# *TARFCOM:* A CGE MODEL OF THE PHILIPPINES

## QUANTIFYING THE IMPACT OF COMPETITION POLICY ON THE PHILIPPINE ECONOMY

**AUGUST 2001**

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## QUANTIFYING THE IMPACT OF COMPETITION POLICY ON THE PHILIPPINE ECONOMY

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We trust that the analysis contained in this report and all future analysis using TARFCOM will enable the Philippines' Government to improve the living standards of all its citizens.

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# Contents

# EXECUTIVE SUMMARY

This report illustrates the potential effects of competition policy reforms in selected industries of the Philippine economy. It describes and explains the effects of the reforms on key sectoral regional and macroeconomic variables. The results are based on simulations using the TARFCOM model, which was developed as part of this project.

Briefly, the experiments indicate that competition policy reforms leads to gains in some industries and losses in others. The direction and magnitude of such responses depend on the industries are subject to reforms and the cost and demand structures of the industries. Despite mixed results at the industry level, all experiments point to an expansion of Real GDP. Apart from suggesting increased economic activity, this result also implies the capacity of the gainers from the policy reforms to compensate the losers.

The section below provides an overview of the TARFCOM model. It explains the theoretical underpinnings and main features of the model. After this discussion a summary of the findings from the implementation and several policy experiments with the TARFCOM model are presented. Specifically, it describes the results from reforms in seven industries and in the *Electricity* industry. Detailed findings can be found in the main body of this report.

## The TARFCOM Model

### *General Overview*

The TARFCOM is a static Computable General Equilibrium (CGE) model of the Philippines. It was constructed at the Centre of Policy Studies of Monash University and is patterned after ORANI-G model of Australia (see Horridge, 2000).

Like other CGE models, TARFCOM has clearly defined roles for the various agents in the economy. Firms use labor, land, capital and intermediate goods in the production of goods and services. It has a representative household that acts as a consumer of goods and services. Government buys of goods and services, provides government services, and collects taxes. Finally, foreign agents interact with domestic agents through imports and exports.

The economic agents of TARFCOM interact through markets. Their transactions determine, among others, sectoral outputs and prices. These variables are then aggregated to derive macroeconomic

indicators like Gross Domestic Product and its components, Consumer Price Index, factor returns and employment.

TARFCOM is flexible, capable of analyzing the effects of various economic policies on different sectors and the macroeconomy. Apart from competition policy, it can analyze changes in tariff rates, producer taxes, government expenditures, etc. As the model is also disaggregated by region, such experiments can be used to evaluate the effects on regional outputs and employment. Finally, the analyses can be conducted over the long and short run.

Data for the model is based primarily on the 1994 Philippine Input-Output table. However, additional information was drawn from the Version 4 of the GTAP database (McDougall et.al., 1998), various Australian CGE models, the National Statistics and Coordination Board and the Tariff Commission.

In its current state, TARFCOM has two versions. It has a "large version" composed of 229 industries. Having the most disaggregated production side among existing CGE models of the Philippines, this version is suited for conducting detailed sectoral analyses. Ideal for teaching and reporting results, the TARFCOM also has a "small version" that aggregates the 229 industries into 43 industries.

### *Model Structure*

TARFCOM has a theoretical structure which is typical of a static CGE model. It consists of equations describing

- producer's demands for intermediate and primary inputs;
- producer's supply of commodities;
- demands for inputs to capital formation;
- household demands;
- government demands;
- the relationship between basic values to production costs and to purchaser's prices;
- market clearing conditions for commodities and primary factors; and
- numerous macroeconomic variables.

Demand and supply equations for private agents are derived from solutions to optimization problems (cost minimization, utility

maximization, etc.). As markets are assumed to be perfectly competitive, no individual economic agent has control over prices.

The production side of the model captures a technology can be classified into two broad categories. These represent the determination of input demands and outputs. Each of these components is further characterized by series of sub-categories.

In its current state, the input demand side of TARFCOM has two stages. In the first stage, intermediate inputs and primary factors are combined to produce industry outputs. On the other hand, the second stage reflects the composition of these inputs. Intermediate inputs are composites of a local good and foreign good (import) while primary factors are composites of land, labor and capital. The first stage assumes that industries combine intermediate inputs and primary factors in fixed proportions. In contrast, the second stage allows for substitution among inputs. For example, changes in relative prices serve an incentive for domestic industries to substitute domestic goods for foreign goods, and vice versa.

The output side also has two stages. The first stage represents the different commodities that an industry produces. This helps explain how much of each good or service that an industry will produce. On the other hand, the second stage deals with the destination of industry outputs. That is, it describes how much of the industry's output will be sold in domestic and foreign markets. Similar to the input side, the technology allows for substitution amongst outputs and their destinations.

As the second stage is currently inactive in TARFCOM, export demand equations are used its place. These equations reflect how foreign demands for the country's exports respond to changes in relative prices. If domestic prices increase relative to their foreign counterparts, the foreign demand for domestic goods decline.

Household demands are modeled in two stages. The first stage shows the household's demands for composite goods. In the case of the 229-sector model, an example is the household demand for *Chicken*. The second stage focuses on the sources of commodities. In the case of *Chicken*, it shows how much of this commodity is going come from local and imported sources. As in production, the demands for commodities and the sources of commodities respond to changes in relative prices.

## Illustrative Simulations

### *Implementing Simulations*

In 1995, the Australian Industry Commission (Industry Commission, 1995) examined the economywide effects of competition policy reforms in various Australian industries. This included a detailed investigation of how competition policy reforms will affect industry-specific labor, capital and intermediate-input-using technical efficiency; the technical efficiency of industry specific capital creation; and rates of return to industry specific capital. The research results were then used as inputs in experiments with a specially designed version of the ORANI model.

Unfortunately, detailed estimates on the consequences of competition policy reforms are not available for the Philippines. Given such a constraint, the following approach was adopted by this study. First, the IRIC proposed a list of industries that are likely to be subject to competition policy-oriented reforms. These industries are *Electricity, Water*, *Communications*, *Banks*, *Insurance*, *Air Transport and Other Transport* and *Communications*. Second, these industries were subject to a five- percent improvement in primary factor productivity in TARFCOM model. This means that a unit of the primary factor composite produces 5 percent more output.

Two sets of experiments were conducted in this study. The first simulates the effects of the improvement in primary factor productivity in all of the seven industries mentioned. The second focuses on improvements in *Electricity* only.

