, to supporting the HRCP.

However, the results are not encouraging. The adoption rate of hybrid rice is very low. There is a high dropout rate among participating farmers, because hybrid rice seeds are so expensive and farmers have to purchase them every planting season rather than reusing them (which would result in drastically decreased yields). The massive government subsidies have distorted the ability of farmers to make an informed choice between hybrid and inbred rice varieties.

Thus instead of supporting the HRCP the government should spend its limited resources on research and development that focuses on improving the yield of inbred rice. Enhancing an inbred-based system that is adapted to farmers' familiar practice of saving, reusing, and exchanging seeds would be a more responsive approach to improving productivity than promoting such costly technologies as hybrid rice, which has not yet achieved commercially viable levels.

CHAPTER 1

Introduction

One of the major structural programs implemented since the mid-1980s by the Philippine government has been in the area of foreign trade. The country has undergone a series of trade reforms that have reduced protection on nonagricultural goods. However, key food items are still subject to high protection, which has resulted in high domestic food prices. More than 60 percent of the consumption of poor Filipino households is for food, and thus these food prices have a negative impact on those households.

Recently there has been increasing pressure to maintain the existing high levels of food protection under the special product (SP) arguments of the World Trade Organization (WTO). These discussions stem from food security, livelihood, and rural development concerns.

Under Article 13 of the 2001 Doha Ministerial Declaration, developing countries are given the option to designate products for special and differential treatment (SDT). As part of the 2004 July Framework and the succeeding discussions in the 2005 Hong Kong Ministerial Declaration and the special session of the Committee on Agriculture in May 2006, two additional windows were added: the SP provision and the special safeguard mechanism (SSM) (WTO 2005, 2006). The SP provision provides developing countries the flexibility to implement a tariff reduction program over an extended period for certain self-designated products. They may also exempt these self-designated products from the minimum access provisions. On the other hand, if there are sudden surges in imports and declines in prices, the SSM provides developing countries with a special mechanism to deal with them.

This research report has two objectives. First, it assesses the poverty and income distribution implications of maintaining high protection on key food items in the Philippines. The assessment is carried out through a series of simulations using a dynamic-recursive computable general equilibrium (CGE) model calibrated to a social accounting matrix (SAM) of the Philippine economy. The results of the CGE model simulations then serve as the basis for a microsimulation process—which uses detailed household data from the 2000 Family Income and Expenditure Survey (FIES)—to assess the poverty and income distribution effects of high levels of protection on major food items.

Over the past two decades, significant structural changes have occurred in the Philippine economy. The contribution of agriculture to the total gross domestic product (GDP) has declined. Similarly, as the growth in domestic demand surpassed the growth in domestic production, Philippine agriculture has switched from a net exporter to a net importer, especially of food items. The increased demand is the result of higher demand for items with high income elasticities, and to a certain extent high population growth. The deceleration in domestic production is due to declining productivity. To address this issue the government vigorously pursued a rice productivity program aimed at improving rice yield through the introduction of so-called hybrid rice.

The second objective of this research report is to assess the poverty and income distribution implications of improved rice productivity. The impact on poverty and income distribution is traced through economywide (macro and sectoral) effects, as well as effects on factor prices, commodity prices, household income and welfare, and income distribution and poverty.

The rest of the report is organized as follows. Chapter 2 explains the structure of the Philippine economy and discusses major shifts in trade and agriculture policies, patterns of nominal protection rates for key food items, trends in public expenditure on agriculture, and the government's rice productivity program. Chapter 3 discusses poverty levels in the Philippines and the food consumption patterns of urban and rural poor and non-poor households. The fourth chapter explains the structure of the CGE model in terms of relationships among key variables and presents the inherent structure of the Philippine economy based on the SAM used to calibrate the model. Chapter 5 discusses the design of the policy experiments and details the assumptions used in the baseline case and in the four policy experiments. The sixth chapter, which is divided into two parts, presents and discusses the results of the policy experiments. The first part discusses the results of the CGE simulation; the second part considers the results of the microsimulation. Finally, Chapter 7 provides a summary of the results and draws lessons for policy.

CHAPTER 2

The Philippine Agricultural Sector

To put the following discussion into perspective, this chapter discusses the structure of the Philippine economy with particular focus on the agricultural sector. It highlights major shifts in policies in trade and agriculture, patterns of nominal protection rates for key food items, trends in public expenditure on agriculture, and specific agricultural programs.

Structure of the Philippine Economy

Over the past two decades, there have been significant changes in the structure of the Philippine economy. The share of agriculture in the country's GDP declined from 21.6 percent in 1991–94 to 14.2 percent in 2005–07 (Table 2.1). Over the same period, the shares for industry and manufacturing remained relatively stable at about 30 percent and 20 percent, respectively, while the share for services increased from 45.4 percent to 54.2 percent.

Palay (rice paddy) is the dominant crop in agriculture. Over the past 15 years, there has been an increase in the amount of agricultural land devoted to palay production. Of the available agricultural land, 26.3 percent was planted with palay in 1993; the share increased to 33.8 percent in 2007 (Table 2.2). The share of palay in the value of overall agricultural output increased from 28.6 percent in 1993 to 35.7 percent in 2007.

Corn and coconut are also major agricultural crops in the Philippines. The share of agricultural land devoted to corn production has declined from 25.2 percent in 1993 to 20.3 percent in 2005, while the share of agricultural land planted with coconut has increased from 24.6 percent to 27 percent. The share of corn in the value of agricultural output has improved slightly, from 12.3 percent in 1993 to 12.9 percent in 2007, while the share of coconut has declined from 13.2 percent to 11.7 percent.

There have also been significant shifts in the structure of demand—most notably in foreign trade, which has evolved as a dominant sector in the Philippine economy. The share of exports of goods and services improved from 30.3 percent in 1990–94 to 51.1 percent in 2000–04, before declining slightly to 45.8 percent in 2005–07 (Table 2.3). Likewise the share of imports of goods and services increased from 36 percent in 1990–94 to 53.3 percent in 2000–04, but it decreased slightly to 47.4 percent in 2005–07.

In merchandise exports, the share of agricultural exports dropped from 40 percent in 1980–84 to 6.6 percent in 2005–06 (Table 2.4), while the share of manufactured exports surged from 44 percent to 88 percent in those same years. There have been significant shifts in manufactured exports as well. Exports of clothing and garments at first saw strong growth, although this was later surpassed by the growth in exports of electronic products. At present, 60 percent of the US$47 billion of merchandise

Table 2.1 Production structure of the Philippine economy, 1991–2007 (percent share)

Sector	1991–94	1995–99	2000–04	2005–07
Agriculture, fishing, and forestry	**21.6**	**19.0**	**15.1**	**14.2**
Agriculture and fishing	21.2	18.9	15.1	14.1
Forestry	0.4	0.2	0.1	0.1
Industry	**33.0**	**31.7**	**31.9**	**31.6**
Mining and quarrying	1.2	0.7	0.8	1.3
Manufacturing	24.1	22.3	22.9	22.7
Construction	5.3	5.9	5.0	4.0
Electricity, gas, and water	2.5	2.7	3.1	3.6
Services	**45.4**	**49.3**	**53.0**	**54.2**
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: National Statistical Coordination Board, *National Income Accounts,* various years.

Table 2.2 Production structure of Philippine agriculture, 1993 and 2007 (percent share)

	1993		2007	
Commodity	Area	Value of output	Area[a]	Value of output
Cereals	**51.4**	**40.9**	**54.1**	**48.6**
Palay[b]	26.3	28.6	33.8	35.7
Corn	25.2	12.3	20.3	12.9
Major crops	**33.0**	**34.4**	**36.6**	**35.6**
Coconut	24.6	13.2	27.0	11.7
Sugarcane	3.1	5.5	3.1	5.7
Banana	2.6	6.0	3.5	11.4
Pineapple	0.3	3.1	0.4	1.9
Coffee	1.2	1.6	1.1	1.1
Mango	0.5	3.6	1.4	3.4
Tobacco	0.7	1.4	0.2	0.4
Other crops	**15.6**	**24.8**	**9.3**	**15.8**
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Bureau of Agricultural Statistics, CountrySTAT, Philippines, various years.
[a]Data for 2005.
[b]Rice paddy.

Table 2.3 Expenditure structure of the Philippine economy, 1990–2007 (percent share)

Expenditure item	1990–94	1995–99	2000–04	2005–07
Private consumption	74.1	73.4	69.5	69.7
Government consumption	10.1	12.6	11.6	9.7
Gross capital formation	22.8	22.1	18.3	14.8
Exports of goods and services	30.3	45.9	51.1	45.8
Less: Imports of goods and services	36.0	52.6	53.3	47.4
Statistical discrepancy	–1.3	–1.4	2.9	7.4
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: National Statistical Coordination Board, *National Accounts of the Philippines,* various years.

exports from the Philippines comprises office and telecommunications equipment, of which semiconductors are a major subsector. The declining share of garment exports from the Philippines is partly due to exports of clothing from China. More significant is the absence of a competitive and efficient local textile industry that can support the garments sector; fabrics used in garments are mostly imported.

In contrast, agricultural imports make up a relatively stable share of total imports—about 10 percent, which are mainly food items. At present, of the US$50 billion of merchandise imported into the Philippines, almost 60 percent comprises office and telecommunications equipment. This is primarily for the semiconductor sector, which is generally an assembly-type operation in which the main value addition is labor. Raw materials are imported from foreign companies operating in the Philippines. Thus, despite the surge in manufactured exports (Table 2.4), the share of manufacturing in overall GDP (Table 2.1) has not improved through the years.

Another notable trend in Table 2.4 is the deterioration in agriculture net trade, particularly that of food. Beginning as a net exporter of more than US$1 billion of agricultural and food products per year in the first half of the 1980s, the Philippines has experienced a continuous decline in its net trade position in these commodities. In 2005–06 the annual average agriculture trade deficit was US$800 million, the bulk of which was accounted for by food imports. This deficit has come about despite the government's effort to implement food self-sufficiency policies and programs.

The literature attributes the growing trade deficit in agricultural and food products to higher growth in domestic demand relative to domestic production. The growth in domestic production lags behind demand because of declining agricultural productivity and comparative advantage. David (2003) has shown a decreasing trend in revealed comparative advantage in agriculture and agricultural exports (Table 2.5), indicative of declining Philippine competitiveness in the international market. As a result the country's share of agricultural exports in the world market has declined sharply. Coxhead and Jayasuriya (2003) have measured declining lowland and upland productivity in the Philippines. According to Habito and Briones (2005), while the Philippines is on a par with other countries in terms of land productivity, overall productivity in the crop subsector has stagnated. Moreover, while David (2003) has noted an improvement in productivity in poultry and livestock, Mundlak, Larson, and Butzer (2004) have reported that the contribution of total factor productivity (TFP) to the growth of agricultural output fell sharply from 36 percent in 1961–80 to 9 percent in 1980–98. This trend is in sharp contrast to the experience of Indonesia and Thailand, where substantial TFP improvements occurred over the same period.

On the other hand, higher demand is a result of increased demand for items with higher income elasticities—such as wheat, milk and dairy products, and beef—in which the Philippines does not have a comparative advantage (David, Intal, and Balisacan 2007). In the case of rice, there has been a buildup in the level of stocks. In addition demand is higher because of significant growth in population (Dawe, Moya, and Casiwan 2005). The average annual population growth rate in the Philippines is about 2.3 percent, which is high compared to the rates for other dynamic economies in the region.

Trade Policies

In 1949 the Philippines embarked on a development strategy of industrial import substitution with reduced emphasis on agriculture and exports. The strategy provided protection to domestic producers of final goods through high tariffs on competing imports and low tariffs on essential producer inputs. Yet the policy was largely ineffective because manufactur-

Table 2.4 Foreign trade structure of the Philippine economy, 1980–2006

Commodity	1980–84	1985–89	1990–94	1995–99	2000–04	2005–06
Structure of exports (average percent share)						
Agricultural products	40.3	28.3	18.5	9.5	6.0	6.6
Food	34.5	23.9	17.0	8.6	5.5	6.1
Fuels and mining products	15.4	11.1	8.2	3.9	3.1	5.4
Fuels	1.0	n.a.	2.3	1.2	1.2	2.0
Manufactures	44.3	60.6	73.3	86.6	90.9	88.0
Iron and steel	1.0	n.a.	0.5	0.2	0.1	0.4
Chemicals	1.8	n.a.	2.8	1.5	1.1	1.5
Pharmaceuticals	0.1	n.a.	0.1	0.1	0.1	0.1
Machinery and transport equipment	19.6	25.7	36.0	65.1	75.7	72.3
Office and telecommunications equipment	17.7	21.6	30.0	56.7	64.8	56.8
Electronic data processing and office equipment	0.0	n.a.	2.2	15.8	20.1	18.2
Telecommunications equipment	0.4	n.a.	7.4	4.4	3.1	2.2
Integrated circuits and electronic components	0.9	n.a.	13.0	39.7	41.6	36.4
Automotive products	0.7	n.a.	0.7	1.4	2.5	3.5
Textiles	1.1	1.0	1.5	1.3	0.8	0.6
Clothing	9.8	16.4	19.7	9.9	6.5	5.6
Structure of imports (average percent share)						
Agricultural products	11.2	12.8	11.0	10.0	8.7	7.5
Food	9.0	10.1	8.7	8.3	7.5	6.7
Fuels and mining products	30.5	20.9	16.5	11.2	13.2	16.9
Fuels	32.0	n.a.	13.0	8.4	10.7	14.5
Manufactures	58.4	66.3	72.5	78.7	78.1	75.6
Iron and steel	5.8	n.a.	4.8	3.9	2.9	2.6
Chemicals	11.0	n.a.	10.6	8.6	8.2	7.3
Pharmaceuticals	1.0	n.a.	1.2	1.0	1.0	1.0
Machinery and transport equipment	32.0	33.3	42.1	54.3	56.7	57.6
Office and telecommunications equipment	10.6	15.5	17.6	32.1	41.9	44.5
Electronic data processing and office equipment	0.7	n.a.	2.6	7.3	9.6	7.6
Telecommunications equipment	1.6	n.a.	5.3	4.9	4.5	2.6
Integrated circuits and electronic components	0.4	n.a.	7.8	21.9	27.8	34.3
Automotive products	3.7	n.a.	4.3	3.8	2.7	2.1
Textiles	3.9	7.5	6.4	3.8	3.1	2.2
Clothing	0.0	0.1	0.2	0.2	0.2	0.2
Exports less imports (million US$)						
Agricultural products	1,201	681	57	–1,086	–994	–807
Food	1,076	636	291	–719	–765	–638
Fuels and mining products	–1,562	–834	–1,826	–2,801	–3,766	–5,942
Fuels	–462	n.a.	–1,846	–2,502	–3,510	–6,292
Manufactures	–2,206	–1,383	–4,561	–3,817	3,798	1,404
Iron and steel	–76	n.a.	–730	–1,232	–1,048	–1,122
Chemicals	–144	n.a.	–1,441	–2,463	–2,633	–2,945
Pharmaceuticals	–13	n.a.	–179	–316	–361	–467
Machinery and transport equipment	–1,454	–1,009	–3,352	–874	6,196	3,371
Office and telecommunications equipment	10 6	133	188	4,272	7,641	2,988
Electronic data processing and office equipment	–10	n.a.	–32	1,506	3,653	4,227
Telecommunications equipment	–20	n.a.	–17	–440	–491	–308
Integrated circuits and electronic components	3	n.a.	6	3,051	4,479	–932
Automotive products	–281	–265	–650	–919	–95	496
Textiles	–239	–504	–863	–956	–852	–840
Clothing	503	997	1,947	2,262	2,265	2,351

Source: World Trade Organization, *Time Series on Merchandise and Commercial Services Trade,* various years.
Note: n.a.—Not available.

Table 2.5 Trend in revealed comparative advantage in agriculture, selected years, 1960–98 (percent)

					Pineapple	
Year	Agriculture	Coconut	Sugar	Banana	Canned	Fresh
1960	3.0	n.a.	n.a.	n.a.	n.a.	n.a.
1965	2.7	131.8	15.3	n.a.	n.a.	n.a.
1970	2.6	145.0	21.4	n.a.	n.a.	n.a.
1975	3.8	211.2	22.0	29.3	n.a.	n.a.
1980	2.9	224.1	12.1	30.4	82.2	48.9
1985	2.4	212.3	7.6	31.2	91.6	59.7
1990	1.6	212.4	3.8	23.4	70.2	54.6
1995	1.1	153.5	2.0	14.1	41.5	23.6
1998	0.8	105.3	1.4	8.8	33.2	11.5

Source: David (2003).
Note: n.a.—Not available.

ing value added and industrial employment increased only minimally. In 1970 the government shifted its policies toward export promotion by extending tax exemptions and fiscal incentives to capital-intensive firms located in export-processing zones. This strategy also achieved very little because of the continued presence of highly skewed intersectoral tariff protection favoring import-substituting manufactured goods. In addition the imposition of export taxes, the policy of maintaining an overvalued exchange rate, and the presence of government corporations (which not only regulated domestic prices but also siphoned off the gains from domestic and international trade) created a strong bias against agriculture and exports.

The restrictive trade policies adopted between the 1950s and the late 1970s created serious market distortions (Austria and Medalla 1996). The policies penalized the domestic economy in three respects: (1) import controls resulted in an overvalued exchange rate that favored import-substituting firms; (2) continued protection increased domestic output prices, which became an impediment to forward linkages; and (3) tariff escalations and import controls weakened backward linkages, as tariffs on capital and intermediate goods were kept low relative to those on finished products.

These policy biases promoted rent-seeking activities and distorted economic incentives against investments in agriculture. The agricultural sector—which served as the country's backbone, providing the necessary foreign exchange needed by the import-dependent manufacturing sector—stagnated, and its comparative advantage eroded. This system of protection led the industrial sector to concentrate on import-dependent, assembly-type operations with minimal value added and few or no forward and backward linkages. Realizing the pitfalls of both the import-substitution policy and the following export-promotion strategy, the government began implementing a series of tariff reform programs (TRPs) in 1981.[1]

The first phase of the tariff reform program (TRP 1) started in the early 1980s and had three major components: tariff reductions, an import liberalization program, and realignment of indirect taxes. The maximum tariff rates were reduced from 100 to 50 percent. Between

[1]The TRPs were major components of the structural programs funded by loans from the World Bank and the International Monetary Fund in the 1980s.

1983 and 1985 sales taxes on imports and locally produced goods were equalized. The markup applied to the value of imports (for sales tax valuation) was also reduced and eventually eliminated. Implementation of TRP 1 was suspended during the balance of payments crisis of 1984–85, but the program resumed in 1986.

In 1991 the government launched TRP 2 to realign tariff rates over a five-year period. The realignment involved narrowing tariff rates through a series of reductions in the number of commodity lines with high tariffs and an increase in the number of commodity lines with low tariffs. The program was aimed at clustering tariff rates within the 10–30 percent range by 1995. In 1992 a program to convert quantitative restrictions (QRs) into tariff equivalents was initiated. In 1995 the Philippines, under the WTO, committed to gradually removing QRs from imports of sensitive agricultural products (products identified by the government as being politically sensitive), with the exception of rice, by switching to tariff measures.

In 1995 the government implemented TRP 3, which established a four-tier tariff schedule: 3 percent for raw materials and capital equipment not available locally, 10 percent for raw materials and capital equipment available from local sources, 20 percent for intermediate goods, and 30 percent for finished goods. But the overriding goal of TRP 3 was to implement a uniform tariff rate of 5 percent by 2005.

In 1996, also under TRP 3, the government implemented a tariff quota system for sensitive agricultural products. According to the minimum access volume (MAV) provision, a relatively low tariff rate was imposed on imported sensitive agricultural products up to a minimum import level (in-quota tariff rate), while a higher tariff rate was levied beyond the minimum import level (out-quota tariff rate). Table 2.6 lists products included in the MAV provision and their in-quota and out-

Table 2.6 In-quota and out-quota tariff rates of selected commodities (percent)

Commodity/tariff rate	1996	2000	2005
Live pork (swine)			
Less than 50 kg			
In-quota	30	30	30
Out-quota	60	45	35
50 kg or more			
In-quota	30	30	30
Out-quota	40	35	35
Live sheep and goats			
In-quota	30	30	30
Out-quota	60	45	40
Live poultry (2 kg or more)			
In-quota	40	40	35
Out-quota	80	50	40
Pork meat (swine)			
In-quota	30	30	30
Out-quota	100	60	40
Sheep and goat meat (fresh or chilled)			
In-quota	30	30	30
Out-quota	60	40	35
Chicken meat			
In-quota	50	45	40
Out-quota	100	60	40
Duck meat			
In-quota	50	45	30
Out-quota	100	60	40
Potato (fresh or chilled)			
In-quota	50	45	40
Out-quota	100	60	40
Onions			
In-quota	30	30	40
Out-quota	100	60	40
Garlic			
In-quota	30	30	40
Out-quota	100	60	40
Coffee			
In-quota	50	45	30
Out-quota	100	60	40
Sugarcane			
In-quota	50	50	50
Out-quota	100	65	65
Corn			
In-quota	35	35	35
Out-quota	100	65	50
Rice (milled or wholly milled)	50	50	50

Table 2.7 Most favored nation tariff rates in the Philippines, 1990–2005 (percent)

Sector	1990–94	1995–99	2000	2001	2002	2003	2004	2005
Sectoral weighted average	28.8	21.3	17.4	14.1	12.6	11.8	10.8	14.4
Agriculture, fishing, and forestry	23.6	19.5	16.6	15.7	15.1	14.9	14.5	14.4
Mining	1.4	0.7	–0.2	0.4	0.3	0.4	0.4	0.4
Manufacturing	32.3	23.2	18.7	14.3	12.4	11.3	9.9	15.2
Food processing	46.2	40.4	35.1	27.0	24.6	23.1	21.5	31.6
Ratio of agriculture tariff to manufacturing tariff	0.7	0.8	0.9	1.1	1.2	1.3	1.5	0.9

Source: Philippine Tariff Commission (2007).

quota tariff rates. One easily sees that, whereas there has been a reduction in the out-quota tariff rates across commodities, the in-quote rates have remained generally unchanged since 1996. By 2005 the in-quota and out-quota tariffs for several products had been equalized, although still at relatively high levels.

In 1998 TRP 4 was undertaken to recalibrate the tariff rate schedules implemented under the previous TRPs. The decision to recalibrate resulted from a review process that evaluated the pace of tariff reduction in line with the competitiveness of local industry and the need to raise additional government revenues. With TRP 4 the planned uniform tariff rate was suspended.

Table 2.7 shows the effects of the TRPs on nominal tariff rates. The overall average tariff rate declined from 28.8 percent in 1990–94 to 10.8 percent in 2004, although it increased to 14.4 percent in 2005. Although all tariff rates across commodities decreased, there were differences in the rates of decline. The average tariff rate on agriculture in 1990–94 was 23.6 percent, which was lower than the average tariff rates on manufacturing (32.3 percent) and on food processing (46.2 percent). In 2004 the average tariff rate on agriculture was 20.1 percent, whereas that on manufacturing was 9.9 percent. The ratio of the average tariff on agriculture to the average tariff on manufacturing increased from 0.8 in 1990 to 1.5 in 2004. However, in 2005 an increase in the average tariff rate on manufacturing (to 15.2 percent) was largely due to the increase in the tariff rate on food processing (to 31.6 percent). Aldaba (2005) attributed the increase in tariffs on manufactured commodities in 2005 to reversals in trade policy, which tended to undermine the gains from the TRPs. This policy reversal was the outcome of political pressures from various interest groups.

David, Intal, and Balisacan (2007) provided estimates of the nominal protection rates (NPRs) of major agricultural commodities.The NPR measures the difference between domestic wholesale and border prices. As such, it can be an estimate of the price wedge between them. The wedge can be the result of tariff rates and all other market distortions. Table 2.8 presents the historical NPRs of eight key agricultural commodities.[2]

[2]The estimates of NPRs by David, Intal, and Balisacan (2007) extend until 2004. We expanded the series to 2007 using available data from the World Bank, the International Monetary Fund, and the Philippine Bureau of Agricultural Statistics. Furthermore, in the original estimates of David, Intal, and Balisacan (2007), the NPRs for chicken, pork, and beef were derived using import unit values from Singapore. To be consistent with the NPRs of the other commodities, the NPRs presented in Table 2.8 for chicken, pork, and beef were derived using the world price of these items as reported in the World Bank data-

Table 2.8 Nominal protection rate, 1960–2007 (percent)

				Coconut				
Year	Rice	Corn	Sugar	Oil	Copra	Beef	Chicken	Pork
1960–64	20	53	9	–16 –24		30 115		–13
1965–69	12	44	86	–29 –31		–32 163		–24
1970–74	4	19 –37		–31 –35		–53	84	–38
1975–79	–13	30 –26		–20 –28		–25	91	–39
1980–84	–13	25	19	–28 –37		15 100		–28
1985–89	16	67 122		–16 –31		6	56	2
1990–94	26	70 51		–7	–26	31 69		43
1995–99	67	86 107		–12 –20		103	43	88
2000	87	104 82		–17	–33	73 23		53
2001	83 79		73	–21	–33	26	8 37	
2002	63	51 111		–13 –18		18	5	76
2003	49	30 86		21	–20	28 –2		49
2004	21	41 47		–10	–30	–1 –5		32
2005	15 53		15	–16	–34	5	0 47	
2006	19 51		2	–11	–32	16	22 80	
2007	27	32 80		–10	–28	26 27		94

Source: David, Intal, and Balisacan (2007) for 1960–2005; International Monetary Fund, IMF Commodity Prices (2008) and Bureau of Agricultural Statistics, CountrySTAT, Philippines (2008) for 2006 and 2007.

In the second half of the 1970s and the first half of the 1980s the NPR of rice was negative. Yet this negative NPR had little effect on the producers because of high world commodity prices, together with the Green Revolution and various land reform programs. During the Green Revolution there was an expansion of irrigation programs and introduction of new seeds and fertilizers, all of which increased rice productivity. The government also expanded credit facilities available to rice farmers. Under the land reform programs, tenant rice farmers became owner-operators.

However, the sharp fall in investment in irrigation and the stagnating yield potential of newer rice varieties in the 1980s slowed the domestic production of rice significantly. The drop in the world price of rice increased the NPR of rice from an average of 16 percent in 1985–89 to 67 percent in 1995–99. It reached a peak of 87 percent in 2000. However, there has been a general decline in the NPR of rice since then. In 2005 the NPR dropped to its lowest level, 15 percent. There are two reasons for the decline: the increase in the world price of rice and the depreciation of the Philippine currency. This is illustrated in Table 2.9: the world price of rice increased from US$192 per metric ton in 2000 to US$301 per metric ton in 2005 while the exchange rate depreciated from PhP44/US$1 to PhP55/US$1. In contrast the wholesale price of rice increased only from PhP15,900 per metric ton in 2000 to PhP19,100 in 2005.

The NPR of corn was always positive and increasing during the years prior to and including 2000, reaching a peak of 104 percent in 2000. However, unlike rice, which is a staple food of Filipinos, there is not much political pressure on corn. The high domestic corn prices are major concerns only for livestock growers, because corn is a major ingredient in animal feed.