This report does not suggest that competition policy reforms in the Philippines will lead to a five- percent improvement in primary factor productivity. Rather, it provides a framework for evaluating the economy-wide effects of competition policy. It is a framework that allows an investigation the direct and indirect effects and the winners and losers from competition policy reforms.[1]

[1] While the experiments should be treated as illustrative, the five- percent improvement in primary factor productivity is conservative relative to the changes in used in the Australian experiments. For a summary of the values used in the Australian experiments, see Madden (1995).

***Economywide Effects of Enhanced Competition in Selected Industries***

The first experiment examines the long run effects of a five- percent improvement in primary factor productivity in the seven industries mentioned above.

The results suggest an expansion in the economy as Real GDP is 0.72 percent higher that it would have been in the absence of the policy (see Table 1 in the text for a summary of these macroeconomic findings). Prices, as measured by the GDP deflator and the Consumer Price Index (CPI), are lower while the real wage rate is higher.

The productivity improvement is the major reason for the GDP increase because this allows existing supplies of labor, land and capital in the affected industries to produce more output. However, this was complemented by the expansion in capital stock as capital-intensive sectors experienced an increase in output. Productivity improvements allow the industries subject to such a change to sell at lower prices. This is due to the fact that these industries can produce a unit of output using fewer primary inputs. As the economy expands, so does the demand for labor. However, with the economywide supply of labor held fixed in the experiment, the expansion in labor demand translates to a higher real wage rate.

The productivity improvements cause an expansion in the country's trade. The fall in the GDP price deflator, with the prices of foreign goods held constant, makes Philippine-made goods as a whole cheaper than foreign goods. This causes an expansion in exports as foreigners substitute Philippine-made goods for foreign goods. Despite the fact that relative price of Philippine-made goods are lower, aggregate imports increase. This is due mainly to the overall expansion in the economy.

Table 2 in the text shows the industry effects of the productivity change on prices, outputs, employment and trade. It shows that *Banks* and *Communications* are the industries that benefit the most from the productivity improvements, while *Dry Coconut* and *Coconut and Vegetable Oils* are hurt the most.

The expansion in the output of *Banks* is mostly due to two factors. First, it is an industry subject to the productivity improvement. Second, it is an industry that experiences an expansion of exports. The expansion in exports is caused by the decline in production costs, which makes the industry more competitive in the world market. The strength of the effect can be traced to the large share of exports (about 38 percent) in the industry's total sales.

The increase in the output of *Communications* is largely due to its productivity improvement. Its expansion is not as large as *Banks* because of differences in the composition of its sales. The bulk (about 66 percent) of the *Communications* industry's sales are intermediate purchases of other industries. As intermediate demand is not as price sensitive as export demand in the model, the possibilities for substitution towards the domestic *Communications* industry's output are not as large as in *Banks.*

With its output declining by 1.50 percent, the worst affected industry is *Dry Coconut.* This decline can be traced to the increase in its production costs and its export oriented nature. The industry's production cost rise because of the increase in the cost of labor (real wages). This in turn makes the industry less competitive in the world market and reduces its exports. The impact of such a change is significant to the *Dry Coconut* industry as 91 percent of its total sales come from exports.

The *Coconut and Vegetable Oils* industry experienced the second largest decline in output. Like *Dry Coconut*, this is due to the increase in its production costs and its export oriented nature. Moreover, about a fifth of this industry's production costs are accounted for by inputs of *Dry Coconut*. Hence, the increase in the price of *Dry Coconut* is part of the explanation for the higher production costs of the *Coconut and Vegetable Oils* industry.

All of the country's regions benefit from the productivity improvements. However, the distribution of the gains tends to favor the National Capital Region (NCR) the most, and the Autonomous Region of Muslim Mindanao (ARMM) the least. The explanation for the disparities lies in the composition of outputs in each region.

The NCR gained the most from the productivity changes because its aggregate output has a relatively high share of the industries which expanded the most and a relatively low share of the industries which contracted. The top 10 industries that gained from the productivity improvements account for 18.78 per cent of the NCR's Regional Gross Domestic Product (RGDP), the highest among all of the regions of the country. This implies that the impact of the expansion is likely to be felt the most in the region. Moreover, the industries that contracted (the bottom 7) account for only 1.09 per cent of the region's output. Taking a wider view of the industry shares, about 64.6 percent of the NCR's output comes from the Top 21 (output of 43) industries that gained from the productivity increase.

At the bottom of the ladder are Western Mindanao and the ARMM. Without going into the details, these regions have an industry composition that is quite the opposite of the NCR. These inter-regional comparisons can be seen in Table 6 in the report.

### *Economywide Effects of Competition Policy in Electricity*

This section explains the long run results from a five- percent productivity improvement in the *Electricity* industry only. At the macro level, the direction of the effects are not dissimilar to those seen as a result of the 'total' simulation, with the major difference being the smaller magnitude of the changes (see Table 4 of the text). This can be explained by the fact that *Electricity* is just one of the seven industries that were subject to the productivity improvement in the previous experiment.

As expected, the productivity improvement causes an increase in the output of the *Electricity* industry (see Table 5). However, the 5 percent productivity improvement only causes a 0.26 percent increase in industry output. The reason is that about 85 percent of *Electricity*'s output is used as an intermediate input and is not subject to competition from imports. Since such a demand is not sensitive to price changes, the sector fails to exploit the 2.67 percent fall in electricity prices.

Industries that export a high share of their output while making relatively high use of electricity and capital gain the most. These industries are *Basic Metals, Jewelry,* and *Paper Products.* Lower electricity prices and the lower relative price of capital cause production costs in these industries to decline. This makes these industries more competitive in world markets; hence raising exports.

In contrast, the industries which lose the most are those that export a large proportion of their output, use relatively less of electricity, and relatively more of labor. Examples of such industries are *Dry Coconut, Coconut and Vegetable Oils, Canned Vegetables and Fruits,* etc. The relatively low use of electricity implies the inability to exploit lower electricity costs. On the other hand, the relatively high use of labor and the higher wage rate raises production costs. Higher production costs lead to higher output prices for these industries. This, in turn, reduces exports and exerts downward pressure on output.

Table 6 in the text shows that productivity improvements in the *Electricity* sector benefits, albeit disproportionately, all the regions of the country. As in the previous simulation, the NCR gained the most as its RGDP.with the lowest gains are recorded for Western Mindanao.

# TARFCOM:

# A CGE Model of the Philippines

## 1.0 Introduction

This document describes a computable general equilibrium (CGE) model of the Philippines constructed for the Philippine Tariff Commission in early 2001. The model, named TARFCOM, was prepared at the Centre of Policy Studies, Monash University, by a team including Mark Horridge, Helen Cabalu, James Giesecke, Marilou Mendoza, U-Primo Rodriguez and others. Theoretically, TARFCOM is a conventional single-country CGE model; its equations closely resemble those of the ORANI-G model of the Australian economy. Data for TARFCOM is drawn from the 229-sector 1994 Philippine Input-Output tables, and later aggregated to 43 sectors. The project was funded by AUSAID under the Philippines-Australia Governance Facility (PAGF).

We summarize the theoretical structure of TARFCOM in Section 2 below. Section 3 covers the construction of the database. In Section 4 we describe the results of a simulation: it shows the effects of efficiency increases in certain sectors which might arise from a program of micro-economic reform.

## 2.0 Model Structure

TARFCOM is based on the Australian ORANI-G model, documented in Horridge (2000); we refer the reader to that document for a full description of the model theory. Here we highlight some of the main features of the model.

TARFCOM has a theoretical structure which is typical of a static AGE model. It consists of equations describing, for some time period:

- producers' demands for produced inputs and primary factors;
- producers' supplies of commodities;
- demands for inputs to capital formation;
- household demands;
- export demands;
- government demands;

- the relationship of basic values to production costs and to purchasers' prices;
- market-clearing conditions for commodities and primary factors; and
- numerous macroeconomic variables and price indices.

Demand and supply equations for private-sector agents are derived from the solutions to the optimization problems (cost minimization, utility maximization, etc.) which are assumed to underlie the behavior of the agents in conventional neoclassical microeconomics. The agents are assumed to be price takers, with producers operating in competitive markets which prevent the earning of pure profits.

Like the majority of CGE models, TARFCOM is a comparative-static model. Its equations and variables all refer implicitly to the economy at a single period, probably some time in the future. Results are in percent change form; they should be interpreted to show the difference, caused by some policy shock, between two alternative future states of the economy.

| | | Absorption Matrix | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| | | Producers | Investors | Household | Export | Government | Change in Inventories |
| | Size | ← I → | ← I → | ← 1 → | ← 1 → | ← 1 → | ← 1 → |
| Basic Flows | ↑ C×S ↓ | V1BAS | V2BAS | V3BAS | V4BAS | V5BAS | V6BAS |
| Margins | ↑ C×S×M ↓ | V1MAR | V2MAR | V3MAR | V4MAR | V5MAR | n/a |
| Taxes | ↑ C×S ↓ | V1TAX | V2TAX | V3TAX | V4TAX | V5TAX | n/a |
| Labor | ↑ O ↓ | V1LAB | | | | | |
| Capital | ↑ 1 ↓ | V1CAP | | | | | |
| Land | ↑ 1 ↓ | V1LND | | | | | |
| Other Costs | ↑ 1 ↓ | V1OCT | | | | | |

C= Number of Commodities

I = Number of Industries

S= 2: Domestic, Imported,

O= Number of Occupation Types

M = Number of Commodities used as Margins

| | Joint Production Matrix |
|---|---|
| Size | ← I → |
| ↑ C ↓ | MAKE |

| | Import Duty |
|---|---|
| Size | ← 1 → |
| ↑ C ↓ | V0TAR |

**Figure 1. The TARFCOM Flows Database**

## 2.1 Structure of the database

Figure 1 is a schematic representation of the model's input-output database. It reveals the basic structure of the model. The column headings in the main part of the figure (an absorption matrix) identify the following demanders:

(1) domestic producers divided into I industries;
(2) investors divided into I industries;
(3) a single representative household;
(4) an aggregate foreign purchaser of exports;
(5) government; and
(6) changes in inventories.

The entries in each column show the structure of the purchases made by the agents identified in the column heading. Each of the C commodity types identified in the model can be obtained locally or imported from overseas. The source-specific commodities are used by industries as inputs to current production and capital formation, are consumed by households and governments, are exported, or are added to or subtracted from inventories. Only domestically produced goods appear in the export column. M of the domestically produced goods are used as margins services (wholesale and retail trade, and transport) which are required to transfer commodities from their sources to their users. Commodity taxes are payable on the purchases. As well as intermediate inputs, current production requires inputs of three categories of primary factors: labor (divided into O occupations), fixed capital, and agricultural land. The 'other costs' category covers various miscellaneous industry expenses.

Each cell in the illustrative absorption matrix in Figure 4 contains the name of the corresponding data matrix. For example, V2MAR is a 4-dimensional array showing the cost of M margins services on the flows of C goods, both domestically produced and imported (S), to I investors.

In principle, each industry is capable of producing any of the C commodity types. The MAKE matrix at the bottom of Figure 4 shows the value of output of each commodity by each industry. Finally, tariffs on imports are assumed to be levied at rates which vary by commodity but not by user. The revenue obtained is represented by the tariff vector V0TAR.

## 2.2 Structure of production

TARFCOM allows each industry to produce several commodities, using as inputs domestic and imported commodities, labor of several types, land, capital and 'other costs'. In addition, commodities destined for export are distinguished from those for local use. The multi-input, multi-output production specification is kept manageable by a series of separability assumptions, illustrated by the nesting shown in Figure 2. For example, the assumption of *input-output separability* implies that the generalized production function for some industry:

$$F(\text{inputs}, \text{outputs}) = 0$$

may be written as:

$$G(\text{inputs}) = X1TOT = H(\text{outputs})$$

where X1TOT is an index of industry activity. Assumptions of this type reduce the number of estimated parameters required by the model. Figure 2 shows that the H function in (16) is derived from two nested CET (constant elasticity of transformation) aggregation functions, while the G function is broken into a sequence of nests. At the top level, commodity composites, a primary-factor composite and 'other costs' are combined using a Leontief production function. Consequently, they are all demanded in direct proportion to X1TOT. Each commodity composite is a CES (constant elasticity of substitution) function of a domestic good and the imported equivalent. The primary-factor composite is a CES aggregation of land, capital and composite labor. Composite labor is a CES aggregation of occupational labor types. Although all industries share this common production structure, input proportions and behavioral parameters may vary between industries.