Similar to rice, there has been a declining trend in the NPR of corn since the peak in

base. Similar to the method of David, Intal, and Balisacan (2007), to convert world prices to border prices we factored in an additional 15 percent to account for cost, insurance, and freight.

Table 2.9 Exchange rate, world prices, and domestic wholesale prices, 1960–2007

		World price (CIF, US$/metric ton)								Wholesale price (PhP [thousands]/metric ton)							
Coconut													Coconut				
Year	PhP/US$	Rice	Corn	Sugar	Oil	Copra	Beef	Chicken	Pork	Rice	Corn	Sugar	Oil	Copra	Beef	Chicken	Pork
1960–64	4	109	58 119		322	209	837 502		885	0.5 0.3		0.3	0.9	0.5	3.8	3.6	2.5
1965–69	4 145		61	58 405		241	1,210	431	993	0.6	0.3 0.4		1.1	0.7	3.2	4.4	3.0
1970–74	7	222	93 280		578	361	1,776 535		1,317	1.1 0.7		0.7	2.8	1.6	5.4	6.4	5.2
1975–79	7 304		125	292 703		478	2,170	796	2,184	1.9	1.2 1.4		4.1	2.6 11.2		11.2	9.9
1980–84	17 346		147	343 826		541	2,838	907	2,950	2.9	1.9 2.9		6.7	3.9 33.5		18.1	21.4
1985–89	†22 263		114	202 554		377	2,695	1,096	2,509	6.1	3.8 8.1		9.6	5.4 59.0		34.8	47.4
1990–94	26 293		122	267 553		370	2,905	1,290	1,857	9.4	5.4	10.4	13.5	7.2 99.5		56.8	65.2
1995–99	39	293	138	263	799	514	2,097 1,528		1,610 15.3		7.9	16.5	22.7	13.4	134.6	68.7	90.9
2000	44	192	102	207	518	350	2,222 1,504		1,500 15.9		9.2	16.7	19.1	10.4	169.6	81.6	101.5
2001	51	171	103	219	366	232	2,449	1,610	1,554	16.0	9.4 19.3		14.7 7.9 157.5			88.7	108.4
2002	52	196	114	175	484	306	2,421 1,596		1,196 16.5		8.9	19.0	21.7	13.0	146.9	86.2	108.8
2003	54	205	121	180	537	345	2,277 1,675		1,351 16.5		8.6	18.1	35.3	14.9	157.5	88.5	109.0
2004	56	256	129	182	760	518	2,889	1,916	1,797	17.3	10.1	14.9	38.4	20.3	160.4 101.9 132.4		
2005	55	301	113	256	710	476	3,017	1,876	1,724	19.1	9.5	16.2	33.0	17.4	174.8 103.8 139.3		
2006	51	319	140	375	698	463	2,941	1,749	1,623	19.5	10.9	19.6	31.8	16.2	175.8 109.9 149.7		
2007	46	352	187	254	1,057	698	2,992	1,978	1,623	20.7	11.4	21.1	44.1	23.1	173.6 116.2 145.2		

Source: David, Intal, and Balisacan (2007) for 1960–2005; International Monetary Fund, IMF CommodityPrices (2008) and Bureau of Agricultural Statistics, CountrySTAT, Philippines (2008) for 2006 and 2007.

Note: CIF—cost, insurance, and freight.

2000. The NPR dropped to its lowest value of about 30 percent in 2003 and 2007. This trend is due to the higher world price of corn and to the depreciation of the Philippine currency. The world price of corn increased from US$102 per metric ton in 2000 to US$187 in 2007. The domestic wholesale price of corn increased only from PhP9,200 to PhP11,400 per metric ton over the same period.

Among agricultural crops, sugar has been one of the most highly protected commodities in the Philippines. It has the highest NPR among key agricultural crops. Two periods are of particular interest. Before the expiration of the Laurel-Langley Agreement in 1974, nearly all domestic production of sugar was exported to the United States. The high NPR during this period was in effect an income transfer from U.S. consumers to Filipino domestic sugar producers. However, after the expiration of the agreement, when a large portion of local production was consumed domestically, the high NPR of sugar shifted the burden to Filipino consumers and food processors. During both periods Filipino domestic sugar producers benefited from the high NPR (David, Intal, and Balisacan 2007).

After 2000, although the NPR of sugar remained generally high, it fluctuated considerably. It declined to 73 percent in 2001 but surged to 111 percent in the following year. It dropped to its lowest level, 2 percent, in 2006 before increasing to 80 percent in 2007. The wide swings in the NPR were due to erratic movements in the world price of sugar. The domestic wholesale price of sugar, however, did not fluctuate as widely as its world price.

Because of an export tax and an export ban, the NPR of coconut (copra and coconut oil) is negative, and this has adverse effects on coconut farmers. The devaluation in the 1970s and the world commodity boom did not translate into higher profits for coconut farmers. Instead the export tax resulted in high revenues for the government, and the export ban resulted in lower raw material costs for the coconut oil milling industry. These policies were eliminated beginning in 1986. However, the continued existence of a government corporation that at present controls 70–80 percent of the coconut oil milling capacity implies that the government retains control over the domestic price of copra.

The producers of chicken broilers were highly protected until the second half of the 1980s. During these years the NPR of chicken was generally above 100 percent. Although it declined in the 1990s, it nevertheless remained above 50 percent.

The world price of chicken has not increased significantly except in 2007. It was the depreciation of the Philippine currency from 2000 to 2005 that resulted in the drop in the NPR of chicken during these years. In 2007 the NPR of chicken was 27 percent.

The NPRs of both beef and pork were negative in the 1970s. They became positive in the 1980s and surged to higher levels in the 1990s. While the NPR of beef has declined, the NPR of pork remains very high.

Before the mid-1980s the NPRs of agricultural inputs such as fertilizers, agricultural chemicals, and farm machinery (Table 2.10) were generally higher compared with those of agricultural crops (with the exception of sugar). This was largely due to the government's industrial promotion policies, which increased the domestic prices of manufactured inputs to agriculture. However, after this period and during the period of trade liberalization there was a substantial reduction in the NPRs of agricultural inputs. From 2000 to 2004 these remained at a uniform 3 percent.

Public Expenditure in Agriculture

There have been major shifts in public expenditures on agriculture. In 2000 the Office of the Secretary (OSEC) of the Department of Agriculture (DA) was a major line item,accounting for 71.3 percent of total expenditures (Table 2.11).

Table 2.10 Nominal protection rates for agricultural inputs, 1960–2004 (percent)

Input	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99	2000–04
Fertilizer[a]									
Urea	49	55	–13	28	21	11	5	3.4	3
Amorphous	17	32	–9	54	19	15	12	3	3
Pesticide[b]	24	24	29	35	35	20	16	7.2[c]	3
Tractors[b]									
Two-wheel	24	20	21	24	24	12	10	10	3
Four-wheel	24	20	21	24	24	12	10	10	3
Threshers[b]	24	24	24	24	24	30	22	10	3
Water pumps[b]	46	46	46	46	46	30	24	10	3

Source: David, Intal, and Balisacan (2007).
[a]Based on price comparison, that is, the percentage difference between the ex-warehouse price and the CIF import unit value, where CIF is cost, insurance, and freight.
[b]Based on book tariff rates. The implicit tariff from 1960 to 1984 includes the markup for the import tariff and the advance sale tax (10 percent and 25 percent, respectively). The advance sale tax was abolished in 1986 and thus the implicit tariffs from 1985 onward include only the tariff rate.
[c]This refers to insecticide.

Table 2.11 Total public expenditure on agriculture, 2000–05

Department of Agriculture agency	2000	2001	2002	2003	2004	2005
	Billion PhP					
Office of the Secretary	14.783	2.447	3.565	2.818	3.183	2.329
Other DA-attached agencies and corporations	5.949	4.636	2.864	12.014	6.527	14.458
National Food Authority	2.000	2.586	0.960	10.742	4.938	12.941
Agriculture and Fisheries Modernization Program	—	15.864	13.309	10.064	10.178	13.565
Total	20.732	22.947	19.737	24.897	19.888	30.352
Total public expenditure on agriculture as percent of:						
National government expenditure	3.2	3.2	2.5	3.0	2.2	3.2
Gross domestic product	0.7	0.6	0.5	0.6	0.5	0.6
GDP—agriculture, fishing, and forestry	4.1	4.2	3.6	4.2	3.1	4.1

Source: Department of Budget and Management (2005) and National Statistical Coordination Board, various years.
Note: DA—Department of Agriculture; GDP—gross domestic product.

However, after the implementation of the Agriculture and Fisheries Modernization Program (AFMP) in 2001, much of OSEC's budget was reallocated to AFMP. Expenditure for OSEC declined from PhP14.78 billion in 2000 to PhP2.45 billion in 2001. From 2002 to 2005 the budget allocated to OSEC remained within the range of PhP2–3 billion, whereas that for AFMP was more than PhP10 billion annually.

Another notable pattern is the expenditures for other agencies and corporations attached to the DA, of which the National Food Authority (NFA) is a major entity. There was a spike in public expenditures for these agencies, increasing from PhP2.9 billion in 2002 to PhP12 billion in 2003. This increase was largely due to an increased budget allocation for the NFA, which has been in financial distress. The NFA allocation increased from PhP0.96 billion in 2002 to PhP10.74 billion in 2003. It declined to PhP4.94 billion in 2004 but rebounded again to PhP12.94 billion in 2005.

Overall public expenditure on agriculture is not substantial, accounting for only about 3 percent of total government spending. Public expenditure on agriculture represents about 0.6 percent of GDP and 4 percent of agricultural GDP. A World Bank technical working paper on public expenditure on Philippine agriculture found that there is relative underspending by comparison with other nations (World Bank 2007). In terms of GDP, Philippine spending on agriculture is comparable to that of the Lao People's Democratic Republic and Vietnam; it is lower than that of other middle-income countries, such as China and Thailand. This underspending is mainly due to the country's inherent fiscal constraints and limited financial capability, as indicated by its low tax ratios relative to other middle- and high-income developing countries.

The Agriculture and Fisheries Modernization Act

A major policy shift in agriculture policy took place when the Agriculture and Fisheries Modernization Act (AFMA) was approved by the Philippine Congress in 1997. The AFMA (Republic Act 8435) has five broad objectives: (1) food security; (2) poverty alleviation and social equity; (3) income enhancement and profitability, especially for those engaged in farming and fishing; (4) global competitiveness; and (5) sustainability. The AFMA was implemented through the AFMP in 2001, when the government started allocating funds for the program from the General Appropriations Act. When President Gloria Macapagal-Arroyo took office in 2001, various programs were instituted under the AFMA, including the Ginintuang Masaganang Ani (Golden and Bountiful Harvest; GMA) programs in rice, corn, coconut, sugar, high-value commercial crops, livestock, and fisheries. In 2003 the AFMA was amended by the Philippine Congress to further strengthen its expected impact. The amendment included exemptions for enterprises engaged in agriculture from tariffs and from import duties on all types of agriculture and fisheries inputs—including imports of chemicals, seeds, machinery, and equipment—until 2015.

Table 2.12 Components of the Agriculture and Fisheries Modernization Program of the Department of Agriculture, 2001–05 (percent share)

Expenditure item	2001	2002	2003	2004	2005
Irrigation services	44.3	53.4	43.9	41.2	40.4
Postharvest facilities	5.9	3.0	1.1	5.7	10.6
Other infrastructure	7.3	2.4	2.2	—	—
Agro-industry modernization credit and financing program	1.3	0.0	0.6	1.4	0.9
Farmer-fisherman marketing assistance	1.1	0.5	0.6	0.6	0.5
Research and development	8.3	5.0	4.2	5.5	5.2
Capability building of farmer and fisherman organizations and LGUs	7.9	6.6	4.6	4.5	11.4
Salary supplement for extension workers under LGUs	3.0	3.8	5.3	4.6	—
National information network	0.5	0.4	0.6	0.5	1.1
Regulatory services	2.0	10.3	6.2	5.7	3.3
Production support	10.5	9.6	27.3	26.6	21.7
Policy and planning	0.3	0.4	1.2	2.3	—
Human resources development	0.0	0.1	—	—	—
Program management	7.5	4.4	2.2	1.2	4.9
Total	100.0	100.0	100.0	100.0	100.0

Source: Department of Agriculture.
Note: LGUs—local government units.

Table 2.12 presents the breakdown of the AFMP budget. The largest component, accounting for more than 40 percent of total spending, is irrigation services. Another major item is production support. Its share increased dramatically from 10.5 percent in 2001 to 27.3 percent in 2003 but then declined slowly to 21.7 percent in 2005. Cororaton (2008) has argued that, while the amount budgeted for irrigation services and production support is substantial and increasing over time, it does not come close to violating the WTO agreements on limits to domestic support. This is because support for irrigation services falls under the Green Box of the WTO notification framework, while production support falls under the SDT provision. In both accounts of the WTO notification framework, there are no set limits for developing countries like the Philippines. The only WTO limits that are applicable to the Philippines are those for market price support (MPS), which is 10 percent of the value of production of the supported commodity (also called the de minimis limit in the WTO agreement). The Philippines has MPS for rice and corn, but Cororaton (2008) has found that it falls far below the de minimis limit both in the past and at present, and that it will most likely fall below the limit in the future.

Table 2.13 shows the breakdown of expenditure on the AFMP by major commodity groups. Because of the preoccupation with food security concerns, the budget allocation process gives a disproportionate share to rice production. In fact, in the development plan for the Philippine economy for the period 2004–10, one of the primary objectives was to make food plentiful at affordable prices. The government equates overall concern for food security with rice sufficiency. The World Bank (2007) study found that from 2001 to 2005 expenditures on rice production accounted for almost 60 percent of the budget, while spending on agricultural commodities accounted for less than 10 percent. In contrast, government funding for exportable agricultural crops has been quite modest.

The National Food Authority

As already discussed, the budget allocation for agriculture is geared toward food self-sufficiency, particularly toward rice sufficiency. The government has set up a system of price supports to assist rice farmers and has imposed a price ceiling to help consumers. It procures rice from farmers, controls imports, and maintains buffer stocks to stabilize supply and prices. It also acts to minimize seasonal price variations in different regions. The northern and southern parts of the Philippines have different wet and dry seasons. Their rice planting and harvesting seasons vary accordingly, resulting in periods of rice surpluses and deficits in different parts of the country. One of the tasks of the NFA is to ensure a continuous supply of rice at stable prices across the country by moving surpluses

Table 2.13 Distribution of expenditures by commodity groups, 2000–05 (percent)

Commodity group	2000	2001	2002	2003	2004	2005
Rice	39.1	53.8	59.0	53.2	56.6	58.0
Non-rice	11.5	12.6	8.3	7.5	9.6	8.7
Livestock	6.5	8.2	5.7	4.4	5.3	4.2
Fisheries	9.2	12.3	14.0	16.6	13.7	8.5
Other commodities	33.7	13.1	13.0	18.2	14.9	20.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Bank (2007).

Table 2.14 Rice supply and National Food Authority intervention, 1990–2007 (thousand metric tons)

			Rice supply			National Food Authority intervention			
						Procurement			
Year	Palay production	Gross supply	Production	Imports	Beginning stocks	Palay	Rice[a]	Rice importation	Rice injection
1990	9,319	8,391	6,095	606	1,690	572	374	621	670
1991	9,673	8,225	6,326	—	1,899	555	363	—	158
1992	9,129	8,091	5,970	1	2,120	420	274	—	521
1993	9,434	8,045	6,170	202	1,673	155	101	210	485
1994	10,538	8,336	6,892	—	1,444	61	40	—	112
1995	10,541	8,656	6,894	264	1,498	8	5	257	257
1996	11,284	9,668	7,379	867	1,422	124	81	893	733
1997	11,269	9,885	7,370	722	1,793	101	66	720	623
1998	8,555	9,745	5,595	2,171	1,979	62	40	2,136	1,627
1999	11,787	10,821	7,708	834	2,279	561	367	782	1,372
2000	12,389	11,107	8,103	639	2,365	663	434	617	1,169
2001	12,955	11,447	8,473	808	2,166	474	310	739	813
2002	13,271	12,146	8,679	1,196	2,271	300	196	1,238	1,239
2003	13,500	12,163	8,829	886	2,448	296	194	698	1,120
2004	14,497	12,844	9,481	1,001	2,362	208	136	984	1,342
2005	14,603	13,423	9,550	1,822	2,051	76	50	1,805	1,666
2006	15,327	13,834	10,024	1,716	2,094	73	48	1,622	1,508
2007	16,240	14,679	10,621	1,805	2,253	n.a.	n.a.	n.a.	n.a.

Source: Bureau of Agricultural Statistics and National Food Authority.
Note: n.a.—Not available.
[a]Palay procurement converted into rice procurement using a rice recovery ratio of 0.654.

from production areas to deficit consumption areas. Furthermore, the government not only manages domestic rice distribution but also monopolizes rice importation and exportation. All of these government interventions are implemented through the NFA. The NFA is also involved in the corn market, but the scope of its intervention there is significantly less than in the rice market.

The NFA's procurement of palay has declined considerably, from 6 percent of total production in 1990 to 0.5 percent in 2006 (Table 2.14). A key reason for this decline is the financial difficulty currently faced by the NFA.[3] However, the authority remains heavily involved in rice importation. From 1998 to 2006, the NFA's rice imports accounted for about 15 percent of rice production (assuming 65.4 percent rice recovery from palay). In 2005 and 2006, the amount of rice that NFA injected into the market was almost equal to that which it imported.

The fiscal cost of the government's program for rice self-sufficiency is substantial, as reflected in the NFA's surging financial deficit. From 2000 to 2005, the NFA's cumulative deficit amounted to PhP44.2 billion (Table 2.15). In 2005 its deficit of PhP10 billion was almost half the total deficit of all government-owned and -controlled corporations. In 2006 the deficit further deteriorated to PhP16.4 billion.

[3]There have also been claims that some rice farmers are hesitant to sell to the NFA. A majority of the farmers who availed themselves of credit from the government during the Green Revolution of the 1970s have not repaid the loans, and they fear that their credit history from that period might be revived once they resume transactions with the government.

Table 2.15 Deficit of the National Food Authority, 2000–06 (million PhP)

Deficit	2000	2001	2002	2003	2004	2005	2006
National Food Authority deficit	–1,897	–2,274	–8,086	–3,689	–1,836	–9,978	–16,430
Total deficit of monitored government-owned and -controlled corporations	–19,160	–24,540	–46,360	–65,320	–85,410	–21,700	n.a.
Ratio of National Food Authority deficit to total deficit of government-owned and -controlled corporations	9.9	9.3	17.4	5.6	2.1	46.0	n.a.

Source: Department of Finance.
Note: n.a.—not available.

Table 2.16 Financial performance of the National Food Authority, 2000–06 (million PhP)

Financial accounts	2000	2001	2002	2003	2004	2005	2006
Total receipts	**22,688**	**14,408**	**19,472**	**17,136**	**25,239**	**40,591**	**30,369**
Operating receipts	21,523	12,480	19,176	16,886	24,387	40,375	30,101
Sales of goods and services	21,523	12,390	18,256	15,964	19,806	27,204	25,290
Current subsidies	0	90	920	922	4,581	13,171	4,811
Other receipts	1,165	1,928	296	250	852	216	268
Current expenditures	**28,474**	**15,342**	**23,742**	**24,765**	**31,493**	**46,664**	**44,041**
Operating expenditures	22,768	11,138	19,596	18,810	26,339	40,846	37,625
Other operating expenditures	5,706	4,204	4,146	5,955	5,154	5,818	6,416
Interest payments	1,430	1,718	1,471	1,964	2,748	3,186	3,927
Others	4,276	2,486	2,675	3,991	2,406	2,632	2,489
Internal cash generation	**–5,786**	**–934**	**–4,270**	**–7,629**	**–6,254**	**–6,073**	**–13,672**
Capital expenditures[a]	**–3,888**	**1,341**	**3,815**	**–3,939**	**–4,418**	**3,905**	**2,758**
Financing deficit (–) or surplus (+)	**1,898**	**2,275**	**8,085**	**3,690**	**1,836**	**9,978**	**16,430**
Net domestic financing	1,898	2,578	8,085	3,840	1,853	9,996	16,497
Net domestic bank credits	–89	3,244	8,109	–311	107	5,732	17,328
Net other domestic financing	1,987	–666	–24	4,151	1,746	4,264	–831
Net external financing	0	–303	0	–150	–17	–18	–67

Source: Department of Finance.
[a]The major component is changes in inventories.

Table 2.16 shows the NFA's financial statement, including current subsidies from the national government. In 2005 the subsidy was more than PhP13 billion. However, despite the subsidies, the NFA's deficit has remained substantial, and its net domestic bank credit has increased considerably. Furthermore the subsidy from the national government is expected to surge because of the rice crisis in 2008. Yet the subsidy will not be enough to finance the NFA's growing deficit, and its indebtedness will continue to increase. Because the maintenance of stability in the rice market has significant political ramifications in the Philippines, the government will be forced to absorb NFA's debt, putting further pressure on it in the face of an already tight budget.

The Rice Sector

Palay or rice is the major agricultural commodity in the Philippines. To underscore the importance of this crop, this section and the next offer a brief discussion of its production structure, including the ongoing program for hybrid rice that attempts to increase rice productivity.

Table 2.17 Palay production, area planted, and yield, 1990–2007

	Production (million metric tons)				Area planted (million hectares)			Yield (metric tons/hectare)		
Year	Total production	Growth (%)	Irrigated	Nonirrigated	Total area	Irrigated	Nonirrigated	All Philippines	Irrigated	Nonirrigated
1990	9.3	n.a.	6.6 2.7		3.3	2	1.3	2.8 3.3 2.1		
1991	9.7	3.8	6.8 2.8		3.4	2.1	1.4	2.8 3.3 2.1		
1992	9.1	–5.6	6.6 2.5		3.2	2	1.2	2.9 3.3 2.1		
1993	9.4	3.3	6.7 2.7		3.3	2	1.3	2.9 3.3 2.1		
1994	10.5	11.7	7.5 3		3.7	2.2	1.4	2.9 3.4 2.1		
1995	10.5	0	7.6 2.9		3.8	2.3	1.4	2.8 3.3 2.1		
1996	11.3	7	8.2 3		4	2.5	1.5	2.9 3.3 2.1		
1997	11.3	–0.1	8.5 2.8		3.8	2.5	1.3	2.9 3.4 2.1		
1998	8.6	–24.1	6.7 1.9		3.2	2.2	1	2.7 3.1 1.9		
1999	11.8	37.8	8.9 2.9		4	2.7	1.3	2.9 3.3 2.1		
2000	12.4	5.1	9.4 3		4	2.7	1.3	3.1 3.5 2.2		
2001	13	4.6	9.8 3.2		4.1	2.7	1.3	3.2 3.6 2.4		
2002	13.3	2.4	9.9 3.3		4	2.7	1.3	3.3 3.7 2.5		
2003	13.5	1.7	10.3 3.2		4	2.7	1.3	3.4 3.8 2.5		
2004	14.5	7.4	10.9 3.6		4.1	2.8	1.3	3.5 3.9 2.7		
2005	14.6	0.7	11.2 3.4		4.1	2.8	1.3	3.6 4		2.6
2006	15.3	5	11.6 3.7		4.2	2.8	1.3	3.7 4.1 2.8		
2007	16.2	6	12.3 4		4.3	2.9	1.4	3.8 4.2 2.9		

Source: Bureau of Agricultural Statistics and Philippine Rice Statistics.
Note: n.a.—not available.

The growth in palay production has been erratic over the past two decades. Palay production dropped 24.1 percent in 1998 because of El Niño (Table 2.17). This resulted in a shortage of rice, which was addressed by significantly increased importation (Table 2.14). Production bounced back in the following year. Thereafter, except for slow production growth in 2003 and 2005, rice production has been generally stable in 2000–07, averaging 4.1 percent per year.

There are two varieties of palay: modern variety (MV) and traditional variety (TV). Over the past three decades, the share of MV production has almost doubled, from 55 percent in 1970 to 96 percent in 2002 (Table 2.18). The production of MV palay is more productive than that of TV in terms of yield per hectare. In 1970 the average yield of MV was 1.9 metric tons per hectare, compared to 1.5 for TV. During the past three decades, both varieties saw a steady upward trend, with the yield of MV increasing to 3.4 metric tons per hectare in 2002 and that of TV improving to 2.1 metric tons per hectare.

There are two types of ecosystems for palay production: irrigated and nonirrigated (which includes rainfed and upland). Irrigated palay farming is more productive than nonirrigated. In 2002 the average yield of irrigated palay farms was 3.7 metric tons per hectare, compared to 2.5 metric tons for nonirrigated palay farms.

Data on the disposition of palay production by farm households indicate that 22 percent of production was sold on the market in 1970, and 35 percent was used for personal food consumption (Table 2.19). The structure has changed dramatically over time. In 2002, 49 percent of palay production of farm households was sold to the market, while the share for personal food consumption dropped to 26 percent. This implies that palay farming is becoming increasingly market oriented, and therefore more vulnerable to changes in the market. Another notable trend has been the significant drop in the share of landlords in palay production, which decreased from 20 percent in 1970 to 7 percent in 2002. This decrease was the result of the land reform program, which distributed palay land to tenant palay farmers.

The Hybrid Rice Commercialization Program

The primary objective of the government's rice policy is improved productivity through the introduction of a new technology called hybrid rice. The technology is the result of crossbreeding two different parental lines to produce hybrid rice seeds. Genetically the hybrid seed (called F1) will have superior characteristics and will offer a yield advantage over its better parent, a phenomenon known as hybrid vigor or heterosis. However, the crop produced from the hybrid seeds (F2) will have significantly diminished hybrid vigor. Thus it is not economically efficient to reuse seeds from hybrid rice, because the yield from those will drop sharply.

Research on hybrid rice in the Philippines was initiated in 1993. In 2001 the government adopted the Hybrid Rice Commercialization Program (HRCP). To improve palay productivity under the program, the government aggressively pursues a two-pronged approach: (1) it encourages production of hybrid seeds and (2) it gives incentives to farmers to increase the adoption of hybrid seeds.

David (2006) conducted a comprehensive study of the HRCP, evaluating the program's performance, cost, profitability to farmers, adoptability, and viability over the long run. She found that accounting for the direct and indirect costs of the hybrid promotion program is not straightforward. The only explicitly available source of information is the planning budget of the GMA Rice Program—one of the DA's key programs, funded as a lump-sum allocation under OSEC. The DA is flexible in reallocating budget resources approved by

Table 2.18 Palay varieties and yield, selected years, 1970–2002

Ecosystem		Palay production (%)			Area harvested (%)			Yield (metric tons/hectare)		
		Total	Modern variety	Traditional variety	Total	Modern variety	Traditional variety	Total	Modern variety	Traditional variety
All ecosystems	1970	100	55	45	100 48		52	1.7	1.9 1.5	
	1980	100	85	15	100 78		22	2.0	2.4 1.5	
	1990	100	93	7	100 89		11	2.8	2.9 1.8	
	2002	100	96	4	100 94		6	3.3	3.4 2.1	
Irrigated	1970	100	68	32	100 66		34	2.1	2.1 1.9	
	1980	100	91	9	100 88		12	2.8	2.9 2.1	
	1990	100	95	5	100 93		7	3.3	3.4 2.4	
	2002	100	98	2	100 97		3	3.7	3.7 2.6	
Rainfed and upland	1970	100	38	62	100 33		67	1.4	1.6 1.3	
	1980	100	77	23	100 69		31	1.7	1.9 1.2	
	1990	100	88	12	100 82		18	2.1	2.2 1.4	
	2002	100	91	9	100 88		12	2.5	2.6 1.8	

Source: Philippine Rice Research Institute (2004).