There are two CET nests on the output side. The first determines the proportions of commodities produced by each industry (initial proportions came from the MAKE matrix). The second is currently disabled in TARFCOM: it allows for some friction in switching output between local and export destinations.

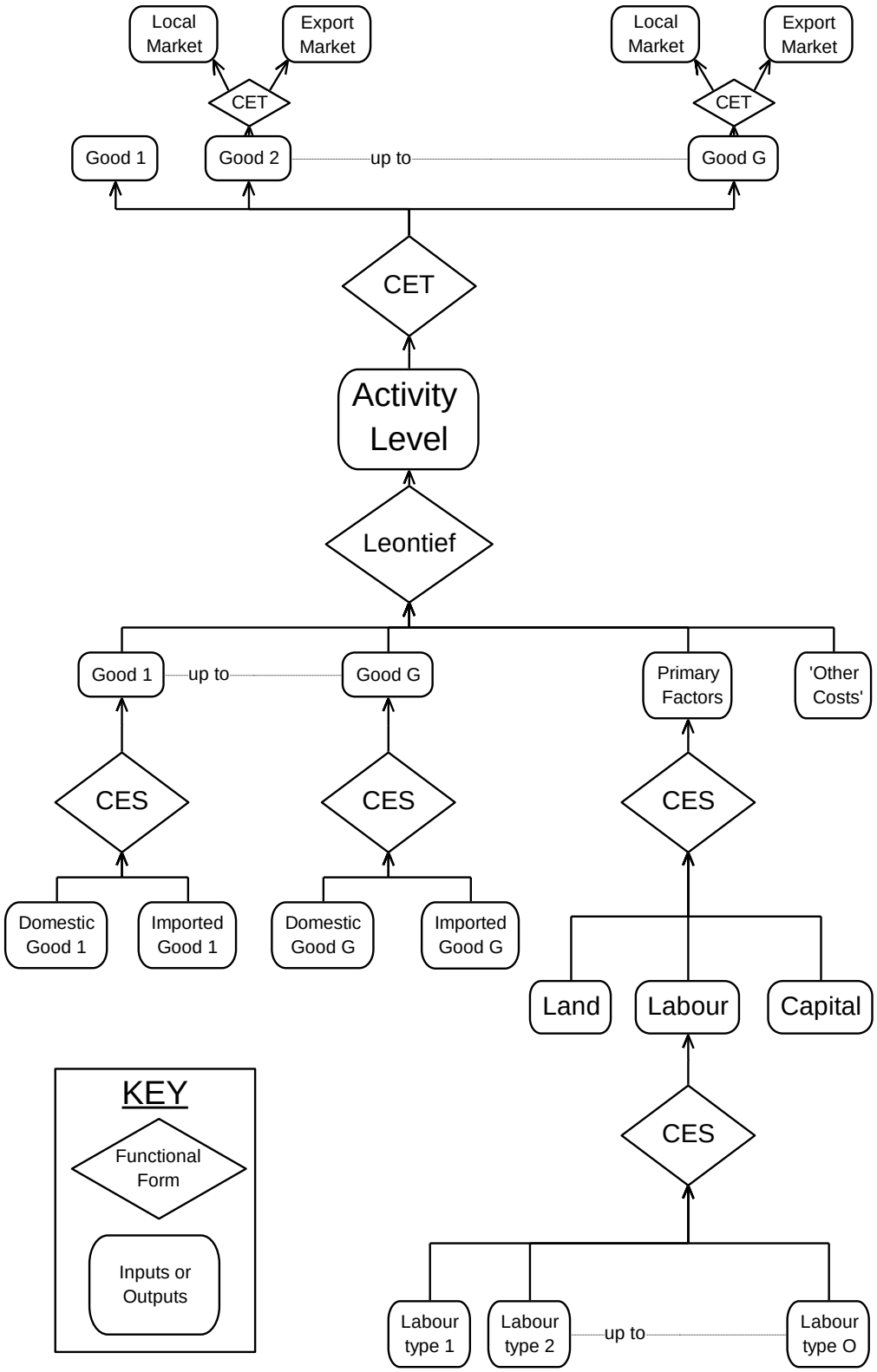


**Figure 2. Structure of Production**

Figure 3 represents the structure of household demands. As for intermediate demands, domestic and imported variants of each good are combined using CES functions. Demands for the resulting composite goods follow the linear expenditure system, which is consistent with a Klein-Rubin utility function.

For each industry, investment demands follow a pattern similar to Figure 3, except that the Klein-Rubin nest is replaced by a Leontief function.

Volumes of exports are price-sensitive; each of the main export commodities[2] faces its own, constant elasticity, foreign demand curve. For the other (low-volume) exports, we did not feel that export volumes were mainly a function of that good's individual price. Service exports, for example, may be a by-product of some other transaction. An arbitrary rule was used to determine these export volumes: foreign demand for each was linked (via a single, constant elasticity, foreign demand curve) to the average price for the whole group.

[2] Main export commodities are defined as those commodities for which 15 per cent or more of domestic output is exported.

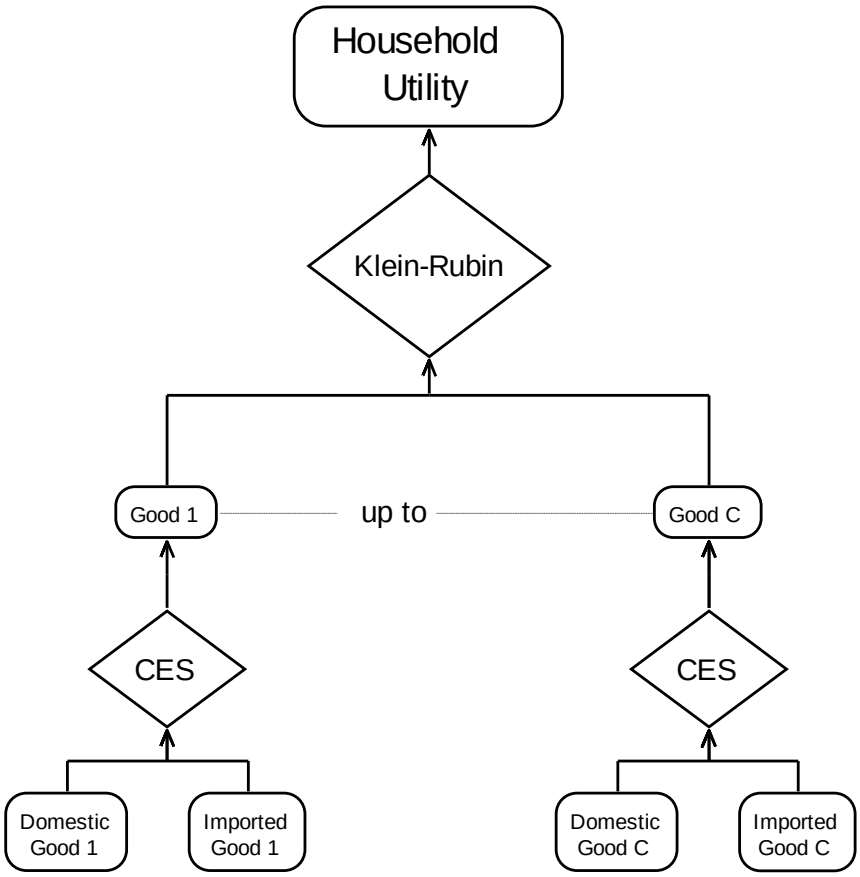


**Figure 3. Structure of Consumer Demand**

# 3.0 Construction of the Model Database

As is usual in CGE modelling, a number of bold assumptions were needed to construct the TARFCOM database. Some of these assumptions might well be revised later, were further data to become available.

## 3.1 Input-output flows database

As shown in Figure 1, the main part of the TARFCOM database is a detailed input-output table. To construct this, we used the 1994 229-sector Philippines Input-Output Table.

This consisted of:

- a single USE table measured in producer prices.
- a MAKE table showing which commodities were produced by which industries; this revealed a strong 1-to-1 relationship between industries and commodities.
- The 229 sectors are listed in Appendix A. A number of assumptions were needed to split up the USE table into the form shown in Figure 1.
- We assumed that all domestic users (except stocks) of a given commodity had the same import/domestic share.
- For agricultural and extractive industries, we imputed 1/3 of gross operating surplus to land or other natural resources. The gross operating surplus seemed to include the income of peasants and small traders -- which ideally should be imputed to labour rather than capital. We did not do this since data was lacking.
- The IO tables showed only the total of indirect taxes levied on each domestic or imported commodity -- there was no information about the incidence of these taxes. We assumed that some users (for example exports or investment) might be partially exempt from some of these taxes. Consistent with the IO control totals, we assumed that commodity tax rates on goods used by households were taxed at twice the rate of those used by industry, which in turn were taxed at twice the rate of those destined for export, investment or government.
- At present, TARFCOM identifies only one type of Labour (i.e., the set O of occupations has but one member).

- For agricultural and extractive industries, we imputed 1/3 of gross operating surplus to land or other natural resources.

- The IO tables did not include separate margins matrices. We identified the following margins commodities (see Appendix A) [WholslRtlTrd, RailTransprt, BusTransport, RoadFreight, OceanTranspt, IslandShips, Stevedoring, CustomsBrokr, Storage, OthInsurance, HotelsMotels]. We assumed that 2/3 of each user's purchases of these goods was used for margins purposes, which we allocated between that user's other purchases in proportion to values.

- Published tariff rates, supplied by the Tariff Commission, were used to impute the vector of tariff revenues, V0TAR, from the import values contained in the IO tables.

## 3.2 Elasticities estimates

The elasticities used in TARFCOM are drawn from the GTAP world database and from Australian CGE models. They were set as follows:

- "Armington" elasticities of substitution between domestic and imported variants of the same good were adapted from Version 4 of the GTAP database (McDougall et al, 1998).

- Export demand elasticities were set equal to the elasticities of substitution between different foreign variants of the same good in Version 4 of the GTAP database. That is, they were set at just twice the size of the corresponding domestic/imported substitution elasticities.

- Expenditure elasticities for households were also adapted from Version 4 of the GTAP database.

- The elasticity of substitution between capital and labour was set to 0.5 for all sectors.

- For each industry, the elasticity of transformation between various different commodity outputs was set to 0.4.

## 3.3 Aggregation to 43 sectors

Although the 229-sector version of TARFCOM is quite quick to solve, we prepared a 43 sector aggregation convenient for: reporting results; for teaching purposes; or for those with a very weak PC. The

aggregation was supplied by the Tariff Commission and is shown in Appendix 1.

# 4.0 AN ILLUSTRATIVE SIMULATION: EFFECTS OF MICRO ECONOMIC REFORM

## 4.1 Setting up the simulation: policy background, shocks, and closure.

The Philippine Tariff Commission requested IRIC to do simulations with TARFCOM that illustrated the model's ability to analyse the benefits of competition policy reforms in the Philippines. In this section we undertake such simulations. In designing shocks to the model that represent competition policy reforms, we follow the example of modelling of similar reforms undertaken in Australia. In 1995 the Australian Industry Commission (Industry Commission 1995) reported on the results of their investigations into the possible economy-wide effects of a set of competition policy reforms directed at state government business enterprises, the building sector, the transport and communications sectors, and the professional services sector. Before proceeding to estimate the economy-wide effects of the proposed policies with a specially-designed version of the ORANI model, the Industry Commission first directed a significant proportion of their research effort towards: a detailed investigation of each of the sectors that would be subject to competition policy measures; the nature of the competition policy reforms that would likely be directed at each of the sectors; and the consequences of the likely competition policy measures for each of the sectors. In estimating the latter, the Industry Commission drew on a significant amount of work conducted by both itself and the Bureau of Industry Economics. This work compared estimates of total factor productivity for the relevant Australian industries with estimates of total factor productivity for world-best-practice examples from the same industry. The estimates of the direct consequences of competition policy for each sector were then translated into terms that could be input to the ORANI model as exogenous shocks to the model's variables. These included estimates of the impacts of the reforms on: industry-specific labour, capital, and intermediate-input-using technical efficiency; the technical efficiency of industry-specific capital creation; and rates of return on industry capital.

Unlike the situation facing the Industry Commission in 1995, detailed prior estimates of the consequences of specific competition policy reforms for target industries are not available for the Philippines. To overcome this problem, the following approach has been adopted in

the present study. First, IRIC proposed a list of industries that were most likely to be the subject of competition policy-oriented reforms. These were: Electricity, Water, Communications, Banks, Insurance, Air Transport, and Other Transport and Communications. Each of these industries was then subject to a 5 per cent improvement in primary factor productivity in the TARFCOM model. The simulations were undertaken under a long run closure.