Table 2.19 Palay utilization and disposition by farm households, selected years, 1970–2002 (percent)

Year	Landlord's share	Sold	Food	Seed	Feed	Other[a]	Total
1970	20	22	35	3	1	18	100
1975	14	28	41	3	1	14	100
1980	13	39	34	3	1	11	100
1985	12	39	30	3	0	14	100
1990	10	41	30	4	1	15	100
1995	8	42	31	—	—	18	100
1997	9	44	29	—	—	17	100
2002	7	49 26		—	—	18	100

Source: Philippine Rice Research Institute (2004).
[a]Seed and/or feed.

the Philippine Congress in order to increase the allocation to rice programs. In addition OSEC has realigned to the rice program funding sources from foreign grants and surpluses from other DA-attached entities. Outside the DA, there are several other sources of funds that support the HRCP. For example, some of the financial resources of the Department of Agrarian Reform (DAR) were used to support the program. In addition, resources from a number of local government units (LGUs) and from the Priority Development Assistance Funds (PDAFs) of several members of Congress have been used to subsidize hybrid seeds and other related agricultural inputs.

The HRCP requires huge financial resources and has relied heavily on government subsidies. David (2006) has estimated that between 2001 and 2005 the government poured sizable resources—amounting to PhP10 billion—into the HRCP program. Table 2.20 shows the breakdown of her estimates of the financial resources used in the rice program between 2001 and 2005. The DA's GMA Rice Program was the largest source of funds, amounting to PhP6.47 billion. This amount includes procurement of hybrid seeds, support to seed growers, subsidies for other inputs, research and development, techno-demo farms, salary supplements for LGU staff, and other expenses.

LGU contributions include time spent by members of the agricultural staff on seed distribution, farmer training and technical assistance, program planning, monitoring, and reporting. Based on assumptions made by David

Table 2.20 Estimated budgetary outlays for the Hybrid Rice Commercialization Program, 2001–05 (billion PhP)

Budget source	Budget
Department of Agriculture Ginintuang Masaganang Ani (Golden and Bountiful Harvest; GMA) Rice Program	6.47
Local government units	
Personnel	1.20
Procurement and distribution	0.75
Priority Development Assistance Funds (congressional pork barrel)	1.00
Department of Agrarian Reform	0.50
Total	9.92

Source: David (2006).

(2006), this amounted to PhP1.2 billion. The LGUs also procured hybrid seeds and other agricultural inputs for distribution to farmers, which cost them about PhP0.75 billion. Several members of Congress designated some of their PDAF allocation to support the program. For example, in 2003 close to PhP400 million of the PDAF was used for agriculture-related inputs, such as hybrid seeds, fertilizers, foliars, and soil conditioners. Another PhP300 million was disbursed in 2004. For 2001–05, total funds from the PDAF amounted to PhP1 billion. In 2004 the DAR used about PhP500 million from the Agrarian Reform Funds to finance distribution of hybrid seeds and other subsidized inputs. A total of about PhP10 billion of government financing has been used to promote the HRCP.

How does the system of government seed procurement and subsidies work under the HRCP? To provide incentives to hybrid seed producers, the government buys the seeds at a guaranteed price of PhP2,400 per 20-kilogram bag. To encourage farmers to replace their inbred seeds with hybrid seeds, the government collects half the purchase price at the time of purchase, with the remainder due after harvest. Furthermore, if the seeds are paid for in cash at the time of purchase, farmers get an additional discount of PhP200 per bag. However, based on past experience, farmers' rate of default on the remaining PhP1,200 per bag of seeds is extremely high, which means that in many cases the government recovers only between PhP1,000 and PhP1,200 for each bag of seeds that it buys from the seed growers at PhP2,400. And this does not cover other distributional and transaction costs that the government incurs in the course of transporting, storing, and distributing the seeds.

To further encourage farmers to adopt hybrid seeds, the government provides additional subsidies for other farm inputs. For example, farmers who adopt hybrid seeds are entitled to a PhP500 discount on chemical fertilizers for every bag of hybrid seeds purchased. In addition, specified amounts of chemicals—such as zinc sulfate, organic fertilizers, foliar fertilizer, and soil conditioners—are distributed free with every bag of hybrid seeds purchased by a farmer. Based on the estimates of David (2006), the government provides PhP1,000 of additional subsidies per bag to encourage every farmer to adopt hybrid seeds.

How has the HRCP performed thus far? David (2006) estimated the yield advantage of hybrid rice over inbred rice using countrywide data collated by the DA. The estimates are presented in Table 2.21. They show that, in a number of rice seasons, hybrid seeds have an average yield advantage over inbred seeds of more than 30 percent, or more than an additional ton of rice harvested per hectare.

The highest yield difference between hybrid and inbred seeds was 55 percent during the dry season of 2002.[4] However, the yield difference dropped significantly thereafter.

While the yield advantage of hybrid over inbred seeds is on average high using countrywide data, it is not uniform across rice fields in the Philippines. The yield advantage varies significantly across rice farms, as can be seen from the farm-level data in Table 2.22 on yield performance of hybrid and inbred seeds for a

[4]There are two production seasons in the Philippines: the wet and dry seasons. However, the wet and dry seasons in the north do not coincide with those in the south. The rice planting and harvesting seasons in the Philippines are as follows:

Season Planting		Harvesting
Wet season, North	May–July	October–December
Dry season, North	January–March	May–June
Wet season, South	October–December	March–May
Dry season, South	May–June	November–December

Table 2.21 National average yield of hybrid and inbred rice seeds in irrigated areas, 2001–04

	Average yield (tons/hectare)		Yield advantage	
Season	Hybrid	Inbred	Tons per hectare	Percent
Wet 2001	5.5	4.3	1.2	27.9
Dry 2002	6.8	4.4	2.4	54.5
Wet 2002	5.8	4.5	1.3	28.9
Dry 2003	6.1	4.6	1.5	32.6
Wet 2003	6	4.6	1.4	30.4
Dry 2004	6.1	4.7	1.4	29.8
Wet 2004	5.6	4.6	1	21.7

Source: David (2006).
Note: Inbred seeds are certified.

Table 2.22 Average yield of hybrid rice and yield advantage over inbred rice, 2002–03

			Yield advantage			
	Average yield (tons/hectare)		Tons/hectare		Percent	
Province	Dry 2002	Wet 2003	Dry 2002	Wet 2003	Dry 2002	Wet 2003
Kalinga	6.3	5.3	1.74	1.05 38*** 25***		
Isabela	5.8	5	0.64 –21		13	–4
Nueva Vizcaya	3.5	4.2	0	0	0	0
Laguna	4	4.6	–0.28	1.02 –6		29*
Quezon	2.9	3.1	–0.28	0.09 –9		3
Mindoro Oriental	5.5	5.6	1.7	1.86 45*** 50		
Albay	5.7	4.8	0.49	0.42 9		9
Camarines Sur	4.6	4.3	0.71	0.53	18	14
Iloilo	1	4.4	–2.35	0.75 –70		–14
Bohol	3.3	4.3	–0.06	0.63 –2		17
Negros Oriental	3.6	3.5	0.56	0.7	18	25
Leyte	4.3	4.2	1.04	0.64 32*** 18**		
Davao del Norte	4.2	4.2	–0.13	–0.02	–3	–0.6
Agusan del Sur	4.7	3.6	0.06	0.5	–1	16
Agusan del Norte	2.6	2.7	0.22	0.01	–8	0.4

Source: David (2006).
Note: *, **, *** indicate that the coefficient is statistically significant at the 10, 5, or 1 percent level, respectively.

number of rice provinces. Hybrid seeds have significant yield advantage over inbred seeds in Kalinga, Laguna (during the wet season of 2003), Mindoro Oriental, Camarines Sur, Bohol (during the wet season of 2003), Negros Oriental, Leyte, and Agusan del Sur (during the wet season of 2003). However, this is not the case in Isabela, Nueva Vizcaya, Quezon, Iloilo, Davao del Norte, and Agusan del Norte.

David (2006, 38) concluded that, based on a farm-level survey, hybrid seeds have a yield advantage over inbred seeds in only 3 out of

Table 2.23 Implementation of the Hybrid Rice Commercialization Program, 2001–05

Season Area	Dry	Wet
Target area (hectares)		
2001	—	20,665
2002	13,087	31,699
2003	49,629	93,687
2004	92,706	182,625
2005	251,060	224,820
Area planted to hybrid (hectares)		
2001	—	5,472
2002	7,078	21,301
2003	25,521	54,691
2004	77,982	131,790
2005	186,329	138,709
Percent of target area		
2001	—	26.5
2002	54.1	67.2
2003	51.4	58.4
2004	84.1	72.2
2005	74.2	61.7
Percent of total rice area		
2001	—	0.2
2002	0.4	0.9
2003	1.6	2.3
2004	4.7	5.5
2005	10.9 (5.0)[a]	5.8

Source: David (2006).

[a]Number in parentheses is the estimated percentage of total rice area using seeds, based on the first-semester Rice and Corn Production Survey of the Bureau of Agricultural Statistics.

14 provinces sampled. "In most cases, there was no statistical difference in yields between hybrid and inbred varieties even though yield advantage may seem high because of wide variations in farm yields for both hybrid and inbred adopters. In some provinces, hybrid varieties even had lower average yield than inbred. With one exception, yield advantage is statistically significant only when the difference in average yield between hybrid and inbred reaches 1 ton per hectare or more."

Despite the huge financial resources made available by the government through various subsidies, the performance of the HRCP has not been very encouraging so far. Table 2.23 shows the target areas for the implementation of the program between 2001 and 2005, and the area actually planted with hybrid seeds during dry and wet seasons. The area targeted for hybrid rice increased significantly during both the wet and dry seasons. The area planted to hybrid rice was more than 50 percent of the targeted area. However, in terms of the total area of rice land in the Philippines, the area planted to hybrid rice is still small—about 6 percent in the wet season and 5 percent in the dry season.

This adoption rate seems to be very small relative to the massive support provided by the government. One reason for this low performance is the very high dropout rate. David (2006) compiled data across municipalities on farmers who participated in the program. The dropout rate refers to the number of farmers who participated in the program but reverted back to growing inbred seeds in the following season. Table 2.24 shows the average dropout rate. The rate during the dry season of 2002 was 68 percent, but it increased to 80 percent in the wet season of 2002 and the dry season of 2003. The dropout rate declined slightly during the wet season of 2003 and the dry season of 2004, but it surged again to 86 percent in the wet season of 2004.

There are several reasons why the dropout rate is high. Based on the hybrid rice fact sheet provided by the Pesticide Action Network Asia and the Pacific (PAN AP 2007), some of the major reasons are as follows:

1. Hybrid rice seeds are expensive. The cost of unsubsidized hybrid rice seeds is PhP2,400 per 20-kilogram bag versus an average cost for certified inbred seeds of PhP1,400 per bag. A number of factors contribute to the high cost of production for hybrid rice seeds. The seeds are partially open and therefore

Table 2.24 Distribution of sample municipalities by dropout rate, 2002–04 (percent)

Municipality or dropout rate	Dry 2002	Wet 2002	Dry 2003	Wet 2003	Dry 2004	Wet 2004
Number of municipalities	8	18	25	37	48	38
Average dropout rate	68	80	80	67	69	86

Source: David (2006).
Note: Numbers refer to the percentage of farmers in the given season who did not grow hybrid rice in the succeeding dry season. Thus, for example, 86 percent of farmers who grew hybrid rice in the wet season of 2004 did not do so in the succeeding dry season of 2005.

susceptible to diseases resulting from seed-borne insect pests, especially under the humid tropical conditions in the Philippines. Under such conditions, hybrid rice seeds would require cold, dry storage facilities, which are very expensive for seed growers to maintain. Hybrid rice seed production is expensive because it is labor-, input-, and knowledge-intensive. Compared to normal mechanized rice cultivation, the production of hybrid rice seeds requires an additional 50 man-days per hectare. The process depends heavily on gibberellic acid, a growth regulator required to synchronize the flowering of the hybrid seed parents. Cultivation of hybrid rice seeds also requires more fertilizers than production of ordinary inbred rice.

2. Despite the yield advantage of hybrid rice seeds over inbred seeds on some rice farmlands in the Philippines, net income for farmers is lower because of the higher cost of seeds, fertilizers, pesticides, and wages for farm labor.
3. Hybrid rice cannot be reused as seeds during subsequent crop seasons because the yield will deteriorate sharply. Thus it is

Table 2.25 Profitability of hybrid and inbred seed production and rice production (PhP/hectare)

	Seed production				
	Hybrid			Rice: Dry season 2004	
Cost/revenue 1	[a] 2	[b] Inbred	[b]	Hybrid Inbred	[b]
Yield (kg/ha)	1,000	735 4,977		5,355 4,993	
Gross revenue	120,280	100,329 67,689		48,098 41,762	
Cost of production	55,095	47,220	32,340	28,209	26,925
Gross revenue less cost of production	63,185	63,109	35,324	19,889	14,838
Cost per kilogram	—	63	65	7	—

Source: David (2006).
[a]Average of cost and returns data of cooperatives, assuming average yields of F1 seeds of 1 ton/hectare for Isabela (ISGMPC for dry season 2004, Roxas for wet season 2004, San Manuel for wet season 2004), Cagayan (CSPMC for wet season 2004), and Kalinga (Tabuk for dry season 2004) provinces.
[b]Based on a sample of farms in five provinces (Davo del Norte, Davao del Sur, Iloilo, Isabela, Nueva Ecija) reported in the Sikap/Strive Foundation and PhilRice (2005) study.

uneconomical for farmers to save some of the hybrid rice. They are forced to purchase expensive new seeds every season.

Another feature of the HRCP as observed by David (2006) is that about half of the market for hybrid rice seeds is controlled by a single supplier. Thus the guaranteed price for the seeds paid by the government largely benefits this single supplier.

Table 2.25 shows comparative cost and revenue data for seed and rice production for both hybrid and inbred rice. This cost comparison is based on a procurement price for hybrid seeds of PhP2,400 per 20-kilogram bag. The net return for hybrid seed production is more than PhP63,000 per hectare. In contrast, inbred seed growers realize only about PhP35,000 per hectare. On the other hand, the return for hybrid rice farmers is about PhP20,000 per hectare, and the net return for inbred rice farmers is about PhP15,000 per hectare.

Table 2.26 provides output data for four major producers of hybrid rice seeds. Various cooperatives produce three types of hybrid rice seeds (Mestizo 1, 2, and 3). SL Agritech produces SL 8. Bayer Crop Science produces Tisoy and Bigante. Monsanto produces Magilas. The share of the various cooperatives in the market for hybrid rice seeds increased from 43 percent in the wet season of 2003 to 69 percent in the dry season of 2004, but it dropped to 47 percent during the dry season of 2005. The market share of SL Agritech increased from 41 percent in the wet season of 2003 to 44 percent in the dry season of 2005. The market share of Bayer Crop Science is about 10 percent.

David (2006) has noted that the Bigante seeds of Bayer Crop Science are not produced locally; they are imported from India. Bigante receives the lowest price guarantee from the government, yet Bayer Crop Science survives and still captures 10 percent of the market. Based on these observations, David (2006) has argued that it is not necessary to grow hybrid rice seeds locally, where the cost of production is so high. The seeds can be produced elsewhere under tropical production conditions similar to those in the Philippines, but at a lower cost. In fact, given the natural and economic conditions in the Philippines, the country is less competitive in hybrid rice seed production than in rice cultivation.

This chapter has provided a comprehensive summary of the structure and policies of the Philippine agricultural system, particu-

Table 2.26 Hybrid rice seeds procured and subsidized, August 2004 (number of bags)

Seed producer	Wet season 2003	Dry season 2004	Dry season 2005
Cooperatives	**30,201**	**146,962**	**99,221**
Mestizo 1	26,064	89,259	58,009
Mestizo 2		1,219	1,395
Mestizo 3	4,137	56,484	39,817
SL Agritech	**29,138**	**48,807**	**93,611**
SL8	29,138	48,807	93,611
Bayer Crop Science	**9,098**	**17,211**	**20,164**
Tisoy	582	2,266	—
Bigante [a]	8,516	14,945	20,164
Monsanto	**2,126**	—	—
Magilas	2,126	—	—
Total	**70,563**	**212,980**	**212,996**

Source: David (2006).

[a]The 15-kg bag of Bigante is considered equivalent to the 20-kg bags for all other brands.

larly as they pertain to food crops. While the trade sector in the Philippines has gone through a series of reforms since the 1980s, the degree of trade protection on key food items is still high. Thus food prices in the Philippines remain very high. Furthermore the policy focus of the government within agriculture is on rice. The government is currently implementing a rice productivity program emphasizing adoption of hybrid rice seeds. Yet the results of the program so far are not encouraging. The next chapter discusses the consumption structure of Filipino households. It provides data on the share of food in the total consumption expenditure of Filipinos, especially of poor households.

CHAPTER 3

Poverty and Food Consumption in the Philippines

More than 30 percent of Filipinos live in poverty (Table 3.1). Almost 50 percent of people in rural areas are living below the poverty threshold, while the incidence of poverty in urban areas is below 20 percent.

The overall incidence of poverty in the Philippines increased slightly from 33.4 percent in 1997 to 34 percent in 2000. The increase in poverty during these years was due to a host of factors, of which the major ones were the Asian financial crisis in 1997 and the El Niño in 1998. Between 1997 and 2000 the increase in urban poverty was higher (from 16.3 percent to 18.6 percent) compared to that in rural poverty (from 48.6 percent to 48.8 percent). In 2003 the overall incidence of poverty dropped to 30.4 percent. There are no corresponding values for urban and rural areas because the 2003 FIES did not provide such a breakdown.

Food is a major item in the Filipino market basket. More than 60 percent of the consumption of poor households is for food. This is true for poor households in both rural and urban areas. For non-poor households food consumption is slightly lower than 50 percent.

Within the food consumption of households, the major item is cereals, mainly rice. The share of cereals in food consumption varies across households. For poor households in rural areas, about 30 percent of consumption is of cereals. For non-poor households in rural areas, the share of cereals in total consumption is about 20 percent. The share of cereals in the total consumption in poor urban households is slightly lower than that for their rural counterparts. But the share of cereal consumption in the total consumption of urban non-poor households is only about 10 percent.

Thus, given the sizable share of food in the household consumption of Filipinos, changes in food prices will have a significant impact on the level of food consumption in general and on poverty in particular. The series of model simulations presented in later chapters highlights how changes in food prices will affect poverty and income distribution in the Philippines.

Table 3.1 Food and poverty, 1997, 2000, and 2003

	All Philippines[a]			Rural Urban			
Parameter	**1997**	**2000**	**2003**	**1997**	**2000**	**1997**	**2000**
Poverty incidence (%)	33.2	34.0	30.4	48.6	48.8	16.3	18.6

	Poor			Non-poor			Poor Non-		or		Poor Non·		ɔor	
	1997	**2000**	**2003**	**1997**	**2000**	**2003**	**1997**	**2000**	**1997**	**2000**	**1997**	**2000**	**1997**	**2000**
Consumption (percent of total)														
Food	64.6	63.3	62.6	49.9	48.1	47.7	64.9	64.2	53.2	52.0	63.3	61.1	47.5	45.4
Cereals [b]	30.2	27.9	27.0	15.3	13.5	12.8	30.9	29.6	19.0	17.2	27.7	23.6	12.5	10.9

Source: National Statistics Office (1997, 2000, 2003).
[a]There is no rural and urban breakdown in the 2003 FIES.
[b]Largely rice.

CHAPTER **4**

The Model

Having concluded our discussion of Philippine agriculture and food policies, we now assess their implications for poverty and income distribution. In our analysis we employ a recursive-dynamic CGE economic model calibrated to Philippine data. This chapter describes the structure of the model and the basic relationships among the key variables. It also discusses the structure of the SAM used to calibrate the model and the parameters of the model. Appendix A discusses in detail the complete specification of the model, including the equations. Appendix B describes the method used to construct the SAM.

Structure of the Model

The dynamic-recursive CGE model is formulated in two stages.[1] In the first stage the model is solved like a static model in which all markets are cleared. In the second stage we explicitly model the dynamic adjustment of variables whose values are fixed in the first stage (such as capital, supply of land, and supply of labor). The model is solved sequentially; it consists of a static within-period equilibrium model and a between-period model that contains the intertemporal linkages and the shifts in the sectoral demand and supply functions.

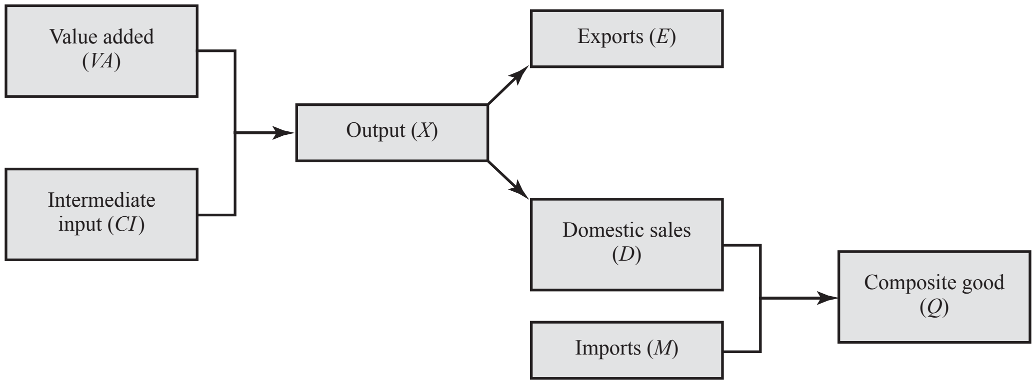
The model is calibrated to a SAM for the year 2000 that we constructed. The SAM uses data from various sources, including the input-output (I-O) table, the FIES, the National Accounts of the Philippines (NAP), the Labor Force Survey (LFS), the Census of Agriculture (CA), and the weighted applied nominal I-O sectoral tariff rates (WANSTR) from the Tariff Commission.

The model accounts for 41 production sectors, 2 labor types (skilled labor, comprising those with at least a college diploma, and unskilled labor, comprising those without a college diploma), capital, and land. The household sector is grouped by decile. There is a government sector, an enterprise sector, and a sector for the rest of the world.

The basic relationships in the model are presented in Figure 4.1. Output (*X*) is a composite of value added (*VA*) and intermediate input. Output is sold either to the domestic market (*D*) or to the export market (*E*) or both. The model allows for some degree of substitution between *E* and *D* through a constant elasticity of transformation (CET) function. The substitution depends on the changes in relative prices of *E* and *D* and on the substitution parameter. The model has an upward-sloping export supply curve but assumes that the economy faces a horizontal world demand curve. The supply of goods and services in the economy is a com-

[1]The model is based on a set of models called EXTER (Decaluwé, Dumont, and Robichaud 2000).

Figure 4.1 Key relationships in the model



posite (Q) of two variables: production sold to the domestic market (D) and imports (M). The model allows for some degree of substitution between D and M through a constant elasticity of substitution (CES) function. The substitution depends on the changes in relative prices of D and M and on the substitution parameter.

Figure 4.2 shows how output is determined. It is a composite of intermediate input and value added using fixed coefficients. Value added (VA) is specified as a CES function. Agriculture value added is a CES function of skilled labor, unskilled labor, capital, and land. Non-agriculture value added is a CES function of skilled labor, unskilled labor, and capital. Capital is fixed in the static within-period equilibrium, but it is updated in the next period using a capital accumulation function, which we discuss further below. The rest of the factor demands—skilled labor, unskilled labor, and land (for agriculture only)—are derived as first-order conditions for profit maximization.

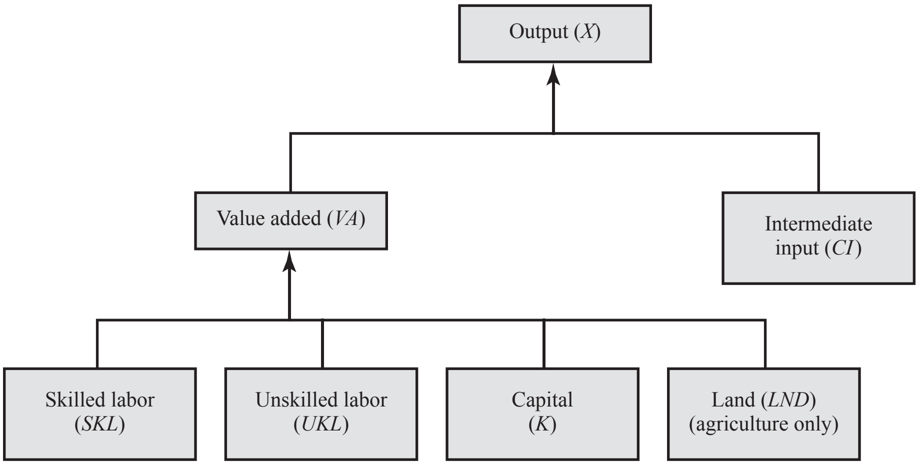
The sources of household income are factor incomes (labor, capital, and land), transfers, foreign remittances, and dividends. Household savings are a fixed proportion of disposable income. Households and enterprise pay direct taxes to the government. The sources of government income are tariffs, indirect taxes, direct taxes, and foreign grants. Household demand is represented by a linear expenditure system (LES).

Government savings and government total income are both endogenous variables in the model. However, government consumption is fixed in real terms. Household savings as well as household income are both endogenous variables. The income of enterprise is derived as a portion of total capital income. Foreign savings is fixed. Since the nominal exchange rate is the numeraire in the model and therefore fixed, the foreign trade sector is effectively cleared by changes in the real exchange rate.[2]

In the dynamic analysis, the capital stock, K_t, in each sector is updated every period using the relationship $K_{i,t+1} = (1 - dep_i)K_{i,t} + Ind_{i,t}$, where dep_i is the depreciation rate and $Ind_{i,t}$ is investment. In period t, sectoral investment demand follows the specification of Bourguignon, Branson, and de Melo (1989) and Jung and Thorbecke (2003), which is given by $\frac{Ind_i}{K_i} = \lambda_i \left(\frac{r_i}{u_i}\right)^2$. This specification states that the capital accumulation rate (the ratio of investment demand, Ind_i, to capital stock, K_i) is an increasing function of the ratio of the rate

[2]There is no explicit form of real exchange rate variable in the model. The change in the real exchange rate is the weighted world prices of exports and imports multiplied by the fixed nominal exchange rate, divided by the weighted local price.