The choice of variable to shock (primary factor productivity) was governed by the precedent set by the Industry Commission, who conceived of most of the gains from competition policy reforms as being realised as improvements in primary factor productivity. The size of the shock (5 per cent) was governed by a desire to ensure that the shocks were conservative relative to those used by the Industry Commission when investigating the Australian case. Madden (1995) provides a convenient condensation and summary of the shocks which the Industry Commission administered to the ORANI model in estimating the effects of competition policy for Australia. Madden's summary is reproduced in Appendix 2. It is clear from this summary that for most industries a 5 per cent improvement in primary factor efficiency is well within the bounds proposed by the Industry Commission for the Australian case. It is important to note however that in administering 5 per cent shocks to primary factor productivity in the subject industries in this report, we are not suggesting that the likely direct effects of competition policy for these sectors will ultimately be of this size. The simulations that are reported upon in Section 4.2 are illustrative of the simulations that could be undertaken when a significant amount of background research has been undertaken into the likely nature and magnitude of the direct effects of competition policy for the Philippines. The simulations reported in Section 4.2 can be seen to:

1. provide a clear demonstration of a framework for modelling competition policy reforms with the TARFCOM model;

2. show how the sizes and directions of the indirect effects of competition policy reforms are related to the direct effects of those reforms;

3. provide a clear exposition of how the major mechanisms of the TARFCOM model operate to translate the direct effects of competition policy into economy-wide effects; and.

4. demonstrate that at the industrial level there can be winners and losers from competition policy reform.

Competition policy reforms cannot be implemented "overnight". The nature of the reforms are likely to be such as to require significant changes in the legal and institutional frameworks governing economic activity within the industries targeted for reform. Not only will these reforms take time to formulate and implement, but we can expect economic agents to take some time to adjust to the new rules governing economic activity within the target markets. For these reasons we believe that a long run closure of the model is the appropriate closure under which to model the effects of the productivity improvements in the target industries. We define the long run to be a solution period that is sufficiently long enough for:

i. capital stocks in each industry to adjust such that rates of return on industry capital stocks remain unchanged; and,

ii. for the economy-wide real wage to adjust to achieve full employment.

We then impose a number of additional assumptions on the long run closure:

i. The ratio of the balance of trade deficit to GDP is exogenous, with real aggregate consumption expenditure determined endogenously;

ii. The percentage change in real government consumption expenditure is indexed to the percentage change in real household consumption expenditure; and

iii. The percentage change in economy-wide real investment expenditure is indexed to the percentage change in real household consumption expenditure.

## 4.2 Commentary on Simulation Results

### *4.2.1. Introduction*

As discussed in Section 4.1, the simulation represents simultaneous 5 per cent primary factor productivity improvements in each of the seven industries targeted for competition policy measures. As a result, the simulation generates a large number of results. For any given variable, there are simulation results for both the total of the seven shocks, in addition to the individual contributions to this total of the individual productivity shocks to each of the seven subject industry. In addition, the model produces results for a large number of variables which in turn can feature a high level of commodity and industrial disaggregation. Given the volume of results generated by this simulation, we need to adopt a number of strategies to both make sense of this large volume of results, and to concentrate our attention on the more important and interesting of the results.

The first of these strategies is to focus our initial discussion on the total results – that is, the results relating to the aggregate effect of productivity improvements in each of the seven subject industries. In doing so, we will first discuss the major macroeconomic consequences of the productivity improvements, before turning to a discussion of the industry results. The results for a number of industries are discussed in some detail. Our choice of the industries on which to focus the discussion was governed by two considerations: first, which industries were the least and most affected by the productivity improvements in the subject industries; and second, which industries are most important to the Philippine economy in terms of their contribution to GDP at factor cost. The two sectors least favourably affected by the shock are the Dry Coconut industry, and the Coconut and Vegetable Oils industry. The two sectors most favourably affected by the shock are the Banks industry and the Insurance industry. The three industries accounting for the highest shares of GDP at factor cost are Trade (14 per cent), Other Agriculture and Forestry (11 per cent), and Government Services (8 per cent). Together these three industries account for one third of Philippine GDP at factor cost. Hence the impacts of the overall scenario on these three sectors are also discussed in some detail.

After discussing the total results, we turn our attention to the results pertaining to individual contribution to the total results of one of the subject industries – Electricity.

### *4.2.2 Long run macroeconomic effects of efficiency gains*

Table 1 contains a selection of key macroeconomic results from the productivity simulation.

**Table 1: Longrun macro effects of efficiency increase**

| | Description | Code | Change |
|---|---|---|---|
| 1 | Real GDP | x0gdpexp | 0.72 |
| 2 | Employment | employ_i | 0.00 |
| 3 | Aggregate Capital Stock | x1cap_i | 0.35 |
| 4 | Real Household Consumption | x3tot | 0.66 |
| 5 | Real Investment | x2tot_i | 0.66 |
| 6 | Real Government Consumption | x5tot | 0.66 |
| 7 | Exports (volume) | x4tot | 0.66 |
| 8 | Imports (volume) | x0cif_c | 0.48 |
| 9 | Real Wage | f1lab_io | 1.34 |
| 10 | Consumer Price Index | p3tot | -0.05 |
| 11 | GDP price index | p0gdpexp | -0.02 |
| 12 | Ordinary Change in Balance of Trade/GDP | delB | 0.00 |
| 13 | Real Devaluation | p0realdev | 0.02 |

Real GDP at market prices is projected to be 0.72 per cent higher than it would otherwise have been in the absence of the simulated productivity improvements. The increase in long run real GDP can be traced to two factors. First, the primary factor productivity improvements in the shocked industries represent an improvement in the economy's overall endowment of effective primary factor inputs. Primary factor inputs in the improving sectors account for approximately 10 per cent of GDP at factor cost. Hence the improvement in primary factor productivity on its own increases real GDP at market prices[3] by 0.5 per cent (0.1 x 5.0 =5.0). Second, the economy's aggregate capital stock is projected to be 0.35 per cent higher than it would otherwise have been. The share of aggregate capital rentals in GDP at factor cost is 63 per cent. Hence the expansion in the economy-wide capital stock adds a further 0.22 (0.63 x 0.35 = 0.22) to the result for real GDP. Under the long run closure, with both aggregate employment and rental rates on capital exogenous, we would typically expect that changes in the aggregate capital stock would be quite small. The increase in the aggregate capital stock in this simulation arises from the shocks to the model causing an expansion in the relative sizes of some of the more capital intensive sectors of the economy. As these sectors expand and absorb

[3] In this simulation, indirect tax revenues increase by 0.68 per cent, which is about the same as the increase in real GDP at market prices.

a higher share of the economy's exogenous endowment of labor, the economy-wide capital-labor ratio increases. With aggregate economic activity expanding with the economy-wide availability of labor exogenous, the real wage rises. The economy-wide real consumer wage is projected to increase by 1.34 per cent.