Figure 4.2 Output determination



of return to capital, r_i, and its user cost, u_i. The user cost of capital is $u_i = Pinv_i(ir + dep)_i$), where $Pinv_i$ is the investment price and ir is the real interest rate.

The supply of skilled labor and unskilled labor is fixed in the static within-period equilibrium but updated in the next period. In the dynamic simulation, the supply of skilled and unskilled labor is assumed to grow by 2 percent per year. The supply of land is fixed throughout the simulation period.

Structure of the SAM and Model Parameters

The production and trade structure in the SAM as well as the production and trade elasticities used in the model are presented in Table 4.1. Generally the agricultural and service sectors have higher value added ratios (value added over output) than the industrial sector. In agriculture, coconut growing and forestry have the highest value added ratios, 89.1 percent and 89.6 percent, respectively. In industry petroleum refining has the lowest ratio, 14.4 percent. The capital-output ratio in agriculture is generally lower than that in the industrial and service sectors. The largest employer of labor is the service sector. More than 90 percent of labor input into agricultural production is unskilled labor. The share of skilled labor employed in the industrial sector is substantially higher than that in the agricultural sector. Forestry has the highest land-output ratio, 33.4 percent.

The column "2000 indirect tax" is discussed in the section on the design of policy experiments because indirect taxes are related to the nominal protection rate that we use in the simulations. The column "2000 tariff" is derived using the official nominal tariff rates on very detailed product classifications. In our analysis the sectoral tariff rates are derived as weighted tariffs, where the weights are the detailed import shares in the 2000 I-O table. The elasticities used in the model (production elasticity, sig_va; import elasticity, sig_m; and export elasticity, sig_e) are based on a recent survey conducted by Annabi, Cockburn, and Decaluwé (2006).

Exports are dominated by electrical and related products, with a 45.9 percent share of the overall exports of the Philippines. Of the total output of these products, 88.4 percent is exported. The bulk of these products are semiconductors.

Another major export item is machinery, which captures 18.1 percent of total exports. These products have a high export intensity

Table 4.1 Elasticity parameters, production, and trade structure

	Production (percent)							
Sector	Value added output ratio	Value added share	Output share	Capital-labor ratio	Employment share	Share of skilled labor	Share of unskilled labor	Land output ratio
1. Palay	77.9 2.0		1.34	0.36	3.00	5.7 94.3 7.2		
2. Corn	79.0 0.6		0.38	0.20	1.01	5.7 94.3 5.2		
3. Coconut	89.1	0.6	0.38	0.49	0.86	5.6	94.4	10.4
4. Fruits and vegetables	80.0	2.2	1.49	0.77	2.50	5.7	94.3	11.4
5. Sugar	70.1	0.3	0.23	0.76	0.33	5.7	94.3	11.1
6. Other crops	77.6	0.6	0.40	0.91	0.58	5.6	94.4	13.9
7. Agricultural services	85.0 0.4		0.24	0.54	0.51	5.7 94.3 9.9		
8. Hogs	64.1 1.3		1.10	0.81	1.51	8.8 91.2 6.7		
9. Cattle	72.2	0.4	0.31	1.10	0.40	8.8	91.2	10.6
10. Chicken	61.1 1.3		1.12	0.84	1.38	8.8 91.2 8.8		
11. Fishing	77.6 2.8		1.91	1.77	2.20	2.2 97.8 3.8		
12. Forestry	89.6	0.2	0.13 2.01 0.11 16.0				84.0	33.4
13. Mining	63.2	0.6	0.50 2.36 0.40 29.3				70.7	—
14. Crude oil and natural gas	35.4	0.0	0.01	—	0.00	—	—	—
15. Meat processing	20.7	1.1	2.72 2.16 0.77 23.9				76.1	—
16. Milk and dairy	31.3	0.3	0.49 2.23 0.20 23.9				76.1	—
17. Fruit processing	36.8	0.4	0.53 1.63 0.32 23.9				76.1	—
18. Fish processing	28.7	0.3	0.61 3.41 0.17 23.8				76.2	—
19. Coconut and edible oil	28.8	0.5	0.91	4.25	0.22	23.8	76.2	—
20. Rice and corn milling	30.6	1.3	2.26	1.37	1.26	23.9	76.1	—
21. Sugar milling	22.2	0.2	0.39 2.01 0.13 23.7				76.3	—
22. Other processed food	31.2	1.3	2.19 1.65 1.11 23.9				76.1	—
23. Tobacco and alcohol	40.7	1.0	1.34 1.66 0.88 57.1				42.9	—
24. Textiles	37.7	1.0	1.41 1.22 1.04			6.1	93.9	—
25. Garments and footwear	46.5	2.1	2.43	1.47	1.97	4.3	95.7	—
26. Leather and rubberwear	43.3	0.8	0.93	1.27	0.76	9.2	90.8	—
27. Paper and wood products	39.6	1.7	2.29	1.54	1.54	22.5	77.5	—
28. Fertilizer	40.1	0.1	0.15 1.40 0.11 37.0				63.0	—
29. Other chemicals	41.4	1.9 2.45		1.91	1.51	37.0	63.0 —	

(*continued*)

Table 4.1 Continued

Sector	Production (percent)							
	Value added output ratio	Value added share	Output share	Capital-labor ratio	Employment share	Share of skilled labor	Share of unskilled labor	Land output ratio
30. Petroleum	14.4	0.7	2.57 1.14 0.75 41.5				58.5	—
31. Cement and other related products	42.0	0.7	0.88	1.50	0.64	28.3	71.7	—
32. Metal and related products	37.2	1.9	2.71	1.94	1.48	8.0	92.0	—
33. Machinery	40.2	3.6	4.78 3.45 1.86 29.3				70.7	—
34. Electrical and related products	45.8	8.6	9.97	1.67	7.39	38.9	61.1	—
35. Other manufacturing	48.5	1.5	1.60 1.24 1.50			6.4	93.6	—
36. Construction	53.6	4.1	4.05 0.57 5.95 13.9				86.1	—
37. Utilities	68.5	3.3	2.58 3.27 1.79 42.8				57.2	—
38. Transportation and communications	53.9	7.0	6.90 2.01 5.32 17.3				82.7	—
39. Wholesale trade	66.3	13.2	10.58 1.86		10.60 24.5		75.5	—
40. Other service	63.8	20.1	16.72 1.67		17.22 30.2		69.8	—
41. Public services	72.4	8.2 6.00 —			18.73	59.7	40.3 —	

Sectors	2000 indirect tax rate (%)	Elasticities[a]			Trade (%)				
					Exports		Imports		
		sig_va	sig_m	sig_e	Share	Intensity[b]	Share	Intensity[c]	2000 tariff rate (%)
1. Palay	3.2	0.6 1.2		1.6 —		—	—	— 50.0	
2. Corn	39.9	0.6	1.2	1.6	0.0	0.1	0.1	8.1	27.5
3. Coconut	0.9	0.6 1.2		1.6	0.0 0.2		—	— 10.6	
4. Fruits and vegetables	3.4	0.6	1.2	1.6	1.2	15.2	0.3	6.0	22.8
5. Sugar	1.7	0.6 1.2		1.6	0.0 —		—	— 41.7	
6. Other crops	1.3	0.6	1.2	1.6	0.1	2.8	1.2	43.7	4.3
7. Agricultural services	2.8	0.6	1.2	1.6	—	—	0.0	0.1	—
8. Hogs	21.4	0.6	1.2	1.6	—	—	0.0	0.0	28.0
9. Cattle	24.4	0.6	1.2	1.6	0.0	0.3	0.1	8.6	11.6
10. Chicken	–6.1 0.6		1.2	1.6	0.0	0.0	0.0	0.4 19.1	
11. Fishing	1.7 0.6		1.2	1.6	0.8	8.1	0.0	0.2 10.0	

12. Forestry	3.9	0.6	1.2	1.6	0.1 10.6		0.0 0.6		2.7
13. Mining	2.2	1.6	1.4	1.8	0.4	15.6	1.4	45.7	3.6
14. Crude oil and natural gas	0.0	1.6	1.4	1.8	—	—	7.5	99.7	1.5
15. Meat processing	–0.2 1.6		1.4	1.8	0.0	0.0	0.4	3.5 37.5	
16. Milk and dairy	1.0	1.6 1.4		1.8	0.0 1.6		1.0	33.9 5.8	
17. Fruit processing	2.2 1.6		1.4	1.8	0.7	24.1	0.3	13.8 10.9	
18. Fish processing	1.3	1.6	1.4	1.8	0.7 22.5		0.2 7.2		11.9
19. Coconut and edible oil	–21.8	1.6	1.4	1.8	1.5	32.6	0.6	19.1	6.1
20. Rice and corn milling	21.4	1.6	1.4	1.8	0.0	0.0	0.3	8.6	46.6
21. Sugar milling	52.1 1.6		1.4	1.8	0.2	8.7	0.1	7.9 24.0	
22. Other processed food	1.6	1.6	1.4	1.8	0.5	4.6	0.9	9.5	10.1
23. Tobacco and alcohol	22.8	1.6	1.4	1.8	0.1	1.4	0.3	5.8	9.8
24. Textiles	0.7 1.6		1.4	1.8	1.2	16.9	2.7	36.4 10.2	
25. Garments and footwear	0.5	1.6	1.4	1.8	0.2	1.8	0.1	1.3	19.2
26. Leather and rubberwear	0.4	1.6	1.4	1.8	1.3	26.7	2.3	45.1	4.7
27. Paper and wood products	0.7	1.6	1.4	1.8	2.4	19.8	1.8	19.0	8.3
28. Fertilizer	0.5	1.6	1.4	1.8	0.1	17.1	0.5	48.6	0.6
29. Other chemicals	1.0	1.6 1.4		1.8	1.0 7.7		4.9	34.6	5.8
30. Petroleum	17.7	1.6	1.4	1.8	1.6	11.8	1.8	16.5	3.3
31. Cement and other related products	1.9	1.6	1.4	1.8	0.4	9.5	0.5	13.7	8.6
32. Metal and related products	1.1	1.6	1.4	1.8	2.5	17.4	4.2	31.6	7.9
33. Machinery	1.7	1.6	1.4 1.8		18.1	72.8 12.7		70.6	4.3
34. Electrical and related products	1.2	1.6	1.4	1.8	45.9	88.4	36.0	88.5	5.6
35. Other manufacturing	1.8	1.6	1.4	1.8	3.7	44.2	2.0	35.7	6.5
36. Construction	1.4	1.6 1.4		1.8	0.3 1.5		0.3	1.9 —	
37. Utilities	3.2	1.6	1.4 1.8 —			—	7.9	0.0	—
38. Transportation and communications	1.2	1.8	1.4	1.8	3.7	10.3	0.0	23.9	—
39. Wholesale trade	1.1	1.8 1.4		1.8	2.9 5.2		1 —		—
40. Other service	2.9	1.8 1.4		1.8	8.4 9.6		6.7	9.8 —	
41. Public services	— 1.8 —			—	—	—	—	—	—

Source: 2000 SAM constructed by the authors; see Appendix B for further discussion.

[a]sig_va is the factor substitution elasticity (this is $\sigma_{va} = (1/[1 + \rho_{va}])$ in equations 2–4 in Appendix A); sig_m is the Armington elasticity (this is σ_m in equation 38 in Appendix A); sig_e is the elasticity of transformation (this is σ_e in equation 36 in Appendix A).

[b]Exports ÷ output.

[c]Imports ÷ composite good.

ratio (ratio of exports to output), 72.8 percent. The other sectors that have significant export intensity are other manufacturing, coconut oil, leather, fertilizer, other chemicals, garments, fruit processing, and fish processing.

On the other hand, 36 percent of total imports are electrical and related products. The import intensity ratio (ratio of imports to output) of these products is 88.5 percent. The share of machinery in total imports is 12.7 percent, while its import intensity ratio is 70.6 percent. The other major import items are crude oil and natural gas, utilities, and other services. Other sectors within which imports make up a major source of supply are other crops, cattle, mining and crude oil, milk and diary, fruit processing, fish processing, coconut oil, sugar milling, other food, textiles, leather, paper, fertilizer, other chemicals, petroleum, cement, and transportation and communication.

The consumption structure of households is presented in Table 4.2. For the first decile, 13.5 percent of its consumption is of rice. The share decreases substantially as we move up to higher deciles. Only 1.7 percent of the consumption of the tenth decile is of rice. The other significant items in household consumption are fish and meat, fruits and vegetables, and other food. Lower-income groups have generally high consumption of agricultural and manufactured food products; in the first decile 42.2 percent of consumption is of these items. This ratio drops substantially as we move to higher deciles; in the tenth decile only 13.3 percent of consumption is on agriculture and manufactured food products. The largest component of consumption in the tenth decile is services.

The sources of household income are presented in Table 4.3. The first decile derives its income from unskilled labor (58.9 percent) and capital (31.9 percent). Unskilled labor includes those without a college diploma. Unskilled labor is also a major source of income in the second and third deciles. Skilled labor, which includes those with a college diploma, is a major income source in the tenth decile. In this group, capital income and foreign remittances are also major sources of income.

Table 4.2 Structure of household consumption (percent share)

	Household (decile)									
Sector	**First**	**Second**	**Third**	**Fourth**	**Fifth**	**Sixth**	**Seventh**	**Eighth**	**Ninth**	**Tenth**
Corn	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1
Coconut	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1
Fruits and vegetables	4.2	3.8	3.6	3.4	3.1	2.8	2.5	2.2	1.9	1.3
Other crops	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0
Chicken	0.8	0.9	0.9	1.0	1.1	1.2	1.2	1.1	1.0	0.7
Fishing	7.1	6.7	6.4	5.7	5.1	4.4	3.7	3.2	2.6	1.5
Forestry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mining	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Meat processing	4.2	4.7	5.0	5.6	6.2	6.9	7.1	6.8	6.3	4.2
Milk and dairy	1.2	1.3	1.3	1.3	1.4	1.3	1.3	1.2	1.1	0.8
Fruit processing	1.2	1.1	1.0	1.0	0.9	0.8	0.7	0.6	0.5	0.4
Fish processing	2.0	1.9	1.8	1.7	1.5	1.3	1.1	0.9	0.7	0.4
Coconut and edible oil	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.3	0.2
Rice and corn milling	13.5	12.2	11.1	9.4	7.9	6.5	5.3	4.2	3.2	1.7
Sugar milling	1.1	1.0	1.0	0.9	0.8	0.8	0.7	0.6	0.4	0.3
Other processed food	5.2	4.9	4.7	4.4	4.1	3.7	3.3	3.0	2.5	1.6
Tobacco and alcohol	3.8	4.0	4.1	4.0	3.8	3.5	3.0	2.6	2.1	1.4
Textiles	0.8	0.9	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.8
Garments and footwear	1.8	2.0	2.2	2.3	2.3	2.2	2.1	2.1	2.0	1.7
Leather and rubberwear	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Paper and wood products	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.9
Fertilizer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other chemicals	2.7	2.4	2.3	2.1	2.0	1.8	1.8	1.9	2.2	3.1
Petroleum	1.6	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.1	0.8
Cement and related products	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Machinery	0.1	0.3	0.3	0.5	0.7	0.9	1.0	1.1	1.1	1.2
Electrical and related products	0.3	0.7	0.8	1.1	1.5	1.7	1.9	2.1	2.2	2.3
Other manufacturing	0.6	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.0
Utilities	3.5	3.1	3.0	2.9	2.9	2.9	2.8	2.6	2.3	1.7
Transportation and communications	6.2	7.3	7.6	8.5	9.7	10.4	11.8	13.2	15.0	17.7
Wholesale trade	18.3	18.0	17.7	17.2	16.8	16.4	16.1	15.9	15.6	14.9
Other service	16.7	17.8	19.1	21.0	22.5	25.1	27.1	29.5	32.1	38.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Selected food items[a]	21.2	20.1	19.3	18.2	17.2	16.3	15.1	13.5	11.5	7.2
Agriculture and selected food items[b]	42.2	40.1	38.4	35.9	33.4	30.7	27.9	24.6	20.9	13.3

Source: 2000 SAM constructed by the authors; see Appendix B for further discussion.
[a]Includes items in Table 2.8, excluding copra.
[b]Includes sectors from corn to other processed food, excluding mining.

Table 4.3 Sources of household income (percent share)

	Household (decile)									
Income source	**First**	**Second**	**Third**	**Fourth**	**Fifth**	**Sixth**	**Seventh**	**Eighth**	**Ninth**	**Tenth**
Skilled labor	0.4	0.4	0.7	0.4	1.0	1.7	3.7	7.5	12.0	24.1
Unskilled labor	58.9	63.1	61.4	28.6	30.8	33.6	36.3	35.1	32.4	17.1
Capital[a]	31.9	27.0	28.1	60.1	56.8	51.9	44.8	40.0	34.9	38.1
Land	5.3	4.8	4.3	3.6	2.8	1.9	1.2	0.8	0.5	0.5
Dividends	0.9	0.8	0.8	1.2	1.1	1.0	0.9	0.8	0.7	0.7
Transfers	1.3	2.2	2.5	2.4	2.7	3.1	3.3	3.5	3.7	4.4
Foreign remittances	1.3	1.7	2.2	3.7	4.9	6.9	9.8	12.3	15.8	15.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: 2000 SAM constructed by the authors; see Appendix B for further discussion.

[a]For lower-income groups, informal capital makes up the bulk of capital income.

CHAPTER 5

Design of Policy Experiments

This chapter discusses the design of the baseline analysis and four other policy experiments. Of the four policy experiments, three are focused on trade reform and one on rice productivity. The trade reform experiments analyze the possible effects on poverty and income distribution of further reduction in trade distortions. The fourth analysis assesses the possible effects of a successful rice program in improving rice productivity. It focuses on rice because the government is spending such significant amounts of resources to support a rice productivity program.

In designing the trade reform experiments, we went through a number of preliminary calculations using actual data in order to capture adequately the degree of distortions currently seen in foreign trade, especially in key agricultural commodities and key food items. We used the information on NPRs of selected agricultural commodities in Table 2.8.

There are wide variations in the NPRs. To smooth out the yearly fluctuations between 2000 and 2007, for each commodity we took the average of the NPRs for the period 2000–02 and assigned it to 2000. Similarly, we took the average of the NPRs for the period 2005–07 and assigned it to 2007. Given these two endpoints for 2000 and 2007, we generated the NPR values for the intervening years using a geometric growth formula.

Since the NPRs are the difference between domestic wholesale and border prices, we assume the level of the NPRs as the price wedge between domestic and foreign prices. This price wedge is the result of the tariff rate and all other market distortions. In our model this is captured in the following equation, which is equation (40) in Appendix A: $Pm_i = Pwm_i \times er(1 + tm_i)(1 + itxr_i)$, where Pm_i is the import price in domestic currency, Pwm_i is the import price in foreign currency, er is the exchange rate, tm_i is the tariff rate, and $itxr_i$ is the indirect tax, which captures all other distortions. In the model we assume fixed Pwm_i and er equal to 1. Thus in our model $(1 + tm_i)(1 + itx_i)$ can be approximated by the NPRs.

We have information on sectoral tariff rates, tm_i. We calculated itx_i using the values of the NPRs and the tariff rates. In this case itx_i is a catchall variable that creates the price wedge between domestic and border prices other than tariffs. We recalibrated our model to account for the new itx_i. Note that this process was carried out only for selected commodities in Table 2.8 for which estimates of NPRs are available. For the rest of the sectors, without NPR estimates, we used the original values of the sectoral tariff and indirect rates in the SAM.

The sectoral tariff rates are shown in Table 5.1. However, the dynamic simulation requires annual tariff rates from 2000 to 2007. Using a geometric growth formula applied to tariff rates between 2000 and 2005, we computed the average annual change in sectoral tariff

Table 5.1 Weighted nominal tariff rates, 2000 and 2005

Sector	2000[a]	2005[b]
Palay	50.0	25.0
Corn	27.5	23.3
Coconut	10.6	15.0
Fruits and vegetables	22.8	12.5
Sugar	41.7	10.0
Other crops	4.3	6.7
Agricultural services	0.0	0.0
Hogs	28.0	26.2
Cattle	11.6	7.9
Chicken	19.1	21.3
Fishing	10.0	8.7
Forestry	2.7	3.4
Mining	3.6	3.3
Crude oil and natural gas	1.5	5.0
Meat processing	37.5	27.5
Milk and dairy	5.8	3.7
Fruit processing	10.9	9.6
Fish processing	11.9	7.9
Coconut and edible oil	6.1	5.0
Rice and corn milling	46.6	44.6
Sugar milling	24.0	31.6
Other processed food	10.1	9.5
Tobacco and alcohol	9.8	7.3
Textiles	10.2	8.6
Garments and footwear	19.2	13.6
Leather and rubberwear	4.7	3.5
Paper and wood products	8.3	6.9
Fertilizer	0.6	2.2
Other chemicals	5.8	6.9
Petroleum	3.3	4.4
Cement and related products	8.6	7.0
Metal and related products	7.9	3.0
Machinery, transportation equipment, etc.	4.3	5.8
Electrical and related products	5.6	5.3
Other manufacturing	6.5	4.1

Source: Philippine Tariff Commission (2007).
[a]Nominal tariff rates in 2000 weighted by import shares in 2000 input-output table.
[b]Nominal tariff rates in 2005 weighted by import shares in 2000 input-output table.

rates, and we used this value to generate sectoral tariff rates for the intervening years. We also used the average annual tariff change to extend the sectoral tariff rate series to 2007.

We solve the model from 2000 to 2020 using the assumptions under each of the scenarios discussed here. In each of these we allow labor supply to grow by 2 percent per year. We assume the supply of land is fixed. Furthermore from 2000 to 2007 under each of the scenarios we incorporate the sectoral tariff rates in Table 5.2 and the sectoral indirect tax rates in Table 5.3. Note that in Table 5.2 we report only the sectoral tariff rates for 2000 and 2007. The sectoral tariff rates for the intervening years were derived using the value for geometric growth discussed earlier. Similarly we report the sectoral indirect tax rates for 2000 and for 2007. For the intervening years we calculated the indirect tax rates using the estimates of NPRs discussed earlier and the annual tariff rates. For sectors without estimates of NPRs, we assume that the original indirect tax rates for 2000 held until 2007. All these assumptions were incorporated into the baseline case and into the other four policy experiments when solving the model from 2000 to 2007. The assumptions in each of the four experiments differ from the assumptions in the baseline case only when we solve the model from 2008 to 2020.

Note the negative indirect tax rates for chicken, coconut and edible oil, and rice and corn milling. These are due to the NPRs of these commodities, which are lower than the tariff rates (Tables 2.8 and 5.2). As noted in the previous chapter, there has been a general increase in the world price of these commodities and a depreciation in the exchange rate. But domestic prices for these items have not increased as much. Thus the NPRs have been declining while the tariff rates remain high.

Baseline Case

In the baseline scenario we assume that sectoral tariff and indirect tax rates in 2007 hold in every year until 2020. This experiment generates the baseline according to which the results under the four policy experiments are analyzed.

SIM 1

We call this experiment “special products,” although the effects that are captured in this

Table 5.2 Changes in tariff rates under various trade reform scenarios (percent)

	Baseline		Special products		Agricultural products[b]		All products	
Sector	2000	2007[a]	2008	2020	2008	2020	2008	2020
Palay	50.0	18.9	18.9	18.9	18.9	18.9	18.9	18.9
Corn	27.5	21.7	9.0	0.0	9.0	0.0	9.0	0.0
Coconut	10.6	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Fruits and vegetables	22.8	9.8	9.8	9.8	9.5	6.4	9.5	6.4
Sugar	41.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Other crops	4.3	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Hogs	28.0	25.5	10.5	0.0	10.5	0.0	10.5	0.0
Cattle	11.6	6.7	6.0	1.6	6.0	1.6	6.0	1.6
Chicken	19.1	22.2	21.6	15.2	21.6	15.2	21.6	15.2
Fishing	10.0	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Forestry	2.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Mining	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Crude oil and natural gas	1.5	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Meat processing	37.5	24.3	10.0	0.0	10.0	0.0	10.0	0.0
Milk and dairy	5.8	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Fruit processing	10.9	9.1	9.1	9.1	9.0	7.7	9.0	7.7
Fish processing	11.9	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Coconut and edible oil	6.1	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Rice and corn milling	46.6	43.8	42.6	31.2	42.6	31.2	42.6	31.2
Sugar milling	24.0	35.3	32.6	12.6	32.6	12.6	32.6	12.6
Other processed food	10.1	9.2	9.2	9.2	9.2	8.3	9.2	8.3
Tobacco and alcohol	9.8	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Textiles	10.2	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Garments and footwear	19.2	11.8	11.8	11.8	11.8	11.8	11.6	9.5
Leather and rubberwear	4.7	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Paper and wood products	8.3	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Fertilizer	0.6	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Other chemicals	5.8	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Petroleum	3.3	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Cement and related products	8.6	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Metal and related products	7.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Machinery	4.3	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Electrical and related products	5.6	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Other manufacturing	6.5	3.4	3.4	3.4	3.4	3.4	3.4	3.4

Source: Philippine Tariff Commission (2007, Table 4.1), for 2000; authors' calculations for remaining years.
[a]In the baseline case, the values in 2007 are held constant until 2020.
[b]Agriculture and selected food items.

exercise may be the opposite of the possible effects from the ongoing discussion on SP in the WTO negotiations. As discussed in Chapter 1, the WTO SP provision allows developing countries the flexibility to implement a tariff reduction program over an extended period for certain self-designated products, as well as to exempt certain products from minimum access provisions. In the present experiment we instead allow a continued reduction in the NPRs of commodities listed in Table 2.8. These commodities are key items in the consumption basket of Filipinos, especially those in the lower income brackets. In Table 4.2 these items make up 28 percent of the total consumption of households in the first decile. The ratio declines sharply to 7.2 percent of the total consumption of households in the tenth decile.