As discussed in Section 4.1, the long-run closure holds the ratio of the balance of trade to nominal GDP exogenous. This is equivalent to requiring that the percentage change in nominal domestic absorption be equal to the percentage change in nominal GDP. However the results for real GDP and real domestic absorption can diverge if the relative changes in the price deflators for these aggregates diverge. This is the case for the simulation results reported in Table 1. As the Philippine economy expands, so too does the volume of imports - Philippine import volumes are projected to be 0.48 per cent higher than they would otherwise have been. In the initial database the balance of trade is in deficit. Hence, given our long run assumption for the ratio of the balance of trade deficit to GDP, the volume of exports must expand at a faster rate than the volume of imports. This requires a decline in the terms of trade, which depresses the GDP price deflator relative to the overall deflator for domestic absorption. Hence, whereas the GDP price deflator decreases by 0.025 per cent, there is a rise in the domestic absorption deflator of 0.034 per cent. This explains why the growth in real domestic absorption (0.66 per cent) is slightly lower then the growth in real GDP (0.72 per cent). The fall in the GDP price deflator is also reflected in our index for the real exchange rate, *p0realdev*, which records a real devaluation of 0.025 per cent.

Each of the elements of domestic absorption (household consumption, investment, and government consumption) are each projected to increase by 0.66 per cent. This reflects our assumptions regarding the determination of real investment and real government consumption in the long run. As discussed in Section 4.1, the percentage changes in both aggregate real investment and aggregate real government consumption are assumed to move with the percentage change in real household consumption in the long run.

Table 2 below outlines the impact of competition policy on various sectors of the Philippine economy.

**Table 2: Longrun sectoral effects of efficiency increase**

| | | Price (p0com) | Output (x1tot) | Employment (employ) | Exports (x4) | Imports (x0imp) |
|---|---|---|---|---|---|---|
| 1 | Palay | 0.49 | 0.23 | -0.11 | 0.34 | 1.22 |
| 2 | Corn | 0.59 | 0.15 | -0.14 | 0.34 | 1.37 |
| 3 | Coconut | 0.71 | 0.14 | -0.11 | 0.34 | 0.00 |
| 4 | Sugarcane | 0.51 | 0.23 | -0.05 | 0.34 | 0.00 |
| 5 | Fishery | 0.27 | -0.02 | -0.46 | -1.06 | 0.99 |
| 6 | OthAgrForest | 0.47 | 0.27 | -0.04 | 0.34 | 1.36 |
| 7 | MiningEtc | 0.15 | 0.10 | -0.22 | -0.49 | 0.75 |
| 8 | CanVegFruit | 0.42 | -0.14 | -0.49 | -1.41 | 1.24 |
| 9 | CannedFish | 0.23 | -0.03 | -0.44 | -0.66 | 0.78 |
| 10 | CocoVegOils | 0.30 | -0.32 | -0.71 | -0.94 | 0.94 |
| 11 | DryCoconut | 0.49 | -1.50 | -1.80 | -1.67 | 0.00 |
| 12 | OtherFoods | 0.27 | 0.23 | -0.24 | 0.34 | 0.77 |
| 13 | Beverages | 0.03 | 0.59 | 0.10 | 0.34 | 0.67 |
| 14 | Tobacco | 0.10 | 0.54 | 0.09 | 0.34 | 0.61 |
| 15 | ClothesShoes | 0.05 | 0.24 | -0.21 | 0.05 | 0.65 |
| 16 | WoodProds | 0.20 | -0.01 | -0.37 | -0.71 | 0.91 |
| 17 | FurnitureEtc | 0.19 | 0.15 | -0.23 | -0.67 | 1.26 |
| 18 | PaperProd | -0.01 | 0.51 | 0.06 | 0.21 | 0.63 |
| 19 | Chemicals | 0.08 | 0.63 | 0.17 | 0.34 | 0.65 |
| 20 | PetrlCoalPrd | -0.09 | 0.72 | 0.24 | 0.34 | 0.58 |
| 21 | NonMtlMinPrd | -0.07 | 0.69 | 0.20 | 0.34 | 0.51 |
| 22 | BasicMetals | -0.07 | 0.60 | 0.14 | 0.61 | 0.34 |
| 23 | NonElecMchin | 0.00 | 0.47 | 0.14 | 0.25 | 0.65 |
| 24 | ElecMachin | 0.03 | 0.24 | -0.16 | 0.13 | 0.51 |
| 25 | MVP | 0.08 | 0.12 | -0.25 | -0.25 | 0.56 |
| 26 | Cycles | 0.11 | 0.54 | 0.13 | 0.34 | 1.08 |
| 27 | JewelryEtc | 0.06 | 0.18 | -0.16 | -0.02 | 0.80 |
| 28 | OtherManuf | 0.06 | 0.30 | -0.08 | -0.04 | 0.58 |
| 29 | Construction | 0.09 | 0.67 | 0.25 | 0.34 | 0.84 |
| 30 | Electricity | -2.62 | 0.85 | -4.68 | 0.34 | 0.00 |
| 31 | Water | -3.84 | 1.02 | -4.45 | 0.34 | 0.00 |
| 32 | LandTrans | 0.22 | 0.60 | 0.27 | 0.34 | 1.17 |
| 33 | AirTrans | -1.24 | 1.18 | -4.29 | 0.34 | -0.88 |
| 34 | Commnication | -3.69 | 1.26 | -4.30 | 0.34 | -4.90 |
| 35 | OthTranComms | -2.71 | 0.87 | -4.56 | 0.34 | -2.72 |
| 36 | Trade | -0.24 | 0.68 | 0.20 | 0.34 | 0.00 |
| 37 | Banks | -3.51 | 6.95 | 1.18 | 12.80 | -2.95 |
| 38 | NonBanks | -0.06 | 0.74 | 0.24 | 0.34 | 0.72 |
| 39 | Insurance | -3.76 | 2.08 | -3.47 | 0.34 | -2.93 |
| 40 | PrivRecSvce | 0.21 | 0.11 | -0.28 | -0.53 | 1.07 |
| 41 | OthServices | 0.22 | 0.84 | 0.48 | 0.34 | 1.40 |
| 42 | RealEstate | 0.04 | 0.95 | 0.35 | 0.34 | 1.10 |
| 43 | GovServices | 0.64 | 0.66 | 0.63 | 0.34 | 0.00 |