Table 5.3 Indirect tax rates under all trade reform scenarios (percent)

	Baseline		Trade scenario[a]	
Sector	2000	2007[b]	2008	2020
Palay	3.2	3.2	3.2	3.2
Corn	39.9	19.3	18.3	10.0
Coconut	0.9	0.9	0.9	0.9
Fruits and vegetables	3.4	3.4	3.4	3.4
Sugar	1.7	1.7	1.7	1.7
Other crops	1.3	1.3	1.3	1.3
Agricultural services	2.8	2.8	2.8	2.8
Hogs	21.4	38.2	34.5	10.0
Cattle	24.4	8.5	8.5	8.3
Chicken	–6.1	–4.5	–4.5	–4.5
Fishing	1.7	1.7	1.7	1.7
Forestry	3.8	3.8	3.8	3.8
Mining	2.2	2.2	2.2	2.2
Crude oil and natural gas	0.0	0.0	0.0	0.0
Meat processing	–0.2	17.0	16.4	10.1
Milk and dairy	1.0	1.0	1.0	1.0
Fruit processing	2.2	2.2	2.2	2.2
Fish processing	1.3	1.3	1.3	1.3
Coconut and edible oil	–21.8	–16.0	–14.5	–4.4
Rice and corn milling	21.4	–16.2	–16.2	–16.2
Sugar milling	52.1	–2.3	–2.3	–2.3
Other processed food	1.6	1.6	1.6	1.6
Tobacco and alcohol	22.8	22.8	22.8	22.8
Textiles	0.7	0.7	0.7	0.7
Garments and footwear	0.5	0.5	0.5	0.5
Leather and rubberwear	0.4	0.4	0.4	0.4
Paper and wood products	0.7	0.7	0.7	0.7
Fertilizer	0.5	0.5	0.5	0.5
Other chemicals	1.0	1.0	1.0	1.0
Petroleum	17.6	17.6	17.6	17.6
Cement and other related products	1.9	1.9	1.9	1.9
Metal and related products	1.1	1.1	1.1	1.1
Machinery	1.7	1.7	1.7	1.7
Electrical and related products	1.2	1.2	1.2	1.2
Other manufacturing	1.8	1.8	1.8	1.8
Construction	1.4	1.4	1.4	1.4
Utilities	3.2	3.2	3.2	3.2
Transportation and communications	1.2	1.2	1.2	1.2
Wholesale trade	1.1	1.1	1.1	1.1
Other service	2.9	2.9	2.9	2.9

Source: Authors' calculations.
[a]SIM 1 (special products), SIM 2 (agriculture and selected food items), and SIM 3 (all products).
[b]In the baseline case, the values in 2007 are held constant until 2020.

The reduction in the NPRs is carried out as follows. Since we assume NPRs as the measure of the gap between domestic and border prices, and since the NPRs are affected by tariff rates and indirect taxes in our model, we reduce the NPRs by reducing annually from 2008 to 2020 both the tariff rates and the indirect tax rates of the selected commodities in Table 2.8, except coconut oil. We did not reduce the NPRs all the way to zero in 2020 but allowed a 10 percent price difference between domestic and border prices at the end of the simulation year. The 10 percent price difference would account for the administrative cost of importation.

The case of coconut oil is slightly different because the NPRs have always been negative, implying that its domestic price is always below the border price. Thus for coconut oil we retain the 2007 tariff rate and annually reduce the negative indirect tax rates until the domestic price is equal to the border price in 2020. For the rest of the sectors, we retain the 2007 tariff rates and indirect tax rates until 2020.

Table 5.2 shows the tariff rates in all the sectors in 2008 and 2020, while Table 5.3 presents the indirect tax rates. The commodities with tariff rates equal to almost zero in 2020 are corn, hogs, and processed meats.[1] There is a reduction in the tariff rate on rice and corn milling from 43.8 percent in 2007 to 31.2 percent in 2020, and one for sugar milling from 35.3 percent in 2007 to 12.6 percent in 2020. As for the indirect tax rates in Table 5.3, the rates on corn decline from 19.3 percent in 2007 to 10 percent in 2020, those on hogs decline from 34.5 percent in 2007 to 10 percent in 2020, and those on processed meats decline from 17 percent in 2007 to 10 percent in 2020. The rates on rice and corn milling and on sugar are the same in all years until 2020. This implies that the earlier reduction in tariff rates is enough to reduce the NPRs of these commodities to 10 percent in 2020. The negative indirect tax rate on coconut and edible oil is reduced from –14.4 percent in 2007 to –4 percent in 2020. The annual reduction in the negative indirect tax rates on coconut oil while retaining its tariff rates will equalize domestic prices with border prices at the end of the simulation period.

We solve the model from 2000 to 2020 using these assumptions and compute the percentage difference of the results from the baseline case. However, since the assumptions in the baseline case and in this experiment are identical from 2000 to 2007, the deviation between the two trajectories will begin in 2008 and continue to 2020.

SIM 2

We call this experiment "agriculture and selected food items." It is identical to SIM 1 with the addition of a reduction in tariff rates on fruits and vegetables, fruit processing, and other processed food. These three items were not included in the list of food items in Table 2.8. There are no changes in the indirect tax rates on these commodities in this experiment. However, we reduce annually the tariff rates on these commodities from 2007 to 2020 so that their domestic price is 10 percent above the border price at the end of the simulation period. We solve the model from 2000 to 2020 using these assumptions and compute the percentage difference of the results in this experiment from the baseline scenario.

SIM 3

We call this experiment "all products." This exercise is the same as SIM 2 with the addition of an annual reduction in tariff rates on the rest of the sectors from 2007 to 2020, so that their domestic prices are 10 percent above the border prices at the end of the simulation period. The gap between domestic and border prices for a number of nonagricultural products is already below 10 percent because of the tariff reduction program discussed in Chapter 2. Based on the tariff rates in Table 5.2, only garments and footwear are added to the list in SIM 2. Its tariff rate declines from 11.8 percent in 2007 to 9.5 percent in 2020.

The domestic price is higher than the border price in the case of tobacco and alcohol

[1]Processed meats are not one of the selected commodities in Table 2.8. There are no estimates of NPRs for processed meats. In our analysis we assume the NPRs for processed meats to be equal to the import-weighted NPRs of hogs, chicken, and beef.

and petroleum not because of high tariffs but because of high indirect taxes (Table 5.3). In this exercise we retain the high indirect tax on these commodities because of their negative health and environmental externalities. We solve the model from 2000 to 2020 and compute the percentage difference between the results and the baseline case.

SIM 4

We call this experiment "total factor productivity." Similar to the baseline scenario, we hold the sectoral tariff and indirect rates in 2007 fixed in all years until 2020. The only difference between this experiment and the baseline case is the increase in the scale production parameter for palay and rice and corn milling by 5 percent in 2008. We retain these new scale parameters for these sectors until 2020. That is, we increase by 5 percent the scale parameter k_{ag} only in the production function for palay, equation (2) in Appendix A, and the scale parameter k_{nag} only in the production function for rice and corn milling, equation (3). This scaling up of these parameters shifts the entire production curves of palay and rice upward, increasing output of these commodities for every level of factor inputs used in production. An upward shift in the production function of rice is the outcome of a successful rice productivity program. In analyzing the results, we take the percentage difference between the results under the TRP experiment and those under the baseline scenario.

CHAPTER 6

Results

In this chapter we present our analysis of the four policy experiments. The discussion is divided into two parts. The first discusses the results generated from the CGE model, which are percentage changes from the baseline. Each simulation generates a huge amount of information for each year from 2008 to 2020.[1] For a shorter and clearer analysis, we summarize the results by taking the average of the annual percentage change of the experiments from the baseline over the simulation period. The analysis focuses on macro and sectoral effects in terms of changes in volumes and prices from the baseline. These changes are then linked to the results for factor prices. The results for household income and welfare are analyzed in terms of changes in factor prices and consumer prices.

The second part presents the results generated from the poverty microsimulation analysis. The microsimulation process incorporates recursively the results generated from the CGE simulations on changes in household income, consumer prices, and employment in agriculture and non-agriculture to calculate the effects on poverty indexes and Gini coefficient. The poverty and income distribution results in the microsimulation analysis are the percentage change relative to the 2000 poverty and distribution indexes. The microsimulation process used in the analysis is discussed in detail in Appendix C.

CGE Simulation Results

In discussing the results we follow the framework in Figure 4.1. We discuss the results for output, which is sold either to the export market or to the domestic market. The results for imports, together with the change in output that is sold to the domestic market, affect the supply of goods and services in the domestic market. These are volume changes that are affected by changes in prices; that is, changes in the price of output, exports, domestic demand, imports, and commodities affect the volume of supply and demand. Changes in output also affect factor demand and factor prices. The results for factor prices and consumer prices are used to examine the effects on household income.

Table 6.1 presents the macro and sectoral results generated in the four policy experiments, while Table 6.2 shows the impact on household income. The sectoral results are aggregated into agriculture and non-agriculture using weights in the SAM. As noted in Table

[1]The model was solved starting in 2000. However, the assumptions in the baseline case are the same as those incorporated into the four other experiments from 2000 to 2007. Thus the percentage change is zero between 2000 and 2007.

Table 6.1 Aggregate effects, 2008–20 (percent change from baseline)

Variable	Trade reform in: Special products	Agriculture[a]	All products	Increase in total factor productivity for rice
Real gross domestic product	0.42	0.43	0.48	0.21
Real exchange rate	1.20	1.32	1.73	0.33
Consumer price index	–2.59	–2.64	–2.80	–0.32
Output				
Agriculture	0.88	0.88	1.01	0.91
Non-agriculture	–0.38	–0.38	–0.66	0.28
Domestic demand				
Agriculture	1.00	1.00	1.15	0.95
Non-agriculture	–0.41	–0.41	–0.69	0.31
Composite commodity				
Agriculture	1.47	1.49	1.56	0.77
Non-agriculture	–0.60	–0.60	–0.91	0.31
Exports				
Agriculture	–1.58	–1.50	–1.70	0.39
Non-agriculture	–0.39	–0.38	–0.75	0.26
Imports				
Agriculture	2.82	2.98	2.64	–0.04
Non-agriculture	–1.09	–1.10	–1.49	0.31
Output price				
Agriculture	–1.22	–1.27	–1.47	–0.83
Non-agriculture	–0.22	–0.23	–0.24	–0.03
Domestic price				
Agriculture	–2.32	–2.37	–2.81	–0.88
Non-agriculture	–0.30	–0.32	–0.33	–0.05
Composite price				
Agriculture	–2.53	–2.59	–2.97	–0.75
Non-agriculture	–0.22	–0.23	–0.24	–0.03
Local price[b]				
Agriculture	–1.31	–1.36	–1.58	–0.88
Non-agriculture	–0.30	–0.32	–0.33	–0.05
Import price				
Agriculture	–1.94	–2.12	–2.18	0.00
Non-agriculture	0.00	0.00	0.00	0.00
Factor prices less inflation				
Wages of skilled workers	2.55	2.60	2.73	0.48
Wages of unskilled workers	2.72	2.74	3.07	0.26
Returns to capital, agriculture	3.12	3.17	3.42	0.42
Returns to capital, non-agriculture	2.87	2.94	3.17	0.48
Return to land	3.49	3.47	3.82	0.30

Source: Authors' calculations.

[a]Agriculture and selected food items.

[b]Domestic price less indirect tax.

6.1, the aggregate for agriculture includes processed meats, coconut and edible oil, rice and corn milling, and sugar milling. Non-agriculture includes the rest of the sectors. The results for the various policy experiments are the average annual percentage difference from the baseline over the simulation period from 2008 to 2020.

Table 6.2 Income and consumer price effects, 2008–20 (percent change from baseline)

	Special products		Agriculture[a]		All products		Increase in total factor productivity for rice	
Household group (decile)	Real income	Consumer prices	Real income	Consumer prices	Real income	Consumer prices	Real income	Consumer prices
First	2.01	–1.76	2.05	–1.83	2.43	–2.19	0.81	–0.69
Second	2.18	–1.92	2.21	–1.99	2.57	–2.32	0.75	–0.64
Third	2.27	–2.04	2.30	–2.10	2.63	–2.41	0.71	–0.59
Fourth	2.29	–2.26	2.34	–2.33	2.51	–2.59	0.76	–0.52
Fifth	2.48	–2.49	2.53	–2.55	2.65	–2.78	0.70	–0.46
Sixth	2.70	–2.75	2.75	–2.81	2.84	–3.00	0.64	–0.39
Seventh	2.84	–2.92	2.89	–2.98	2.95	–3.14	0.58	–0.34
Eighth	2.85	–2.95	2.89	–3.01	2.94	–3.14	0.53	–0.29
Ninth	2.80	–2.92	2.84	–2.97	2.86	–3.08	0.47	–0.24
Tenth	2.26	–2.42	2.30	–2.47	2.24	–2.54	0.45	–0.17
Overall	2.53	–2.59	2.57	–2.64	2.63	–2.80	0.56	–0.32

Source: Authors' calculations.
[a]Agriculture and selected food items.

SIM 1: Special Products

The continued reduction in the NPRs of rice, corn, sugar, beef, chicken, pork, and processed meat products, and the improvement of the NPR of coconut oil, increase GDP from the baseline by an average of 0.42 percent per year between 2008 and 2020. The real exchange rate depreciates by an average of 1.2 percent over the same period. The depreciation of the real exchange rate is largely due to the reduction in prices as a result of the decline in the NPRs through the reduction in tariff rates and indirect tax rates on the selected commodities. These commodities account for a large combined share of the consumption basket of Filipino households. Thus the decline in their prices leads to a reduction in consumer prices of 2.59 percent.

Since the shock introduced was a reduction in tariff rates and indirect tax rates, in order to bring down the NPRs of the selected commodities, let us start the discussion with the impact on import and domestic prices in agriculture. The reduction in tariff rates in these selected products leads to a decline in the import price of agricultural products of 1.94 percent, while the reduction in the indirect tax rates on these products results in a drop in the domestic price of agricultural products of 2.32 percent. The drop in the import price of agricultural products leads to an improvement in imports of agriculture of 2.82 percent.

The reduction in domestic and import prices in agriculture translates to a fall in the composite price in agriculture of 2.53 percent. This triggers a strong demand for agriculture, as indicated by a higher composite good of 1.47 percent. This in turn triggers a demand-pull effect on agricultural output, increasing it by 0.88 percent. However, the increase in domestic demand for agriculture is stronger; it increases by 1 percent. This shifts some agricultural products away from exports, and exports of agriculture decline by 1.58 percent.

These are aggregate effects. They are not uniform across sectors in agriculture, as seen in Table 6.3. Among the selected commodities, there is an improvement in the output of hogs, cattle, chicken, and processed meats, but there is also a decline in the output of coco-

Table 6.3 Special products: Average sectoral effects, 2008–20 (percent change from baseline)

	Volume Price									
Sectors	Output	Domestic demand	Exports	Imports	Composite commodity	Output	Domestic	Local[a]	Imports	Composite
Palay	–0.46	–0.46 0.00 0.00			–0.46 0.34		0.34	0.34	0.00	0.34
Corn	–3.19 –3.19		–3.16	20.78	0.25	–0.02	–0.02 –0.02		–20.39 –7.09	
Coconut	–1.26	–1.26	–1.84	0.00	–1.26	0.38	0.38 0.38		0.00 0.38	
Fruits and vegetables	–0.13	–0.13	–0.87	0.43	–0.07	0.47	0.47	0.47	0.00	0.41
Sugar	–1.90	–1.90	–2.55	0.00	–1.90	0.42	0.42 0.42		0.00 0.42	
Other crops	–1.20	–1.20 –1.93 –0.65			–0.88	0.47	0.47	0.47	0.00	0.20
Agricultural services	–0.36	–0.36	–0.98	0.11	–0.36	0.39	0.39 0.39		0.00 0.39	
Hogs	6.00	6.00	0.00 34.59		6.03 –1.44		–1.44	–1.44	–29.19	–13.79
Cattle	1.19	1.19 0.38 5.68			1.87 0.50		0.50	0.50	–3.12	–0.14
Chicken	2.87 2.87		2.37	7.23	2.90	0.30	0.30 0.30		–3.06 0.28	
Fishing	–0.28	–0.28	–0.74	0.06	–0.28	0.29	0.29 0.29		0.00 0.29	
Forestry	–0.79	–0.79	–1.91	0.06	–0.78	0.72	0.72 0.72		0.00 0.71	
Mining	–0.84 –0.88		–0.67	–1.04	–0.95	–0.10	–0.10 –0.12		0.00 –0.06	
Crude oil and natural gas	0.01	0.01	0.00	–0.43	–0.43	–0.32	–0.32	–0.32	0.00	0.00
Meat processing	4.99	4.99 22.45 24.30			6.66 –7.92		–7.92	–7.92	–21.05	–11.87
Milk and dairy	0.34	0.33	0.98	–0.16	0.14	–0.35	–0.35	–0.35	0.00	–0.21
Fruit processing	0.02 0.03		–0.51	0.45	0.13	0.30	0.30 0.30		0.00 0.23	
Fish processing	–0.36	–0.33	–1.14	0.31	–0.26	0.44	0.44 0.46		0.00 0.40	

Coconut and edible oil	–3.46	–3.46	–4.82	–2.38	–3.10	0.80	0.80	0.81	8.50	9.10
Rice and corn milling	–0.42	–0.42	0.86	5.43	0.93	–0.71	–0.71	–0.71	–4.63	–1.67
Sugar milling	–2.32	–2.32	–2.90	13.95	0.70	0.34	0.34	0.34	–9.92	–1.82
Other processed food	1.06	1.05	3.16	–0.54	0.81	–1.12	–1.12	–1.13	0.00	–0.96
Tobacco and alcohol	0.24	0.24	0.82	–0.21	0.21	–0.32	–0.32	–0.32	0.00	–0.29
Textiles	–1.29	–1.28	–1.45	–1.15	–1.23	0.09	0.09	0.10	0.00	0.05
Garments and footwear	–1.65	–1.65	–1.30	–1.92	–1.66	–0.19	–0.19	–0.20	0.00	–0.19
Leather and rubberwear	–1.12	–1.08	–1.43	–0.80	–0.94	0.17	0.17	0.20	0.00	0.10
Paper and wood products	–0.79	–0.77	–1.54	–0.17	–0.60	0.43	0.43	0.43	0.00	0.31
Fertilizer	–0.97	–0.96	–1.12	–0.84	–0.89	0.08	0.08	0.09	0.00	0.04
Other chemicals	–1.90	–1.79	–4.87	0.70	–0.82	1.76	1.76	1.82	0.00	1.09
Petroleum	–0.42	–0.41	–0.48	–0.36	–0.40	0.03	0.03	0.04	0.00	0.03
Cement and related products	–1.29	–1.30	–1.17	–1.41	–1.32	–0.07	–0.07	–0.07	0.00	–0.06
Metal and related products	–0.84	–0.86	–0.78	–0.92	–0.88	–0.04	–0.04	–0.04	0.00	–0.03
Machinery	–0.78	–1.30	–0.71	–1.75	–1.60	–0.04	–0.04	–0.33	0.00	–0.11
Electrical and related products	–0.68	–1.23	–0.61	–1.70	–1.65	–0.04	–0.04	–0.34	0.00	–0.04
Other manufacturing	–0.87	–0.92	–0.75	–1.05	–0.97	–0.07	–0.07	–0.09	0.00	–0.06
Construction	–2.16	–2.16	–1.61	–2.60	–2.17	–0.31	–0.31	–0.32	0.00	–0.31
Utilities	–0.30	–0.30	0.00	0.00	–0.30	0.06	0.06	0.06	0.00	0.06
Transportation and communication	–0.12	–0.16	0.22	–0.33	–0.20	–0.19	–0.19	–0.21	0.00	–0.16
Wholesale trade	–0.40	–0.41	–0.09	–0.55	–0.41	–0.17	–0.17	–0.18	0.00	–0.18
Other services	0.83	0.73	2.73	–0.12	0.65	–1.02	–1.02	–1.07	0.00	–0.97

Source: Authors' calculations.
[a]Domestic price net of indirect taxes.

nut and edible oil, rice and corn milling, and sugar milling. Outputs of the rest of the sectors in agriculture decline. Another important result is that while overall agricultural exports decline, there are some agricultural products whose exports improve. There is a 22.45 percent surge in exports of processed meats, and exports of other processed foods increase by 3.16 percent. These effects are due largely to the depreciation of the exchange rate.

Table 6.1 also presents the effects on factor prices. These are net of the change in consumer prices, which decline by 2.59 percent under SIM 1. The highest increase is the average return to land, which improves by 3.49 percent. The average return to capital improves by 3.12 percent in agriculture and 2.87 percent in non-agriculture. The average wage of labor improves by 2.72 percent for unskilled labor and 2.55 percent for skilled labor.

These positive factor price effects lead to higher household income. In Table 6.2 we show the increase in real income and the reduction in consumer prices in each of the 10 household groups. Overall real household income improves by 2.53 percent. This is largely due to the 2.59 percent reduction in overall consumer prices. As noted earlier, the reduction in consumer prices is due to the lowering of tariff rates and indirect tax rates, which brings down the NPRs of rice, corn, sugar, beef, chicken, pork, and processed meat products. The largest improvement in real income is in the sixth, seventh, and eighth deciles. This is because the composite price of processed meats declines by 11.87 percent (Table 6.3). Processed meats has the highest share in the consumption basket of these three household groups, compared to the rest of the households (Table 4.2).

Rice and corn milling has the highest consumption share in the first decile compared to the rest of the groups. However, the composite price of rice and corn milling declines by only 1.67 percent (Table 6.3). Thus the decline in the consumer price in the first decile is lower than the drop in the sixth, seventh, and eighth deciles. The first decile has the least improvement in real income, 2.01 percent.

SIM 2: Agriculture and Selected Food Items

As discussed in the previous chapter, the difference between this experiment and the previous one is that in the present exercise we included in SIM 1 the annual reduction in tariff rates on fruits and vegetables, fruit processing, and other processed food, so the difference between domestic and border prices is reduced 10 percent at the end of the simulation period in 2020. The macro and sectoral effects under this experiment, which are presented in Table 6.1, are not very much different from the results under SIM 1. GDP improves by 0.43 percent. The consumer price declines by 2.64 percent, which is slightly higher than the result in the previous experiment. The decline in commodity prices of agriculture increases the demand, which triggers demand-pull effects on agricultural output. The improvement in output and the decline in consumer prices lead to higher real factor price effects.

The increase in household income is presented in Table 6.2. Overall real income of households improves by 2.57 percent, which is slightly more than in SIM 1. The reduction in consumer prices of 2.64 percent is also higher than that in the previous experiment. All household groups realize higher real income. Similar to the previous case, the sixth, seventh, and eighth deciles have the highest increase in income. The first decile has the least improvement in income.

SIM 3: All Products

In addition to the list of selected food items in SIM 1 and fruits and vegetables, fruit processing, and other processed food, as added for SIM 2, we added garments and footwear to the list for this experiment. We added only garments and footwear to the list because the domestic prices of the rest of the sectors are not very different from the border prices, as a result of the TRPs implemented by the government since the 1980s (with the exception of tobacco, beverages, and petroleum products).

The macro and sectoral results in Table 6.1 and the household income effects in Table 6.2 are higher than but not significantly different from the results under SIM 1 and SIM 2. All household groups experience higher real income because of significant reduction in consumer prices. The least income improvement is in the first decile.

SIM 4: Total Factor Productivity

In this experiment we retain the 2007 NPRs for all sectors in all years until the end of the simulation period in 2020. However, we increase by 5 percent the scale production parameters of palay and rice and corn milling starting in 2008 and retain the new scale parameters until the end of the simulation in 2020. The increase in the scale production parameters shifts the production function of these products upward, which implies higher output in these sectors for all factor inputs used in production.

Higher productivity in the rice sector will bring about a 0.22 percent average increase in GDP over the simulation period (Table 6.1). The output of agricultural products improves by 0.91 percent. This increase is largely due to improvements in the output of rice and corn milling (3.25 percent), palay (2.89 percent), and corn (2.07 percent).[2] There is a slight decline in agricultural imports of 0.04 percent, largely due to the 2.37 percent reduction in rice and corn milling imports. The domestic price of agricultural products declines by 0.88 percent, largely due to the 3.92 percent decrease in the domestic price of rice and corn milling. Factor prices net of the decline in consumer prices are higher with improved rice productivity.

The effects on household income are presented in Table 6.2. Overall real income improves by 0.56 percent. All household groups experience higher income, but the effects are not uniform across households. The first decile has the largest improvement in real income. This is because rice accounts for the largest share of its consumption basket compared to the rest of the household groups (Table 4.2). Thus the 3.92 percent drop in the price of rice and corn milling has the biggest impact on consumer prices in the first decile.

In sum the trade reform analysis shows that further reductions in trade distortions will benefit households by making possible higher real income through significant reduction in consumer prices. This is because most of the reductions in trade distortions will focus on agricultural and major food items, which account for large shares of the consumption basket of Filipinos. Trade distortions outside agricultural and food items are already minimal as a result of the trade reform programs implemented since the 1980s. On the other hand, higher rice productivity will not only increase rice production; it will also reduce the domestic price of rice. This will benefit the lowest-income group (the first decile) because rice makes up the highest share of its consumption basket compared to the consumption baskets of the rest of the household groups.

The next section will use these CGE simulation results to assess the impact of trade reform and higher rice productivity on poverty and income distribution. The CGE results are incorporated recursively into a microsimulation process that uses disaggregated household data from the 2000 FIES.

Poverty Microsimulation Results

Appendix C offers a discussion of the microsimulation process we employ to calculate the poverty effects of Philippine agricultural and food policies under each of the policy experiments. The appendix also presents detailed results for the mean, standard error, and 95

[2]Detailed sectoral results are available from the authors on request.

percent confidence intervals of the poverty indexes in each of the policy experiments. Presented in this section are summary results for the percentage changes of the poverty indexes and the Gini coefficient from the base data in the 2000 FIES.

The microsimulation uses the CGE results for the average change in household income, consumer prices, and employment in agriculture and non-agriculture to compute the poverty indexes.[3] Two household groupings were used in the microsimulation analysis: decile and socioeconomic categories. The decile households are similar to the household categories in the CGE model. The socioeconomic categories group households according to urban and rural areas, gender, and whether the household is headed by a skilled or an unskilled worker. The skills categories are similar to those for the CGE model: skilled refers to workers with at least a college diploma while unskilled workers are those without a college diploma.

Table 6.4 presents the change in the Gini coefficient and the three poverty indexes—P0 (poverty incidence), P1 (poverty gap), and P2 (poverty severity)—for each decile relative to the indexes in the 2000 FIES. Table 6.5 presents the change in poverty indexes by socioeconomic category in urban and rural areas. The tables also present the indexes calculated from the household data in the 2000 FIES.

Before discussing the results, two points should be noted. The first is that, in the Philippine household survey, the poverty threshold is computed regionally to account for the cost of living in each region. Thus there is no national poverty threshold. This is the reason why all households in the first decile are not below the poverty threshold. It is possible that, even though a household has an income placing it in the first 10 percent income bracket, it remains above the poverty line, because the poverty threshold in its region is low owing to a lower cost of living. It is also possible that, even though a household belongs to the second 10 percent income bracket and therefore has an income above those of households in the first bracket, it is below the poverty line, because it is located in a region (such as Metro Manila) where the cost of living is extremely high and thus the poverty threshold is also very high. Thus the poverty incidence in the first decile is 85.4 percent (Table 6.4) and that in the second decile is 71 percent. The poverty incidence drops considerably as we move to the higher-income deciles. There is practically no poverty in the eighth decile, and all households in the top 20 percent are above the poverty threshold.

The incidence of poverty in urban areas is 18.6 percent, while that in rural areas is 48.8 percent (Table 6.5). Within urban areas the incidence of poverty among households headed by male skilled workers is higher (3.2 percent) than that among households headed by female skilled workers (0.9 percent). Furthermore urban households headed by male unskilled workers have a higher incidence of

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[3]Poverty impacts are measured by variations in Foster, Greer, and Thorbecke (FGT) (1984) indexes given by

$$P_\alpha = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{z - y_i}{z} \right)^\alpha ,$$

where n is population size, q is the number of people below the poverty line, y_i is income, and z is the poverty line. The poverty line is equal to the food poverty line plus the nonfood poverty line, respectively representing the estimated cost of basic food and nonfood requirements. The poverty incidence, which measures the proportion of the population whose income (or consumption) falls below the poverty line, is obtained when $\alpha = 0$. When $\alpha = 1$, we obtain the poverty gap, which measures the depth of poverty, that is, how far the poor are below the poverty line on average. The poverty severity index is obtained with $\alpha = 2$. This measure is sensitive to the distribution among the poor, as more weight is given to the poorest below the poverty line.

Table 6.4 Summary of poverty and distributional effects, by decile

Household group variable	Poverty[a]	Index in 2000	Percent change relative to index in 2000: Special products	Agricultural products	All products	Increase in total factor productivity for rice
All Philippines	Gini coefficient[b]	0.51 –0.03 –0.02			–0.13 –0.07	
	P0	32.8 –3.7 –3.7			–4.1 –1.0	
	P1	10.0 –5.2 –5.3			–6.0 –1.6	
	P2	4.2 –6.3 –6.3			–7.2 –2.0	
Decile 1	P0	85.4 –0.7 –0.7			–0.9 –0.2	
	P1	39.0 –2.5 –2.6			–3.1 –0.9	
	P2	20.9 –3.6 –3.7			–4.4 –1.4	
Decile 2	P0	71.0 –1.5 –1.6			–1.8 –0.5	
	P1	25.3 –4.0 –4.1			–4.8 –1.3	
	P2	11.1 –5.6 –5.7			–6.7 –1.9	
Decile 3	P0	58.0 –1.8 –1.7			–2.1 –0.6	
	P1	16.9 –5.6 –5.5			–6.5 –1.7	
	P2	6.3 –7.6 –7.6			–8.9 –2.3	
Decile 4	P0	45.3 –3.9 –4.0			–4.3 –1.2	
	P1	10.7 –7.3 –7.5			–8.1 –2.4	
	P2	3.4 –9.6 –9.8			–10.6 –3.2	
Decile 5	P0	27.4 –7.7 –7.8			–8.3 –2.1	
	P1	5.1 –10.5 –10.7			–11.3	–3.0
	P2	1.3 –12.8 –13.1			–13.6	–3.8
Decile 6	P0	15.3	–10.0 –9.9		–10.7 –2.2	
	P1	2.3 –14.1 –14.4			–14.7	–3.3
	P2	0.5 –16.9 –17.5			–17.5	–4.2
Decile 7	P0	6.6 –21.0 –20.6			–20.9	–3.3
	P1	0.7 –23.0 –22.8			–23.3	–4.9
	P2	0.1 –26.3 –25.7			–26.2	–5.7
Decile 8	P0	0.9 –21.1 –20.8			–20.8	0.0
	P1	0.1 –22.0 –22.3			–21.3	–4.3
	P2	0.0 –24.1 –24.9			–19.9	–5.0
Decile 9	P0	—	—	—	—	—
	P1 —		—	—	—	—
	P2 —		—	—	—	—
Decile 10	P0	—	—	—	—	—
	P1 —		—	—	—	—
	P2 —		—	—	—	—

Source: Authors' calculations. Index in 2000 is from National Statistics Office (2000).
Note: Means, standard errors, and 95 percent confidence intervals are presented in Appendix C.
[a] P0—poverty incidence; P1—poverty gap; P2—poverty severity.
[b] A measure of income distribution.

poverty (23.3 percent) than those headed by female unskilled workers (15 percent).

Among rural households, those headed by male skilled workers have a lower incidence of poverty (12 percent) than those headed by female skilled workers (14.7 percent). However, there is a higher incidence of poverty among rural households headed by male unskilled workers (52.4 percent) than those headed by female unskilled workers (34.9 percent).

The second point is that the Gini coefficient for the Philippines in 2000 was 0.51, which is very high (Table 6.4). This indicates that income is unequally distributed within the country.

Table 6.5 Summary of poverty effects by location, gender, and skill level

			Percent change relative to index in 2000			
Household group	Poverty variable[a]	Index in 2000	Special products	Agricultural products	All products	Increase in total factor productivity for rice
Urban	P0	18.6 –5.6		–5.6	–6.1 –1.5	
	P1	5.0 –6.6		–6.7	–7.3 –1.9	
	P2	2.0 –7.2		–7.3	–8.1 –2.3	
Urban male skilled	P0	3.2	–6.3	–5.7	–5.6	–1.3
	P1	0.7 –8.1		–7.9	–7.3 –4.0	
	P2	0.2 –8.3		–8.1	–5.2 –4.8	
Urban male unskilled	P0	23.3	–5.4	–5.5	–6.0	–1.5
	P1	6.4 –6.5		–6.6	–7.3 –1.9	
	P2	2.5 –7.2		–7.3	–8.2 –2.2	
Urban female skilled	P0	0.9	–8.5	–8.2	–6.9	–0.7
	P1	0.1 –7.9		–12.3	–8.6 –4.9	
	P2	0.0 –1.5		–18.8	3.8 –7.7	
Urban female unskilled	P0	15.2	–6.3	–6.3	–6.8	–1.4
	P1	3.9 –6.9		–6.9	–7.7 –2.0	
	P2	1.6 –7.0		–7.0	–8.0 –2.2	
Rural	P0	48.8 –3.0		–3.1	–3.3 –0.9	
	P1	15.9 –4.8		–4.9	–5.6 –1.5	
	P2	6.8 –6.0		–6.1	–7.0 –2.0	
Rural male skilled	P0	12.0	–1.9	–2.0	–1.5	–1.5
	P1	3.5 –5.2		–5.2	–5.3 –2.2	
	P2	1.4 –6.5		–6.3	–6.7 –2.7	
Rural male unskilled	P0	52.4	–3.1	–3.1	–3.4	–0.8
	P1	17.2 –4.8		–4.9	–5.6 –1.5	
	P2	7.4 –6.0		–6.0	–7.0 –2.0	
Rural female skilled	P0	14.7	0.0	0.0	0.0	–0.7
	P1	4.1 –4.8		–6.3	–5.1 –2.9	
	P2	1.4 –6.0		–9.5	–5.0 –4.3	
Rural female unskilled	P0	34.9	–2.5	–2.5	–2.8	–0.9
	P1	10.8 –5.2		–5.3	–6.1 –1.7	
	P2	4.4 –6.5		–6.5	–7.6 –2.2	

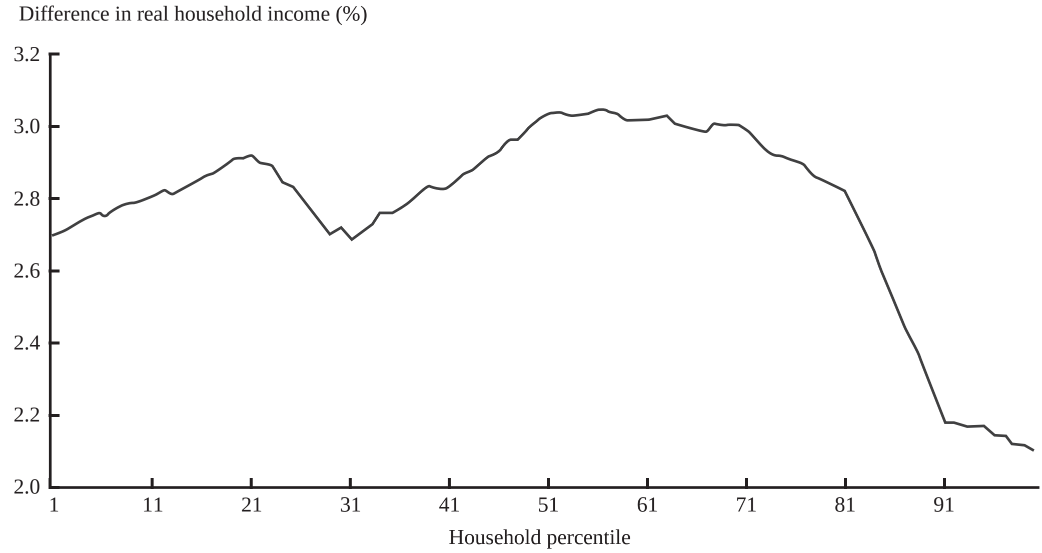
Source: Authors' calculations. Index in 2000 is from National Statistics Office (2000).
Note: Means, standard errors, and 95 percent confidence intervals are presented in Appendix C.
[a]P0—poverty incidence; P1—poverty gap; P2—poverty severity.

In the special product experiment in SIM 1, the Gini coefficient declines marginally by 0.03 percent. The second experiment, involving agriculture and selected food items (SIM 2), also results in a declining Gini coef ficient. However, of the three trade reform experiments, SIM 3 (all products) has the most favorable effect on income distribution. An improvement in rice productivity (SIM 4) will also marginally reduce income inequality in the Philippines.

The reduction in the NPRs of selected key food items in the special product experiment (SIM 1) will reduce the overall poverty incidence by 3.7 percent. The reduction in poverty in those households that are far below the poverty threshold is larger, as indicated by the 5.2 percent poverty gap index (P1) and 6.3 percent poverty severity index (P2).

The reduction in poverty occurs across all household groups. However, the largest reduction in poverty is in the fifth to eighth deciles.

Figure 6.1 Growth incidence curve under special products experiment (SIM 1)



The reduction in the incidence of poverty in the first decile is only –0.7 percent. Despite this, there is a greater reduction in the poverty gap and poverty severity indexes, which implies that those households in the first decile that are far below the poverty threshold are significantly and favorably affected. The impact on poverty in the second decile is relatively higher. The impact on poverty increases as we move to higher deciles.

Another way of looking at the results is through the growth incidence curve (GIC), which was developed by Ravallion and Chen (2003). A GIC provides a graphical estimate

Table 6.6 Sensitivity of poverty effects to changes in trade elasticities

			Percent change relative to index in 2000		
Location	Poverty variable[a]	Index in 2000	All products[b]	20 percent less[c]	20 percent more[c]
All Philippines	P0	32.8 –4.1 –4.0			–4.1
	P1	10.0 –6.0 –5.9			–6.1
	P2	4.2 –7.2 –7.1			–7.3
Urban	P0	18.6 –6.1 –5.8			–6.3
	P1	5.0 –7.3 –7.0			–7.5
	P2	2.0 –8.1 –7.8			–8.2
Rural	P0	48.7 –3.3 –3.3			–3.4
	P1	15.9 –5.6 –5.5			–5.6
	P2	6.8 –7.0 –6.9			–7.0

Source: Authors' calculations. Index in 2000 is from National Statistics Office (2000).
Notes: The sensitivity analysis uses the assumptions under SIM 3 (all products). Mean, standard error, and 95 percent confidence interval are presented in Appendix C.
[a]P0—poverty incidence; P1—poverty gap; P2—poverty severity.
[b]Reduction in trade distortions in all products
[c]Relative to the values of trade elasticities in Table 4.1.

of household real income growth according to its percentile rank relative to the growth in the mean income of the poor. The vertical axis shows the growth in real income while the horizontal axis identifies the population by percentile. Thus the GIC shows the distribution of gains throughout the entire population.

Figure 6.1 shows the GIC for the special products (SIM 1) experiment. It is computed as the percentage-point difference in real household income before and after reduction in the NPRs of selected food items under the SIM 1 experiment. The GIC is generally concave, indicating that middle- to moderately high-income households (sixth to the eighth deciles) have benefited more relative to the rest of the households. Nonetheless the average increase in income of the poorest households is greater than that of the tenth decile, indicating that inequality would fall, albeit marginally.

Table 6.5 presents the poverty results for household groups by socioeconomic category. The reduction in the NPRs for selected food items under SIM 1 will result in a 5.6 percent reduction in the incidence of poverty among urban households. Yet the poverty effects are not uniform across urban households. Urban households headed by skilled workers (both male and female) have a higher reduction in poverty than those headed by unskilled workers (both male and female).

The decline in the incidence of poverty among rural households is slightly lower, at 3 percent. Among rural households the effects on poverty are also not uniform. There is relatively higher poverty reduction for rural households headed by unskilled workers (both male and female) than those headed by skilled workers.

The poverty results under SIM 2 (agriculture including selected food items) and under SIM 3 (all products) are generally similar to those under SIM 1, but they involve slightly greater reductions in poverty. Finally, an increase in rice productivity (SIM 4) also reduces poverty.

Apart from the four policy experiments, we also solve the model under the assumptions of SIM 4 (all products), but with lower and higher trade elasticities, to determine how sensitive the poverty results are to changes in the trade elasticities. To conduct the sensitivity analysis we reduce the sectoral export elasticities (sig_e) and import elasticities (sig_m) in Table 4.1 by 20 percent. We also run the model with 20 percent higher sectoral export and import elasticities. The poverty results are summarized in Table 6.6. They do not change very much with changes in the trade elasticities. This implies that the effects of trade reform on poverty in the Philippines are quantitatively robust to variations in key trade parameter assumptions in the CGE model.

CHAPTER 7

Summary and Policy Insights

This research report analyzes the poverty and income distribution implications of agricultural and food policies in the Philippines. The first part of the report offers a comprehensive look at the structure of Philippine agriculture by highlighting major shifts in trade and agriculture policies, patterns of the nominal protection rate for key food items, trends in public expenditure on agriculture, and specific agricultural programs. The second part assesses the possible implications for poverty and income distribution of changes in agricultural and food policies by conducting a series of simulations using a CGE model and a microsimulation. Three simulations focus on trade reform and one simulation focuses on productivity improvement.

Summary

There have been significant changes in the structure of agriculture in the Philippines. Over the past two decades, there has been a continuous decline in the share of agriculture in total GDP. During these years Philippine agriculture has shifted from a net exporter to a net importer, having become less competitive in the international market for agricultural and food products. In addition agricultural productivity has declined. On the other hand there is increasing demand pressure because of increased demand for food items with high income elasticities and high population growth. As a result of the widening trade imbalance in agriculture and food, the Philippines has become increasingly vulnerable to fluctuations in the world food market. The 2008 world rice crisis, for example, had severe negative effects on the country's domestic rice market.

The Philippine government has attempted to address this issue by adopting policies aimed at achieving food self-sufficiency. Based on expenditure patterns and programs in place, the government's food self-sufficiency policies are focused mainly on rice. The government adopted the HRCP in order to increase rice yields. Despite the considerable resources invested by the government in the HRCP, its results have not been very encouraging. The total area of rice farms planted with hybrid seeds is very low compared to the total area of rice fields in the country. For farmers who have participated in the program, the dropout rate (the number of participating farmers who decided to revert back to inbred rice seeds in the next planting season) is very high. Furthermore the market for hybrid rice seeds is increasingly controlled by a single producer, which benefits from the government-guaranteed price for hybrid rice seeds.

The Philippines has undergone a series of trade reform programs since the mid-1980s. While trade protection has declined, particularly in the nonagricultural sector, protection for agriculture and major food products is still high.

The policy of food self-sufficiency resulted in high levels of protection in support of domestic production of key food items, indicated by high NPRs for rice, corn, sugar, beef, chicken, pork, and processed meat products. (The NPR refers to the difference between domestic wholesale and border prices.) High NPRs for key food items lead to very high food prices in the Philippines. Food accounts for a large share of the total consumption of Filipino households, especially those that are below the poverty threshold. Thus poor households are most affected by high food prices.

We have conducted three policy simulations to assess the impact of reducing the NPRs on key food items. In the first policy simulation (SIM 1, special products) we reduce annually the NPRs of rice, corn, beef, chicken, pork, and processed meat products from their levels in 2007 to 10 percent in 2020. In the second (SIM 2, agriculture and selected food items) we add to SIM 1 a reduction in tariff rates on fruits and vegetables, fruit processing, and other processed food. In the third policy simulation (SIM 3, all products) we add to the list a reduction in tariff rates on garments and footwear. Trade protection in other sectors is already low because of the series of trade reform programs implemented since the 1980s, and therefore we did not include them in the policy experiment. Finally in the fourth policy simulation (SIM 4, total factor productivity) we increase the productivity of the palay and rice and corn milling sectors.

The reduction in the NPRs of rice, corn, beef, chicken, pork, and processed meat products in SIM 1 leads to lower import and domestic prices for these commodities. This translates into a significant reduction in the overall consumer price. There is an increase in demand for these commodities and for agricultural products in general, which creates a demand-pull effect on agricultural output. Because of higher domestic consumption of food and agricultural products due to falling consumer prices, exports of agriculture in general switch to the domestic market in order to meet the growing domestic demand.

However, the decline in domestic prices because of the reduction in the NPRs of these commodities results in real depreciation of the exchange rate. While the overall exports of agriculture decline because they switch to the domestic market, the real depreciation of the exchange rate triggers a surge in exports of a few of these products, such as processed meat products and pork.

Factor prices increase, which improves household income. In real terms, however, the increase in household income is much higher because of the significant drop in the consumer price. The income effects vary across household groups. Households in the sixth, seventh, and eighth deciles have slightly higher positive real income effects than those in the rest of the groups, because there is a greater reduction in consumer prices in these groups owing to the drop in the price of processed meat products. Processed meat products account for a relatively high share of the consumption of these households compared to the rest of the groups.

The microsimulation analysis indicates that the reduction in the NPRs of rice, corn, beef, chicken, pork, and processed meat products reduces poverty. In addition a GIC analysis shows that middle- to moderately high-income households (sixth to eighth deciles) realize greater benefits relative to the rest of the households. However, the average increase in income of the poorest households (first decile) is greater than that of those in the tenth decile, indicating that inequality falls, albeit marginally.

In SIM 2 we included a reduction of tariff rates on fruits and vegetables, fruit processing, and other processed food. The results are similar to those for SIM 1, but the change is slightly higher in terms of the increase in real income and the reduction in poverty. Income inequality is also reduced slightly.

In SIM 3 we added a reduction of tariff rates on garments and footwear to the policy simulation. The results are generally similar to those for SIM 1 and SIM 2, but the change is slightly higher. SIM 3 also reduces poverty, and it reduces income inequality.

We conducted a sensitivity analysis to examine how the poverty effects of trade reform respond to changes in the trade elasticities of the model. We employed the assumptions used in SIM 3 (all products) but changed both the sectoral export and import elasticities by ±20 percent. The results show that changes in trade elasticities do not lead to significant changes in the effects on poverty. Thus we conclude that the effects on poverty of trade reform in the Philippines are quantitatively robust to variations in key trade parameter assumptions in the CGE model.

Finally SIM 4 increases the productivity of palay and rice and corn milling. Higher productivity in rice leads to higher rice output and lower rice imports. There is a significant reduction in the price of rice, which leads to a decline in the overall consumer price. Factor prices improve, leading to higher real income in all household groups. In contrast to the results for the previous three trade reform simulations, the first decile has the highest increase in real income. The increase is due to the reduction in the consumer price in the first decile. Compared to the rest of the household groups, rice is the largest item in the consumption basket of households in the first decile. Thus the reduction in the price of rice because of higher productivity leads to a relatively greater increase in real income in the first decile compared to the rest of the household groups.

Policy Insights

There has recently been increasing political pressure in the Philippines to change the course of the country's trade policy, particularly with regard to agricultural and major food items. The discussion on SP within the WTO only reinforces the arguments. Article 13 of the 2001 Doha Ministerial Declaration provides developing countries the option to designate products under the SDT provision for reasons relating to food security, livelihood, and rural development. To bolster this mechanism, two additional windows, the SP provision and the SSM, were introduced during the 2004 July Framework and the succeeding discussions in the 2005 Hong Kong Ministerial Declaration and the special session of the Committee on Agriculture in May 2006 (WTO 2005, 2006). Under the SP provision, developing countries can have the flexibility to implement a tariff reduction program over an extended period for certain self-designated products, as well as exempt certain products from minimum access provisions. On the other hand, the SSM provides developing countries with a mechanism to address and deal with sudden surges in imports and declines in prices.

The simulation results indicate that continuing the trade reform programs in the Philippines, especially those for key food items, would reduce poverty. This implies that a reversal in the current trade reform program would lead to increased poverty: increasing the protection afforded agriculture and major food items would further increase food prices, which are already very high. As we have seen, food is a major item in the consumption basket of Filipinos, especially those below the poverty threshold.

The government's effort to increase rice yield through the introduction of new technology is a step in the right direction. The simulation results in this report clearly indicate that higher rice productivity increases domestic output and reduces imports. Most important, it reduces the domestic price of rice and therefore benefits poor households in the lower income brackets. However, the present rice productivity program as implemented through the HRCP has major flaws. It is costly and unsustainable. The considerable government resources supporting the program create considerable waste and inefficiency. The massive subsidies provided by the government only distort farmers' ability to make choices among different varieties of rice, especially between inbred and hybrid rice (David 2006).

Although in some rice fields hybrid rice has a yield advantage over inbred rice, the cost of adopting hybrid rice would exceed the expected benefits, because hybrid rice varieties have not reached commercially viable levels, as has been the case in China, where its adoption has proven successful (David 2006). The price of hybrid rice seeds (PhP2,400 per bag) is far above that for inbred rice seeds (PhP1,400 per bag). And it is costly to produce hybrid rice seeds in the Philippines: (1) They are susceptible to diseases resulting from seed-borne insect pests because they are partially open. This is especially true in the case of the Philippines, with its humid tropical conditions. Seed growers would therefore be required to maintain expensive cold, dry storage facilities (PAN AP 2007). (2) Hybrid rice seed production is labor-intensive. It requires an additional 50 man-days per hectare. Farm wages in the Philippines are high. Compared to the production of ordinary inbred rice seeds, the production of hybrid rice seeds requires more fertilizers and other chemical inputs, such as gibberellic acid, a growth regulator needed to synchronize the flowering of the hybrid seed parents. These are expensive inputs in the Philippines (PAN AP 2007). (3) Fifty percent of the supply of hybrid rice seeds is controlled by a single supplier, based in the Philippines, where the cost of production is very high. This single supplier benefits from the government-guaranteed price for hybrid rice seeds, which is PhP2,400 per bag. One supplier of hybrid rice seeds, which is guaranteed a much lower price by the government, has only a 10 percent share of the market; this supplier imports its seeds from India, where the cost of production is much lower and where the seeds are grown under tropical conditions similar to those in the Philippines (David 2006).

The performance of the HRCP has not been very encouraging, despite the massive inflow of government funds. Of the total rice field area in the Philippines, only about 5 percent is planted with hybrid rice seeds. The dropout rate among participating farmers is very high, owing to the high cost of hybrid rice seeds and the need to purchase them in every planting season. Farmers cannot reuse hybrid rice seeds in the next planting season because the yield will drop dramatically. Furthermore the performance of hybrid rice is location specific. It is ideal in subtropical and subtemperate zones, and it is well suited for planting in irrigated, uniform lowland conditions (PAN AP 2007). Thus, while countrywide data for the Philippines would indicate a yield advantage of hybrid overinbred rice on average, farm-level data in a number of provinces would show the reverse—inbred rice seeds have a yield advantage over hybrid seeds.

The HRCP is very expensive and not sustainable in the long run. It cannot survive without large amounts of government support. However, the government cannot sustain such support indefinitely because the budget allocations for the program, plus the widening deficit at the National Food Authority, will create a significant drain on government resources. The government is thus faced with very tight budget constraints.

Given all these factors, the government should end the present costly and inefficient system of subsidies under the HRCP (David 2006). Instead it should divert its resources to supporting research and development activities that are focused on inbred varieties: "Rather than promote costly technologies such as hybrid rice, a more responsive approach in addressing rice productivity problems is to enhance inbred-based seed systems with farmers' practice of saving, re-using and exchanging seeds. National governments should instead focus their meager resources on sustainable initiatives that ensure farmers' participation in technology developments such as Participatory Plant Breeding Programs and, at the same time, focus on other factors that cause yield constraints" (PAN AP 2007, 5).

APPENDIX A

Specification of the CGE Model

Sectoral output is determined in equation (1) using fixed coefficients relating intermediate input (*CI*) and value added (*VA*). Value added in agriculture is determined in equation (2) through a CES function of skilled labor (*SKL*), unskilled labor (*UKL*), capital (*K*), and land (*LW*). Value added in non-agriculture is determined in equation (3) through a CES function of *SKL, UKL,* and *K.* Value added in nontradables is determined in equation (4). The factor demand for skilled and unskilled labor in various sectors is given in equations (5)–(10), which are first-order conditions for profit maximization. The demand for land in equation (11) is also derived as a first-order condition. Capital is fixed in the static within-period equilibrium but is updated in the next period using a capital accumulation function in equation (60).

The consumption function in equation (15) is specified as an LES. Equation (35) is a CET function of exports (*E*) and domestic demand (*D*). Sectoral export supply in equation (36) is a first-order condition for profit maximization. It is a function of the relative price of exports (*Pe*) and local price (*Pl*), which does not includes indirect tax. The model defines a sectoral composite good (*Q*), which is given in equation (37) usi ng a constant elasticity of substitution (CES) function of imports (*M*) and domestic demand. The demand for imports in equation (38) is derived as the first-order condition for cost minimization, which is a function of relative price involving the domestic price (*Pd*), which includes indirect tax, and the import price (*Pm*). The current account balance in equation (39) is the residual between the outflow and the inflow of foreign exchange. The outflow includes import payments, dividend payments to foreigners, capital payments to foreigners, and foreign debt service payments, while the inflow includes export receipts, household foreign remittances, and foreign grants to the government.

The import price in domestic currency (*Pm*) is given in equation (40). It is a function of the world price of imports, exchange rate, tariff rate, and indirect tax. The export price is given in equation (41). It is a function of the world price of exports and the exchange rate. The price of the composite good (*Pq*) is given in equation (42). The price of output in equation (43) is the weighted average of the local price and the export price. The difference between the domestic price in equation (44) and the local price is the indirect tax, *itxr.* Equation (45) specifies the value added price. We define a general price variable, *Pindex,* in equation (46) as the weighted sectoral value added price. The price of investment is specified in equation (47).

Equations (48) and (49) determine the rate of return to capital in agricultural and nonagricultural sectors, respectively. These equations also assure that zero profit conditions are satisfied in the model. Equilibrium in the product market is determined in equation (50). Equilibrium in the market for skilled labor is determined in equation (52), that for unskilled labor in equation (53), and that for land in equation (54). The supply of each of these labor types is fixed in the static within-period equilibrium, but it is updated using the growth equations in (55) for skilled labor and (56) for unskilled labor. Equation (51) states that total investment is equal to total savings. Total savings is composed of household savings, enterprise savings, government savings, and foreign savings. All of these savings are endogenous variables, except for foreign savings (*CAB*), which is fixed in equation (39). The nominal exchange rate (*er*) is the numeraire. The foreign trade sector is effectively cleared by changes in the real exchange rate.[1] Government savings is endogenous. Total government income (*YG*) is endogenous. Total government consumption in real terms, defined in equation (20) as X_{ntd}, is fixed.

Equation (60) updates the sectoral capital stock in the next period using information on the level of the capital stock in the preceding period, the depreciation rate, and investment. Investment demand in equation (58), which follows the specification of Bourguignon, Branson, and de Melo (1989) and Jung and Thorbecke (2003), is affected positively by the sectoral ratio between the sectoral return to capital (*r*) and the user cost of capital (*u*).

Production

(1) $$X_j = \min\left[\frac{CI_j}{io_j}, \frac{VA_j}{\nu_j}\right]$$

(2) $$VA_{ag} = \kappa_{ag} \cdot (\omega_{skl} \cdot SKL_{ag}^{-\rho va} + \omega_{ukl} \cdot UKL_{ag}^{-\rho va} + \omega_k \cdot K_{ag}^{-\rho va} + \omega_{lw} \cdot LW_{ag}^{-\rho va})^{-1/\rho va}$$

(3) $$VA_{nag} = \kappa_{nag} \cdot (\omega_{skl} \cdot SKL_{nag}^{-\rho va} + \omega_{ukl} \cdot UKL_{nag}^{-\rho va} + \omega_k \cdot K_{nag}^{-\rho va})^{-1/\rho va}$$

(4) $$VA_{ntd} = \kappa_{ntd} \cdot (\omega_{skl} \cdot SKL_{ntd}^{-\rho va} + \omega_{ukl} \cdot UKL_{ntd}^{-\rho va})^{-1/\rho va}$$

(5) $$UKL_{ag} = VA_{ag} \cdot \left(\frac{Pva_{ag} \cdot \omega_{ukl}}{wu \cdot \kappa_{ag}^{-\rho va}}\right)^{1/1+\rho va}$$

(6) $$UKL_{nag} = VA_{nag} \cdot \left(\frac{Pva_{nag} \cdot \omega_{ukl}}{wu \cdot \kappa_{nag}^{\rho va}}\right)^{1/1+\rho va}$$

[1]Since there is no explicit form of the real exchange rate in the model, the foreign trade sector is cleared by changes in the ratio involving the world price and the local price, both expressed in the same price using the fixed nominal exchange rate.

(7) $$UKL_{ntd} = VA_{ntd} \cdot \left(\frac{Pva_{ntd} \cdot \omega_{ukl}}{wu \cdot \kappa_{ntd}^{\rho va}} \right)^{1/1 + \rho va}$$

(8) $$SKL_{ag} = VA_{ag} \cdot \left(\frac{Pva_{ag} \cdot \omega_{skl}}{ws \cdot \kappa_{ag}^{\rho va}} \right)^{1/1 + \rho va}$$

(9) $$SKL_{nag} = VA_{nag} \cdot \left(\frac{Pva_{nag} \cdot \omega_{skl}}{ws \cdot \kappa_{nag}^{\rho va}} \right)^{1/1 + \rho va}$$

(10) $$SKL_{ntd} = VA_{ntd} \cdot \left(\frac{Pva_{ntd} \cdot \omega_{skl}}{wu \cdot \kappa_{ntd}^{\rho va}} \right)^{1/1 + \rho va}$$

(11) $$LW_{ag} = VA_{ag} \cdot \left(\frac{Pva_{ag} \cdot \omega_{lw}}{rlw_{ag} \cdot \kappa_{ag}^{\rho va}} \right)^{1/1 + \rho va}$$

(12) $$CI_j = io_{ij} \cdot X_j$$

(13) $$mat_{ij} = aij_{ij} \cdot CI_j$$

Demand

(14) $$CT_h = Dyh_h - Savh_h$$

(15) $$C_h = C\min_{i,h} + \frac{\alpha_{i,h}}{Pq_i} (CT_h - \sum Pq_i \cdot C\min_{i,h})$$

(16) $$INTD_i = \sum mat_{ij}$$

(17) $$INV_i = \tau_i \cdot TINV / Pq_i$$

(18) $$TINV = TINVR \cdot Pinv$$

(19) $$TINVR = \sum IND_i$$

(20) $$GC = Px_{ntd} \cdot X_{ntd}$$

(21) $$YSKL = \sum ws \cdot SKL_i$$

(22) $YUKL = \sum wu \cdot UKL_i$

(23) $YK = \sum r_i \cdot K_i$

(24) $YLW = \sum rlw \cdot LW_{ag}$

(25) $YH_h = YSKL \cdot Sh\_SKL_h + YUKL \cdot Sh\_UKL_h + YLW \cdot Sh\_LW_h + YK \cdot Sh\_K \cdot lamda_h + DIV\_H \cdot Sh\_DIV_h \cdot Pindex + TRGOVH_h \cdot Pindex + YFORH_h \cdot er$

(26) $DYH_h = YH_h \cdot (1 - dtxrh_h)$

(27) $YF = YK \cdot (1 - lamda - lamd\_for) \cdot (1 - dtxrf)$

(28) $TMREV = \sum tm_i \cdot M_i \cdot er \cdot Pwm_i$

(29) $DTXREV = \sum dtxrh_h \cdot YH_h + \sum YK \cdot (1 - lamda - lamda\_for) \cdot (dtxrf)$

(30) $ITXREV = \sum itxr_i \cdot D_i \cdot Pl_i + \sum itxr_i \cdot M_i \cdot er \cdot Pwm_i \cdot (1 + tm_i)$

(31) $YG = TMREV + DTXREV + ITXREV + GRANT\_FOR{*}er$

(32) $SAVH_h = aps_h \cdot DYH_h$

(33) $SAVF = YF - DIV \cdot Pindex - er \cdot DIV\_FOR$

(34) SAVG $\cdot Pindex = YG - GC - \sum TRGOVH \cdot Pindex - er \cdot PAYGV\_FOR$

International Trade

(35) $X_i = \mu_i \cdot (\theta_i \cdot E_i^{\rho e} + (1 - \theta_i) \cdot D_i^{\rho e})^{(1/\rho e)}$

(36) $E_i = D_i \cdot \left[\frac{Pe_i}{Pl_i} \cdot \frac{1 - \theta_i}{\theta_i}\right]^{\sigma e}$

(37) $Q = \zeta \cdot (\delta \cdot \mathrm{M}^{-\rho m} + (1 - \delta) \cdot \mathrm{D}^{-\rho m})^{(-/\rho m)}$

(38) $M_i = D_i \cdot \left[\frac{Pd_i}{Pm_i} \cdot \frac{1 - \delta_i}{\delta_i}\right]^{\sigma m}$

(39) $CAB = \sum Pwm_i \cdot M_i + DIV\_FOR + lamda\_for \cdot YK/er + PAYGV\_FOR -$
$\sum Pwe_i \cdot E_i - \sum YFORH_h - GRANT\_FOR$

Prices

(40) $Pm_i = Pwm_i \cdot er \cdot (1 + tm_i) \cdot (1 + itxr_i)$

(41) $Pe_i = Pwe_i \cdot er$

(42) $Pq_i \cdot \mathrm{Q}_i = Pd_i \cdot D_i + Pm_i \cdot M_i$

(43) $Px_i \cdot X_i = Pl_i \cdot D_i + Pe_i \cdot E_i$

(44) $Pd_i = Pl_i \cdot (1 + itxr_i)$

(45) $Pva_i \cdot VA_i = Px_i \cdot X_i - \sum mat_{ij} \cdot Pq_j$

(46) $Pindex = \sum w\_va_i \cdot Pva_i$

(47) $Pinv = \sum pq_i \times \tau_i$

(48) $r_{ag} \cdot K_{ag} = Pva_{ag} \cdot VA_{ag} - wu \cdot UKL_{ag} - ws \cdot SKL_{ag} - rlw_{ag} \cdot LW_{ag}$

(49) $r_{nag} \cdot K_{nag} = Pva_{nag} \cdot VA_{nag} - wu \cdot UKL_{nag} - ws \cdot SKL_{nag}$

Equilibrium

(50) $Q_i = INTD_i + \sum C_{i,h} + GC$

(51) $TINV = \sum SAVH_h + SAVF + SAVG + CAB \;\; er$

(52) $SKLS = \sum SKL_i$

(53) $UKLS = \sum UKL_i$

(54) $LWS = \sum LW_i$

Dynamic Equations

(55) $SKLS_{t+1} = SKLS_t \cdot (1 + grw)$

(56) $UKLS_{t+1} = UKLS_t \cdot (1 + grw)$

(57) $u_i = Pinv \cdot (ir + dep_i)$

(58) $IND_i / K_i = \lambda \left(r_i / u_i \right)^2$

(60) $K_{i,t+1} = K_{i,t} \cdot (1 - dep_i) + IND_{i,t}$

Endogenous Variables

CAB	current account balance or foreign savings
CH	commodity consumption of households
CI	intermediate input
$Cmin_h$	subsistence consumption
CT	total consumption of households
D	domestic demand
dep	depreciation rate
DIV_FOR	dividends paid to foreigners
DIV_H	total dividend income of households
DTXREV	direct tax revenue
dtxrf	income tax rate of firms
dtxrh	direct income tax rate of households
DYH	disposable income
E exports	
er	nominal exchange rate
GC	real government consumption
GRANT_FOR	foreign grants to government
grw	growth in labor supply
IND	demand for capital, by destination
INTD	intermediate demand
INV	investment demand, by origin
ir	real interest rate
itxr	indirect tax rate
ITXREV	indirect tax revenue
K capital	
LW land	
M imports	
mat	interindustry matrix
PAYGV_FOR	debt service payments of government
Pd	domestic price
Pe	export prices
Pindex	weighted value added price
Pinv	price of investment
Pl	local prices
Pm	import prices
Pq	composite price of commodities
Pva	value added price
Pwe	FOB (free on board) price exports
Pwm	world prices of imports
Px	output price
Q	composite demand, domestic demand and imports
r	return to capital
rlw	return to land
SAVF	firm savings
SAVG	government savings
SAVH	household savings
SKL	skilled labor
SKLS	supply of skilled labor
TINV	nominal total investment
TINV_R	real total investment
tm	tariff rate
TMREV	tariff revenue
TRGOVH	government transfers to households
u	user cost of capital
UKL	unskilled labor
UKLS	supply of unskilled labor

VA value added
ws average wage for skilled labor
wu average wage for unskilled labor
X output
YF firm income
YFORH foreign income of households
YG government income
YH household income
YK capital income
YLW land income
YSKL income from skilled labor
YUKL income from unskilled workers

All other notations represent elasticities and calibrated share and scale parameters that are fixed and sector-specific. The following sets are used: *ag* denotes agricultural sectors; *h* denotes households; (*i, j*) denote production sectors; *nag* denotes nonagricultural sectors; and *ntd* denotes nontradables.

APPENDIX **B**

Social Accounting Matrix

A SAM is an integrated framework that records all transactions in an economy in a given year. Presented in the form of a square matrix, a SAM is a simple yet comprehensive dataset that provides information on the prevailing economic and social structure of a particular economy. Owing to its coherent structure, a SAM can illuminate the interaction of various agents and can capture economic flows at both micro and macro levels. Indeed a SAM framework traces the linkage between producing sectors and institutions and at the same time shows how income is generated and consequently distributed and transferred within the economic system. Simple as it may seem, constructing or even updating a SAM poses a significant challenge: one must obtain data from various sources (which are almost always inconsistent) with the objective of creating a coherent and consistent dataset.

This appendix briefly describes the steps undertaken in constructing the Philippine SAM for the year 2000. The benchmark year was chosen based on the availability of the most recent 240-sector Philippine I-O table, which coincided with that year. Other data sources for the year 2000 include the NAP, the LFS, the FIES, the CA, and the WANSTR from the Tariff Commission.

The Philippine SAM

The year 2000 Philippine SAM is composed of 41 production sectors, of which 12 are subsectors in agriculture, fishing, and forestry; 24 are subsectors in industry; and 5 are subsectors in services, including the government subsector. Factors of production are classified according to labor, land, and capital. Labor is further classified by skill (unskilled, semiskilled, skilled, and professional), while land is limited to agriculture subsectors. There are 10 households groups, which are classified according to deciles. Table B.1 illustrates a basic SAM for the Philippines, while Table B.2 shows the aggregated value (in 2000 PhP) for each SAM account.[1] The rest of this appendix discusses each of the cells in the SAM and how the values were derived using Philippine data.

The eight major accounts are: (1) activities, (2) commodities, (3) factors, (4) households, (5) firms, (6) government, (7) savings and investment, and (8) rest of the world (*ROW*). Payments or expenditures are recorded in the columns while income or receipts are represented by the rows. A basic feature of the SAM

[1]Table B.2 is the macro SAM. The disaggregated SAM—with 41 sectors, 6 factors, and household groups in deciles used to calibrate the model—is available from the authors on request.

Table B.1 Basic social accounting matrix for the Philippines

	Activities	Commodities	Factors	Households	Firms	Government	Savings and investment	Rest of the world	Total
Activities		C1						C2	RT1
Commodities	C3			C4	C5		C6		RT2
Factors	C7								RT3
Households			C8		C9	C10		C11	RT4
Firms		C12							RT5
Government		C13		C14	C15			C16	RT6
Savings and investment				C17	C18	C19		C20	RT7
Rest of the world		C21	C22		C23	C24			RT8
Total	CT1	CT2	CT3	CT4	CT5	CT6	CT7	CT8	

Table B.2 Aggregated social accounting matrix for the Philippines, 2000 (million PhP)

	Activities	Commodities	Factors	Households	Firms	Government	Savings and investment	Rest of the world	Total
Activities		5,989						1,402	7,391
Commodities	3,459			2,914		443	1,246		8,062
Factors	3,932								3,932
Households			3,437		33	147		470	4,087
Firms			431						431
Government		271		211	102			6	590
Savings and investment				962	160	(47)		171	1,246
Rest of the world		1,802	64		137	46			2,049
Total	7,391	8,062	3,932	4,087	431	590	1,246	2,049	

Note: Owing to rounding, some rows and columns may not total exactly. Row and column totals are equal in the micro SAM.

is that receipts must equal expenditures; hence each column sum must be equal to its corresponding row sum. Specifically each cell in the SAM corresponds to an agent's transaction with the rest of the economy.

We now explain each major account as well the individually labeled cells in the SAM.

1. Cells C1, C2, and TR1. Cell C1 shows the interaction between the activity (by row) and commodity (by column) accounts, that is, the proportion of goods and services that were sold and consumed in the local economy. This is domestic demand. Cell C2 records the portion of goods and services that were exported or sold to the rest of the world. The values for TR1 (total sectoral output) and C2 were taken directly from the I-O table, with C1 derived as a residual by subtracting C2 from TR1.
2. Cells C3 and C7. C3 represents the interindustry linkage and C7 refersto factor usage by each activity. Both cells were obtained from the I-O table.
3. Cell C4. This cell represents household consumption expenditure, data for which were taken from the personal consumption expenditure in the I-O table. The data in this cell are mapped and reconciled using data on household consumption in the FIES.
4. Cell C5. This cell, gross government consumption expenditure, is obtained directly from the I-O table.
5. Cell C6. This cell represents sectoral investment by sector of origin, which was derived residually by deducting C3, C4, and C5 from CT2: C6 = CT2 – C3 – C4 – C5.
6. Cell C8. This cell represents household factor income. This was initially taken from the I-O table but was then further reconciled using factor income information in the FIES.
7. Cells C9, C10, and C11. These cells represent households' receipts from firms, from government, and from abroad, respectively. All these data were taken from the NAP. They are reconciled using information in the FIES.
8. Cell C12. This cell shows the amount of income earned by enterprises in the economy. The data in this cell were taken from the NAP.
9. Cells C13, C14, C15, and C16. These cells represent government receipts from commodity taxation (indirect tax and import tariff), income tax payments by households and enterprises, and foreign grants from abroad. Tariff revenue per sector was computed by following the steps outlined in the next section, while indirect tax receipts per sector were taken directly from the I-O table. Income tax payments by each household category were obtained from the FIES. Finally, firms' income tax payments and government aid from abroad were both taken from the NAP.
10. Cells C17, C18, and C19. These cells represent savings generated from all the institutions within the domestic economy. In addition, cell C20 presents the current account balance. These cells were derived residually to balance accounts of the different institutions.
11. Cell C21. This cell represents the amount of imports by each commodity treated as either intermediate or final goods. These data were taken directly from the I-O table.
12. Cells C22, C23, and C24. These cells represent dividends earned by foreigners from local investments, factor payments to the rest of the world, and foreign payments by the government, respectively. The data in these cells were taken directly from the NAP.

Tariff Revenue

One of the major challenges in constructing the Philippine SAM is the absence of sectoral tariff revenue in the I-O table: only total tariff revenue is available. The implied tariff duty or revenue for each sector was computed using the trade-weighted average nominal tariff rates (TWANTR) by I-O sector from the Philippine Tariff Commission.

Computation of Tariff Revenue by Sector

Sectoral tariff revenue was calculated using import data from the I-O table and the TWANTR: $CIM\_i_{\_TR} = IM\_i * IM\_i\_{_{TR}}$, where $CIM\_i_{\_TR}$ is the computed sectoral tariff revenue, IM_I the imports of sector i, and $IM\_i_{\_TR}$ the trade-weighted average nominal tariff rates.

Normalize Tariff Revenue by Sector

The computed sectoral tariff revenue was normalized to the tariff revenue in the I-O table. This was done by dividing the computed tariff revenue by sector into the product of total computed tariff revenue and the total tariff revenue from the I-O: $NM\_i_{\_TR} = CIM\_i_{\_TR}/ [(\Sigma i\ CIM\_i_{\_TR})IM\_i_{\_TR\_IO}]$, where $NM\_i_{\_T}$ is the normalized sectoral tariff revenue and $IM\_i_{\_TR\_IO}$ is the total tariff revenue in the I-O table.

Factor Utilization by Sector

Factor utilization by sector was initially taken from the I-O table. However, we adjusted it because the ratios of sectoral payments to labor (compensation) were low, and the ratios of sectoral capital (operating surplus plus depreciation) to gross value added were high.

Labor income among unincorporated enterprises is normally recorded as capital income, resulting in an operating surplus with a sizable payment to labor. To adjust the unincorporated income of enterprises, we applied an adjustment factor to augment payments to labor and lessen payments to capital while at the same time ensuring that the sum of total payments to factors (capital and labor) is the same before and after the adjustment. The adjustments were carried out through the following steps:

1. Initially the share of labor from the GDP in the NAP was derived using the equation $\alpha\_L = (LC_{\_NAP}/GDP_{\_NAP})$, where α_L is labor share in the NAP, $LC_{\_NAP}$ is labor compensation in the NAP, and $GDP_{\_NAP}$ is GDP in the NAP.
2. Total labor compensation in the I-O table was scaled up by multiplying the computed labor share, α_L, by total labor compensation in the I-O table: $A\_LC_{\_IO} = TLC_{\_IO} (1 + \alpha\_L)$, where $A\_LC_{\_IO}$ is the adjusted total labor compensation in the I-O table and $TLC_{\_IO}$ is the original total labor compensation in the I-O.
3. The labor compensation in each sector was distributed by using the initial sectoral labor shares $A\_LC_{\_IO\_I} = A\_LC_{\_IO}(SLC_{\_IO\_I}/ TLC_{\_IO})$, where $A\_LC_{\_IO\_I}$ is adjusted sectoral labor compensation per sector and $SLC_{\_IO\_I}$ is sectoral labor compensation by I-O sector.
4. Sectoral capital was derived residually by deducting total adjusted labor utilization per sector from total value added: $A\_KC_{\_IO\_I} = TVA_{\_IO\_I} - A\_LC_{\_IO\_I}$, where $A\_KC_{\_IO\_I}$ is adjusted sectoral capital compensation per sector and $TVA_{\_IO\_I}$ is total valued added per sector.
5. Payments to land were calculated by taking the share of land payment to overall capital in the CA: $\alpha\_Ld = (LD_{\_CA}/AGK_{\_CA})$, where α_Ld is land share in the CA, $LD_{\_CA}$ is payments to land in the CA, and $AGK_{\_CA}$ is total payments to agricultural capital in the CA.
6. Payments to land per agricultural sector in the I-O table were calculated by multiplying the land share computed from the CA to capital. Capital is determined residually after deducting land payments. Thus $LD_{\_IO} = \alpha\_Ld * A\_KC\_{_{IO\_I}}$ and $FA\_KC_{\_IO\_I} = A\_KC_{\_IO\_I}LD_{\_IO}$, where $LD_{\_IO}$ is the com-

puted payments to land and $FA\_KC_{\_IO\_I}$ is the final adjusted capital by sector.

Disaggregating Labor Accounts

The initial SAM has only one labor category, thereby failing to account for the divergence in labor earning opportunities across skill levels and human capital endowments. To address this shortcoming, the labor payment shares in the FIES were used to disaggregate labor into four categories. The following steps outline the procedures undertaken to ensure consistency between the macro and micro data, that is, the SAM and the household dataset.[2]

1. The sectoral payments to labor for each producing sector in the SAM were disaggregated to account for variations in sectoral employment by skill category. That is, the share as well as total amount of wage payments per industry was computed using the FIES. The following equations were used: (1) $\alpha\_Unsk\_w_{\_i\_FIES} = Unsk\_w_{\_i\_FIES}/(\Sigma i\ TLC_{\_FIES})$; (2) $\alpha\_Smsk\_w_{\_i\_FIES} = Smsk\_w_{\_i\_FIES}/(\Sigma i\ TLC_{\_FIES})$; (3) $\alpha\_Sk\_w_{\_i\_FIES} = Sk\_w_{\_i\_FIES}/(\Sigma i\ TLC_{\_FIES})$; and (4) $\alpha\_Pr\_w_{\_i\_FIES} = Pr\_w_{\_i\_FIES}/(\Sigma i\ TLC_{\_FIES})$, where $\alpha\_Unsk\_w_{\_i\_FIES}$ is the share of unskilled wages per sector to total wages, $\alpha\_Smsk\_w_{\_i\_FIES}$ is the share of semiskilled wages per sector to total wages, $\alpha\_Sk\_w_{\_i\_FIES}$ is the share of skilled wages per sector to total wages, $\alpha\_Pr\_w_{\_i\_FIES}$ is the share of professional wages per sector to total wages, $Unsk\_w_{\_i\_FIES}$ i s u nskilled wages per sector in the FIES, $Smsk\_w_{\_i\_FIES}$ is semiskilled wages per sector in the FIES, $Sk\_w_{\_i\_FIES}$ is skilled wages per sector in the FIES, $Pr\_w_{\_i\_FIES}$ is professional wages per sector in the FIES, and $TLC_{\_FIES}$ is total labor compensation in the FIES.
2. The computed share of payments to labor from the FIES was multiplied by the total labor compensation per sector in the SAM to account for skilled and unskilled labor utilization per sector. The following equations were used: (1) $Unsk\_w_{\_i\_SAM} = \alpha\_Unsk\_w_{\_i\_FIES} * TLC_{\_i\_SAM}$, (2) $Smsk\_w_{\_i\_SAM} = \alpha\_Smsk\_w_{\_i\_FIES} * TLC_{\_i\_SAM}$, (3) $Sk\_w_{\_i\_SAM} = \alpha\_Sk\_w_{\_i\_FIES} * TLC_{\_i\_SAM}$, and (4) $Pr\_w_{\_i\_SAM} = \alpha\_Pr\_w_{\_i\_FIES} * TLC_{\_i\_SAM}$, where $Unsk\_w_{\_i\_SAM}$ is unskilled wages per sector in the SAM, $Smsk\_w_{\_i\_SAM}$ is semiskilled wages per sector in the SAM, $Sk\_w_{\_i\_SAM}$ is skilled wages per sector in the SAM, and $Pr\_w_{\_i\_SAM}$ is professional wages per sector in the SAM.

Disaggregating Household Groups

Another inherent limitation in the SAM is that it uses a single homogeneous household, thereby failing to account for individual household characteristics. The adjustment in the household account was carried out in two steps. The first was to obtain FIES data on the income and expenditures of 10 representative household groups (RHGs) in deciles. In the second step the FIES income and expenditure data were applied to the SAM to disaggregate income shares and consumption expenditures and to make the shares consistent with the FIES.

The income adjustments were initially undertaken by computing for total income as well as income shares per RHG in the FIES (labor income by skill category, capital income, income from transfers, and other income). Then the RHG income shares were used to distribute the total income from labor, capital, and transfer per household group in the SAM. The following equation was used:

[2]The adjustment process was carried out in Stata and then in Excel. The two datasets could also be reconciled using an entropy procedure.

$Y\_{H\_SAM} = \alpha\_unsk\_Ly\_{H\_FIES} * T\_Unsk\_w\_{SAM} + \alpha\_Smsk\_Ly\_{H\_FIES} * T\_Smsk\_w\_{SAM} + \alpha\_Sk\_Ly\_{H\_FIES} * T\_Sk\_w\_{SAM} + \alpha\_Pr\_Ly\_{H\_FIES} * T\_Pr\_w\_{SAM} + \alpha\_ky\_{H\_FIES} * T\_r\_ky\_{SAM} + \alpha\_Ldy\_{H\_FIES} * T\_r\_Ldy\_{SAM} + \alpha\_FTrans\_{H\_FIES} * T\_FTrans\_{SAM} + \alpha\_GTrans\_{H\_FIES} * T\_GTrans\_{SAM} + \alpha\_ROWTrans\_{H\_FIES} * T\_ROWTrans\_{SAM}$,

where Y_{H_SAM} is total income per RHG in the SAM, $\alpha\_unsk\_Ly\_{H\_FIES}$ is the share of unskilled labor income in RHG's total income in the FIES, $\alpha\_Smsk\_Ly\_{H\_FIES}$ is the share of semiskilled labor income in RHG's total income in the FIES, $\alpha\_Sk\_Ly\_{H\_FIES}$ is the share of skilled labor income in RHG's total income in the FIES, $\alpha\_Pr\_Ly\_{H\_FIES}$ is the share of professional labor income in RHG's total income in the FIES, $\alpha\_ky\_{H\_FIES}$ is the share of capital income in RHG's total income in the FIES, $\alpha\_Ldy\_{H\_FIES}$ is the share of land income in RHG's total income in the FIES, $\alpha\_FTrans\_{H\_FIES}$ is the share of dividend income in RHG's total income in the FIES, $\alpha\_GTrans\_{H\_FIES}$ is the share of government transfers in RHG's total income in the FIES, $\alpha\_ROWTrans\_{H\_FIES}$ is the share of income from abroad in RHG's total income in the FIES, $T\_Unsk\_w\_{SAM}$ is total unskilled labor income in the SAM, $T\_Smsk\_w\_{SAM}$ is total semiskilled labor income in the SAM, $T\_Sk\_w\_{SAM}$ is total skilled labor income in the SAM, $T\_Pr\_w\_{SAM}$ is total professional labor income in the SAM, ky_w_{SAM} is total professional labor income in the SAM, Ldy_w_{SAM} is total land income in the SAM, $FTrans\_w\_{SAM}$ is total firm transfers in the SAM, $GTrans\_w\_{SAM}$ is total government transfers in the SAM, and $ROWTrans\_w\_{SAM}$ is total income from abroad in the SAM.

The income adjustments were initially undertaken by computing for total income as well as income shares per RHG in the FIES. Then the RHG income shares were used to distribute the total labor, capital, and transfer income per household group in the SAM. The expenditure pattern and shares per RHG were taken from the FIES. The household commodity consumption categories in the SAM were matched (map out) with the household commodity consumption categories in the FIES to reflect the RHG expenditure pattern and shares. The aggregated household commodity expenditure in the SAM was multiplied by the shares derived from the FIES to compute for the expenditure share per RHG in the SAM: $T\_C\_{H} = \alpha\_H\_CE\_{j} * T\_CE\_{j\_SAM}$, where T_C_{H} is the total consumption per RHG in the SAM, $\alpha\_H\_CE\_{j}$ is the share of commodity j in the total consumption per RHG in the FIES, and $T\_CE\_{j\_SAM}$ is the total consumption expenditure of all households for commodity j in the SAM.

APPENDIX **C**

Microsimulation Process

There are several approaches to linking CGE models with data in the household survey to analyze poverty issues.[1] One is a top-down method, in which the results of CGE models with representative households are applied recursively to data in the household survey with no further feedback effects. Within the top-down method there are wide variations. A popular one is to assume a lognormal distribution of income within each household category, where the variance is estimated from data in the survey (De Janvry, Sadoulet, and Fargeix 1991). In this method the change in income of the representative household generated in the CGE model is used to estimate the change in the average income for each household category, while the variance of this income is assumed fixed. Decaluwé, Dumont, and Robichaud (2000) argue that a beta distribution is preferable to other distributions such as the lognormal because it can be skewed left or right and thus may better represent the types of intra-category income distributions commonly observed. Instead of using an assumed distribution, Cockburn et al. (2006) apply the actual incomes from a household survey and apply the change in income of the representative household generated in the CGE model to each individual household in that category.

Recent and more sophisticated microsimulation methods link CGE models with household data to analyze poverty issues through the labor market transmission channel. Ganuza, Barros, and Vos (2002) introduce a randomized process to simulate the effects of changes in the structure of the labor market. Random numbers are used to determine key parameters in the labor market, such as: (1) which persons of working age change their labor force status, (2) who will change occupational category, (3) which employed persons obtain a different level of education, and (4) how are new mean labor incomes assigned to individuals in the sample. The random process is repeated a number of times in a Monte Carlo fashion to construct 95 percent confidence intervals for the indexes of poverty. The CGE model is used to quantify the effects of a macroeconomic shock on key labor market variables, such as wages and employment, and apply them to the microsimulation process. The advantage of this method is that it works through the labor market channel.

[1]There are several approaches to and papers on CGE microsimulation. This appendix includes only a few of these approaches.

The top-down method usually uses CGE models with representative households. One criticism of this approach is that it does not account for the heterogeneity of income sources and consumption patterns of households within each category. Intra-category income variances could constitute a significant part of the total income variance. There is increasing evidence that households within a given category may be affected quite differently according to their asset profiles, location, household composition, education, and other parameters. To address this issue an integrated CGE microsimulation allows full integration of all households in the survey in the CGE model. As demonstrated by Cockburn (2001) and Cororaton and Cockburn (2007), this approach poses no particular technical difficulties because it involves constructing a standard CGE model with as many household categories as there are households in the household survey providing the base data. Decaluwé, Dumont, and Savard (1999) constructed an integrated CGE microsimulation model in which 150 households are directly modeled within a CGE model using fictional data from an archetypal developing country. They constructed the model to allow comparisons with earlier approaches using multiple household categories and fixed intra-category income distributions. They show that intra-category variations are important, at least in this fictional context.

In this report we apply a simpler version of the method of Ganuza, Barros, and Vos (2002). The idea is to allow a change in employment status after a policy change. Thus if a household does not earn labor income initially because of unemployment, it will have a chance to gain employment after the policy shock. Similarly if it earns labor income initially, it will have a chance of having zero labor income after the policy change. Thus household labor income is affected by changes in wages as well as the chance of becoming unemployed after the policy shock. Similar to the method of Ganuza, Barros, and Vos (2002), we introduce a randomized process to simulate the effects of changes in sectoral employment. One limitation of this approach is that, while the CGE model assumes full employment, the microsimulation method uses data on unemployment. We are currently developing a way of making the two models more consistent by incorporating unemployment both in the CGE model and in the microsimulation.

The step-by-step procedure given below adopts some features of the process in Sanchez (2004) and Vos (2005):

1. The household head represents the entire family. In the first phase of this procedure, household heads are distinguished by skill level and sector of employment. Sector of employment is differentiated into agriculture and non-agriculture, whereas skill level is classified into unskilled (no education to non–high school graduates) and skilled (high school graduates and higher). There are four labor income sources or sectoral employment groups: unskilled agriculture, skilled agriculture, unskilled non-agriculture, and skilled non-agriculture.
2. Generate a dummy variable called *employed,* where 1 denotes households with wage income and 0 applies otherwise. Compute the total employment rate u^* for each of the four groups defined in step 5. The total employment rate for each group (u^*) is the weighted mean of the dummy variable *employed* and weights in the household survey. Note that the dummy variable is only a subset of the survey as it only covers those with wage income (dummy variable = 1) and those with zero wage income but unemployed (dummy variable = 0).
3. Update the total sectoral employment u^* in the household survey by using the variation in sectoral employment from the CGE model.

4. Assign a random number from a normal distribution to those identified as employed. This variable is called *random*. The variables *random* and *employed* are then sorted in descending order.
5. Compute the accumulated weight of *employed* in each group (by sector and by skill level as defined in step 1).
6. Compute the overall weight (step 9) of each group. This is simply the sum of accumulated weight by sector and by skill level as defined in step 5.
7. Take the ratio of the accumulated weight (step 9) and the overall weight (step 10) of each group. This ratio is called r_{ij}.
8. Compare r_{ij} and u^*. If $r_{ij} = u^*$ then that household head is employed; if $r_{ij} > u^*$ the household head is unemployed.
9. Arrange each group in deciles. The decile grouping is based on the sum of labor income and capital income, where capital income is the sum of "total income from entrepreneurial activities" and "net share of crops" in the household survey. Other incomes, such as dividends and interest income, are not used in grouping households into deciles.
10. Assign the decile mean labor income to those who become newly employed (after a change in u^*), and reduce the labor income of those who become unemployed (after a change in u^*).[2] For those who belong to the first decile and who become newly employed, for example, the mean labor income in the first decile will be assigned to them. Those with labor income but who are not picked by the random process will retain their labor income. On the other hand, those with zero labor income but who are not picked by the random process will continue to have no labor income earnings.
11. Define total income. It is composed of three major items: labor income, capital income, and other income. Capital income is income derived from the various production sectors other than labor income, while other income includes income from dividends, government transfers, and remittances. Note that similar income sources are found in the CGE model and in the household survey.
12. Derive the change in capital and other income of each household in the survey using the average change in capital and other income per household category from the CGE model.
13. Derive the change in labor income in a two-step procedure: (1) Compute the change in labor income of each household in the survey using the average change in labor income per household category from the CGE model. (2) Update the final labor income using the result of the random process carried out in step 8.
14. Compute the total household income by taking the sum of labor income, capital income, and other income.
15. Update the nominal value of the poverty line of each household in the survey by applying the variation in the household-specific consumer price index from the CGE model.
16. Calculate the Gini coefficient using the new column of income, as well as the FGT poverty indexes using the income and new nominal poverty line.
17. The FGT poverty indexes are calculated according to the demographic characteristics of the household head: gender, skill

[2]Reduce labor income of those who become unemployed, that is, they will move to the area where $r_{ij} > u^*$ after the change in u^*. The one we adopted involves deducting the decile mean labor income from the labor income if the former is less than the latter. Otherwise, labor income is reduced to zero.

level, and location, urban-rural. The final FGT indexes are derived for households in both decile and socioeconomic categories.

18. The microsimulation process is repeated 30 times.[3] Thus there will be 30 estimates of Gini coefficient and FGT indexes in each simulation. Confidence intervals of estimates from the 30 simulations or runs are derived. The mean, standard error, and 95 percent confidence interval of the poverty indexes under various scenarios are presented in Tables C.1, C.2, C.3, and C.4.

[3]Vos (2005) observes that thirty iterations are sufficient. Repeating this process further does not significantly alter the results.

Table C.1 Poverty results: Mean, standard error, and 95 percent confidence interval, by decile

Household group variable	Poverty[a]	Mean Index in 2000	Special products: poverty index	Special products: Standard error	Special products: 95 percent confidence interval		Agricultural products: Mean poverty index	Agricultural products: Standard error	Agricultural products: 95 percent confidence interval		All products: Mean poverty index	All products: Standard error	All products: 95 percent confidence interval	
All Philippines	P0	33.9	32.7	0.0	32.7	32.7 32.7		0.0	32.7	32.7	32.6	0.0	32.6 32.6	
	P1	10.6 10.0		0.0	10.0	10.0	10.0	0.0 10.0		10.0	9.9	0.0	9.9	9.9
	P2	4.5 4.2		0.0	4.2	4.2	4.2 0.0 4.2			4.2	4.1	0.0	4.1	4.1
Decile 1	P0	86.0	85.4	0.0	85.4	85.4 85.4		0.0	85.4	85.4	85.2	0.0	85.2 85.3	
	P1	40.0	39.0	0.0	38.9	39.0 38.9		0.0	38.9	38.9	38.7	0.0	38.7 38.7	
	P2	21.7	20.9	0.0	20.9	20.9 20.9		0.0	20.9	20.9	20.7	0.0	20.7 20.7	
Decile 2	P0	72.1	71.0	0.0	70.9	71.0 70.9		0.0	70.9	70.9	70.7	0.0	70.7 70.7	
	P1	26.3	25.3	0.0	25.3	25.3 25.3		0.0	25.3	25.3	25.1	0.0	25.1 25.1	
	P2	11.7	11.1	0.0	11.0	11.1 11.0		0.0	11.0	11.0	10.9	0.0	10.9 10.9	
Decile 3	P0	59.0	58.0	0.0	57.9	58.0 58.0		0.0	57.9	58.0	57.7	0.0	57.7 57.7	
	P1	17.8	16.9	0.0	16.8	16.8 16.8		0.0	16.8	16.8	16.7	0.0	16.7 16.7	
	P2	6.8 6.3		0.0	6.2	6.2	6.2 0.0 6.2			6.2	6.2	0.0	6.2	6.2
Decile 4	P0	47.0	45.2	0.0	45.2	45.2 45.1		0.0	45.1	45.1	45.0	0.0	44.9 45.0	
	P1	11.5	10.7	0.0	10.6	10.6 10.6		0.0	10.6	10.6	10.6	0.0	10.5 10.6	
	P2	3.7 3.4		0.0	3.4	3.4	3.3 0.0 3.3			3.3	3.3	0.0	3.3	3.3
Decile 5	P0	29.4	27.4	0.0	27.2	27.2 27.2		0.0	27.1	27.2	27.0	0.0	27.0 27.0	
	P1	5.6 5.0		0.0	5.0	5.0	5.0 0.0 5.0			5.0	5.0	0.0	5.0	5.0
	P2	1.5 1.3		0.0	1.3	1.3	1.3 0.0 1.3			1.3	1.3	0.0	1.3	1.3
Decile 6	P0	16.8	15.2	0.0	15.1	15.2 15.1		0.0	15.1	15.2	15.0	0.0	15.0 15.0	
	P1	2.7 2.3		0.0	2.3	2.3	2.3 0.0 2.3			2.3	2.3	0.0	2.3	2.3
	P2	0.6 0.5		0.0	0.5	0.5	0.5 0.0 0.5			0.5	0.5	0.0	0.5	0.5
Decile 7	P0	8.2 6.5		0.0	6.5	6.5	6.5 0.0 6.5			6.5	6.5	0.0	6.5	6.5
	P1	0.8 0.7		0.0	0.7	0.7	0.7 0.0 0.7			0.7	0.6	0.0	0.6	0.7
	P2	0.1 0.1		0.0	0.1	0.1	0.1 0.0 0.1			0.1	0.1	0.0	0.1	0.1
Decile 8	P0	1.2 0.9		0.0	0.9	0.9	0.9 0.0 0.9			0.9	0.9	0.0	0.9	0.9
	P1	0.1 0.1		0.0	0.1	0.1	0.1 0.0 0.1			0.1	0.1	0.0	0.1	0.1
	P2	0.0 0.0		0.0	0.0	0.0	0.0 0.0 0.0			0.0	0.0	0.0	0.0	0.0
Decile 9	P0	—	—	— —		—	—	— —		—	— —		—	—
	P1	—	—	— —		—	—	— —		—	— —		—	—
	P2	—	—	— —		—	—	— —		—	— —		—	—
Decile 10	P0	—	—	— —		—	—	— —		—	— —		—	—
	P1	—	—	— —		—	—	— —		—	— —		—	—
	P2	—	—	— —		—	—	— —		—	— —		—	—

[a]P0—poverty incidence; P1—poverty gap; P2—poverty severity.

Table C.2 Sensitivity analysis of poverty results: Mean, standard error, and 95 percent confidence interval, by decile

Household group variable	Poverty [a]	Index in 2000	Mean poverty index	Standard error	95 percent confidence interval		Poverty variable[a]	Index in 2000	Mean poverty index		Standard error	95 percent confidence interval	Poverty variable[a]	
			Increase in total factor productivity for rice				All products, trade elasticities (15% less)				All products, trade elasticities (15% more)			
All Philippines	P0	33.9	33.6	0.0	33.6	33.6 32.6		0.0	32.6	32.6	32.5	0.0 32.5		32.5
	P1	10.6	10.4	0.0	10.4 10.4		9.9	0.0	9.9 9.9		9.9	0.0	9.9	9.9
	P2	4.5 4.4 0.0			4.4	4.4	4.1	0.0	4.1	4.1	4.1	0.0	4.1	4.1
Decile 1	P0	86.0	85.8	0.0	85.8	85.8 85.2		0.0	85.2	85.3	85.3	0.0 85.3		85.3
	P1	40.0	39.6	0.0	39.6	39.6 38.7		0.0	38.7	38.7	38.7	0.0 38.7		38.8
	P2	21.7	21.4	0.0	21.4	21.4 20.7		0.0	20.7	20.7	20.7	0.0 20.7		20.7
Decile 2	P0	72.1	71.7	0.0	71.7	71.7 70.7		0.0	70.7	70.7	70.8	0.0 70.7		70.8
	P1	26.3	26.0	0.0	26.0	26.0 25.1		0.0	25.1	25.1	25.1	0.0 25.1		25.1
	P2	11.7	11.5	0.0	11.5	11.5 10.9		0.0	10.9	10.9	10.9	0.0 10.9		10.9
Decile 3	P0	59.0	58.6	0.0	58.6	58.6 57.7		0.0	57.7	57.7	57.7	0.0 57.7		57.8
	P1	17.8	17.5	0.0	17.5	17.5 16.7		0.0	16.7	16.7	16.7	0.0 16.7		16.7
	P2	6.8 6.6 0.0			6.6	6.6	6.2	0.0	6.2	6.2	6.2	0.0	6.2	6.2
Decile 4	P0	47.0	46.5	0.0	46.5	46.5 45.0		0.0	45.0	45.0	44.9	0.0 44.9		44.9
	P1	11.5	11.2	0.0	11.2	11.2 10.6		0.0	10.6	10.6	10.5	0.0 10.5		10.5
	P2	3.7 3.6 0.0			3.6	3.6	3.3	0.0	3.3	3.3	3.3	0.0	3.3	3.3
Decile 5	P0	29.4	28.8	0.0	28.8	28.8 27.1		0.0	27.0	27.1	26.8	0.0 26.8		26.8
	P1	5.6 5.4 0.0			5.4	5.4	5.0	0.0	5.0	5.0	4.9	0.0	4.9	5.0
	P2	1.5 1.5 0.0			1.5	1.5	1.3	0.0	1.3	1.3	1.3	0.0	1.3	1.3
Decile 6	P0	16.8	16.4	0.0	16.4	16.5 15.2		0.0	15.1	15.2	15.0	0.0 15.0		15.0
	P1	2.7 2.6 0.0			2.6	2.6	2.3	0.0	2.3	2.3	2.3	0.0	2.3	2.3
	P2	0.6 0.6 0.0			0.6	0.6	0.5	0.0	0.5	0.5	0.5	0.0	0.5	0.5
Decile 7	P0	8.2 8.0 0.0			8.0	8.0	6.5	0.0	6.5	6.5	6.5	0.0	6.5	6.5
	P1	0.8 0.8 0.0			0.8	0.8	0.7	0.0	0.7	0.7	0.6	0.0	0.6	0.6
	P2	0.1 0.1 0.0			0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Decile 8	P0	1.2 1.2 0.0			1.2	1.2	0.9	0.0	0.9	1.0	0.9	0.0	0.9	0.9
	P1	0.1 0.1 0.0			0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1
	P2	0.0 0.0 0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decile 9	P0	— — —			—	—	—	—	—	—	—	—	—	—
	P1	— — —			—	—	—	—	—	—	—	—	—	—
	P2	— — —			—	—	—	—	—	—	—	—	—	—
Decile 10	P0	— — —			—	—	—	—	—	—	—	—	—	—
	P1	— — —			—	—	—	—	—	—	—	—	—	—
	P2	— — —			—	—	—	—	—	—	—	—	—	—

Source: Authors' calculations. Index in 2000 is from the 2000 FIES.

[a]P0—poverty incidence; P1—poverty gap; P2—poverty severity.

Table C.3 Poverty results: Mean, standard error, and 95 percent confidence interval, by location, gender, and skill level

Household group variable	Poverty [a]	Mean Index in 2000	Special proucts: poverty index	Special proucts: Standard error	Special proucts: 95 percent confidence interval		Agricultural products: Mean poverty index	Agricultural products: Standard error	Agricultural products: 95 percent confidence interval		All products: Mean poverty index	All products: Standard error	All products: 95 percent confidence interval	
Urban	P0	18.6	17.6 0.0		17.5	17.6 17.5 0.0			17.5	17.5	17.4	0.0	17.4	17.5
	P1	5.0 4.7		0.0	4.7	4.7	4.7	0.0 4.7		4.7	4.6 0.0		4.6	4.6
	P2	2.0 1.8		0.0	1.8	1.8	1.8	0.0 1.8		1.8	1.8 0.0		1.8	1.8
Urban male	P0	3.2 3.0		0.0	3.0	3.0	3.0	0.0 3.0		3.0	3.0 0.0		3.0	3.0
skilled	P1	0.7	0.6	0.0	0.6	0.6	0.6	0.0	0.6	0.6	0.6	0.0	0.6	0.6
	P2	0.2 0.2		0.0	0.2	0.2	0.2	0.0 0.2		0.2	0.2 0.0		0.2	0.2
Urban male	P0	23.3	22.1 0.0		22.0	22.1 22.0 0.0			22.0	22.1	21.9	0.0	21.9	21.9
unskilled	P1	6.4	6.0	0.0	5.9	6.0	5.9	0.0	5.9	5.9	5.9	0.0	5.9	5.9
	P2	2.5 2.3		0.0	2.3	2.3	2.3	0.0 2.3		2.3	2.3 0.0		2.3	2.3
Urban female	P0	0.9 0.8		0.0	0.8	0.8	0.8	0.0 0.8		0.8	0.8 0.0		0.8	0.8
skilled	P1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1
	P2	0.0 0.0		0.0	0.0	0.0	0.0	0.0 0.0		0.0	0.0 0.0		0.0	0.0
Urban female	P0	15.2	14.3 0.0		14.2	14.3 14.3 0.0			14.2	14.3	14.2	0.0	14.2	14.2
unskilled	P1	3.9	3.7	0.0	3.7	3.7	3.7	0.0	3.7	3.7	3.6	0.0	3.6	3.6
	P2	1.6 1.5		0.0	1.5	1.5	1.5	0.0 1.5		1.5	1.4 0.0		1.4	1.5
Rural	P0	48.7	47.3 0.0		47.2	47.3 47.2 0.0			47.2	47.2	47.1	0.0	47.1	47.1
	P1	15.9	15.2 0.0		15.1	15.1 15.1 0.0			15.1	15.1	15.0	0.0	15.0	15.0
	P2	6.8 6.4		0.0	6.4	6.4	6.4	0.0 6.4		6.4	6.4 0.0		6.4	6.4
Rural male	P0	12.0	11.8 0.0		11.8	11.8 11.8 0.0			11.8	11.8	11.8	0.0	11.8	11.9
skilled	P1	3.5	3.4	0.0	3.3	3.3	3.3	0.0	3.3	3.3	3.3	0.0	3.3	3.3
	P2	1.4 1.3		0.0	1.3	1.3	1.3	0.0 1.3		1.3	1.3 0.0		1.3	1.3
Rural male	P0	52.4	50.8 0.0		50.8	50.8 50.8 0.0			50.7	50.8	50.6	0.0	50.6	50.6
unskilled	P1	17.2	16.4	0.0	16.4	16.4	16.4	0.0	16.4	16.4	16.2	0.0	16.2	16.2
	P2	7.4 7.0		0.0	7.0	7.0	7.0	0.0 7.0		7.0	6.9 0.0		6.9	6.9
Rural female	P0	14.7	14.7 0.0		14.7	14.7 14.7 0.0			14.7	14.7	14.7	0.0	14.7	14.7
skilled	P1	4.1	3.9	0.0	3.8	4.0	3.9	0.0	3.9	3.9	3.9	0.1	3.8	4.1
	P2	1.4 1.3		0.0	1.2	1.4	1.2	0.0 1.2		1.2	1.3 0.1		1.2	1.5
Rural female	P0	34.9	34.1 0.0		34.0	34.1 34.1 0.0			34.0	34.1	34.0	0.0	33.9	34.0
unskilled	P1	10.8	10.3	0.0	10.2	10.2	10.2	0.0	10.2	10.2	10.1	0.0	10.1	10.1
	P2	4.4 4.1		0.0	4.1	4.1	4.1	0.0 4.1		4.1	4.1 0.0		4.1	4.1

Table C.4 Sensitivity analysis of poverty results: Mean, standard error, and 95 percent confidence interval, by decile

			Increase in total factor productivity for rice				All products, trade elasticities (15% less)				All products, trade elasticities (15% more)			
Household group variable	Poverty[a]	Mean Index in 2000	poverty index	Standard error	95 percent confidence interval		Mean poverty index	Standard error	95 percent confidence interval		Mean poverty index	Standard error	95 percent confidence interval	
Urban	P0	18.6	18.3	0.0	18.3	18.3 17.5		0.0	17.5 17.5 17.4			0.0	17.4	17.4
	P1	5.0	4.9 0.0		4.9	4.9 4.7		0.0	4.6 4.7 4.6			0.0	4.6	4.6
	P2	2.0	1.9 0.0		1.9	1.9 1.8		0.0	1.8 1.8 1.8			0.0	1.8	1.8
Urban male	P0	3.2	3.2 0.0		3.1	3.2 3.1		0.0	3.1 3.1 3.0			0.0	3.0	3.0
skilled	P1	0.7	0.6	0.0	0.6	0.6	0.6	0.0	0.6	0.7	0.6	0.0	0.6	0.6
	P2	0.2	0.2 0.0		0.2	0.2 0.2		0.0	0.2 0.2 0.2			0.0	0.2	0.2
Urban male	P0	23.3	23.0	0.0	23.0	23.0 22.0		0.0	22.0 22.0 21.9			0.0	21.9	21.9
unskilled	P1	6.4	6.2	0.0	6.2	6.2	5.9	0.0	5.9	5.9	5.9	0.0	5.9	5.9
	P2	2.5	2.5 0.0		2.5	2.5 2.3		0.0	2.3 2.3 2.3			0.0	2.3	2.3
Urban female	P0	0.9	0.9 0.0		0.9	0.9 0.8		0.0	0.8 0.9 0.8			0.0	0.8	0.8
skilled	P1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1
	P2	0.0	0.0 0.0		0.0	0.0 0.0		0.0	0.0 0.0 0.0			0.0	0.0	0.0
Urban female	P0	15.2	15.0	0.0	15.0	15.0 14.2		0.0	14.2 14.2 14.1			0.0	14.1	14.1
unskilled	P1	3.9	3.9	0.0	3.9	3.9	3.6	0.0	3.6	3.6	3.6	0.0	3.6	3.6
	P2	1.6	1.5 0.0		1.5	1.5 1.5		0.0	1.5 1.5 1.4			0.0	1.4	1.5
Rural	P0	48.7	48.3	0.0	48.3	48.3 47.1		0.0	47.1 47.1 47.1			0.0	47.1	47.1
	P1	15.9	15.7	0.0	15.7	15.7 15.0		0.0	15.0 15.0 15.0			0.0	15.0	15.0
	P2	6.8	6.7 0.0		6.7	6.7 6.4		0.0	6.4 6.4 6.4			0.0	6.4	6.4
Rural male	P0	12.0	11.8	0.0	11.8	11.9 12.1		0.1	12.0 12.2 11.8			0.0	11.7	11.8
skilled	P1	3.5	3.4	0.0	3.4	3.4	3.4	0.0	3.4	3.4	3.3	0.0	3.3	3.3
	P2	1.4	1.3 0.0		1.3	1.3 1.3		0.0	1.3 1.3 1.3			0.0	1.3	1.3
Rural male	P0	52.4	51.9	0.0	51.9	51.9 50.6		0.0	50.6 50.6 50.6			0.0	50.6	50.6
unskilled	P1	17.2	16.9	0.0	16.9	16.9	16.3	0.0	16.2	16.3	16.2	0.0	16.2	16.2
	P2	7.4	7.3 0.0		7.3	7.3 6.9		0.0	6.9 6.9 6.9			0.0	6.9	6.9
Rural female	P0	14.7	14.6	0.1	14.4	14.8 14.8		0.1	14.7 14.9 14.7			0.0	14.7	14.7
skilled	P1	4.1	4.0	0.0	3.9	4.1	4.0	0.1	3.8	4.2	3.9	0.0	3.8	3.9
	P2	1.4	1.3 0.0		1.3	1.4 1.3		0.1	1.2 1.5 1.2			0.0	1.2	1.2
Rural female	P0	34.9	34.6	0.0	34.6	34.6 33.9		0.0	33.9 34.0 34.0			0.0	34.0	34.0
unskilled	P1	10.8	10.6	0.0	10.6	10.6	10.1	0.0	10.1	10.1	10.1	0.0	10.1	10.1
	P2	4.4	4.3 0.0		4.3	4.3 4.1		0.0	4.1 4.1 4.1			0.0	4.1	4.1

Source: Authors' calculations. Index in 2000 is from the 2000 FIES.
[a]P0—poverty incidence; P1—poverty gap; P2—poverty severity.

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About this Report

Despite progress in recent years, poverty incidence remains very high in the Philippines, and poor households are highly vulnerable to the recent dramatic increases in food prices. In response to this problem, this research report investigates how Philippine policymakers can lower prices and reduce poverty. Using a dynamic-recursive computable general equilibrium model calibrated to a social accounting matrix of the Philippine economy, as well as other tools, the report simulates the effects of trade reform and increased rice productivity. The results indicate that diminished protection for major food items and investments in greater inbred-rice productivity have the potential to reduce prices and poverty in the Philippines. This report will be a valuable resource for policymakers, development specialists, and others trying to cope with the challenges of rising food prices.

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