### *4.2.3. Selected long run sectoral effects of efficiency gains*

*4.2.3.1 Dry Coconut (least favorably affected)*

The sector that is worst affected by the productivity improvements is Dry Coconut. Long run activity in this industry is projected to contract by 1.50 per cent relative to what it would otherwise have been. The contraction in the output of this sector is due to the sector experiencing a relatively sharp increase in its per-unit production costs (+0.49 per cent) while facing a price-elastic demand for its output. The sector sells approximately 91 per cent of its output to the export market, and the price elasticity of demand for its exports is –4.4. The increase in production costs in the Dry Coconut industry are passed through to the foreign currency export price for Dry Coconut. After taking into account the indirect taxes and margins on exports of Dry Coconut, the commodity's export price is projected to increase by 0.38 per cent. On its own, the increase in the export price of Dry Coconut will decrease the output of the Dry Coconut industry by approximately 1.52 per cent (0.38 x –4.4 x 0.91 = -1.52).

The increase in the production costs of the Dry Coconut industry can be traced to two main sources. First, with the economy-wide real wage rising, the industry's labor input costs are also rising, causing an increase in the overall cost of primary factor inputs to the industry of 0.67 per cent. Primary factor inputs account for approximately 32 per cent of the sector's inputs, so that on its own the increase in the price of labor[4] causes this sector's output price to increase by 0.21 per cent (0.32 x 0.67 = 0.21).

The second main factor contributing to the increase in this industry's costs is that the price of one of its major intermediate inputs - domestically sourced Coconut - is rising sharply. Intermediate inputs account for approximately 60 per cent of the Dry Coconut industry's total costs. Approximately 81 per cent of the industry's intermediate inputs are Coconut. The price of Coconut to the Dry Coconut industry is projected to increase by 0.64 per cent. The rise in the price of domestically-sourced Coconut can be traced to an increase in domestic demands for Coconut. The price of Coconut rises sharply in response to this increase in demand because approximately 20 per cent of the primary factor input to this industry is in the form of industry-specific land. The supply of this land is assumed to be

[4] With real rental rates exogenous, and the cost of constructing a unit of capital being largely unaffected by the shocks, the rental price of a unit of capital in each industry is also largely unaffected by the shock. Hence the change in the price of each industry's primary factor input bundle is due almost entirely to the change in the economy-wide price of labour.

exogenous (and unchanged) in the long run. Hence, as the Coconut industry expands, the rental on its land is bid-up, causing the industry's output price to increase. Overall, the increase in the cost of Coconut to the Dry Coconut industry causes the latter's per-unit production costs to increase by a further 0.31 per cent (0.60 x 0.81 x 0.64 = 0.31).

Long run employment in Dry Coconut is projected to be 1.80 per cent lower than in it would have been in the absence of the productivity shocks to the subject industries. The contraction in the industry's employment (-1.80 per cent) is greater than the contraction in the industry's output (-1.50 per cent) because the wage/rental ratio faced by the industry is rising. While the price of labor is projected to be 1.28 per cent higher, the rental price of capital is projected to be only 0.04 per cent higher. This causes the industry to increase its capital/labor ratio.

*4.2.3.2 Coconut and Vegetable Oils (second least favorably affected)*

The Coconut and Vegetable Oils (CVO) industry is the industry that is the next worst affected by the simulation. Output and employment in the sector are projected to be lower than they would otherwise have been by -0.32 per cent and -0.71 per cent respectively. This is largely a reflection of the fact that the industry's input costs are rising while the industry faces a relatively price-elastic demand for its output. The basic price of CVO is projected to increase by 0.30 per cent. Approximately 80 per cent of Philippine CVO is produced by the CVO industry[5]. Production costs in the CVO industry are projected to increase by 0.29 per cent. This is due in part to increasing labor costs and in part to rising intermediate input costs. Labor inputs account for 8.5 per cent of the industry's total costs. With the price of labor rising by 1.28 per cent, the increase in labor costs account for 0.11 percentage points of the industry's cost increase (0.085 x 1.28 = 0.11). Approximately 61 per cent of the industry's costs are intermediate inputs, and of these approximately 28 per cent are inputs of domestic Coconut. As discussed in Section 4.2.3.1 above, the price of domestic coconut is projected to increase. The price paid by the CVO industry for domestic Coconut is projected to increase by 0.65 per cent. On its own, this accounts for another 0.11 percentage points (0.61 x 0.28 x 0.65 = 0.11) of the industry's cost increase.

Approximately 41 per cent of CVO is exported, with the commodity's export elasticity being -4.4. The export price of CVO is projected to be approximately 0.214 per cent higher than it would otherwise have been. This causes a reduction in CVO exports of 0.94 per cent (-4.4 x 0.214 = -0.94). On its own, this is sufficient to cause

[5] The remaining 20 per cent is produced by the Other Foods industry.

a contraction in CVO output of 0.39 per cent (0.41 x -0.94 = 0.39). The final result for the CVO industry is a contraction in output of somewhat less than this amount: 0.32 per cent. This is because, while export demands for CVO fall sharply, there are small increases in intermediate and household demands for CVO.

Employment in CVO is projected to fall by 0.72 per cent. Just under one half of this contraction is a reflection of the fact that the industry's activity level is lower by 0.32 per cent. The remainder of the fall in employment is due to the industry increasing the long run capital intensity of its production, in response to the increase in its wage / rental ratio.

*4.2.3.3 Banks (most favorably affected)*

The sector most favorably affected by the simulation is Banks. The long run output of Banks is projected to be 6.95 per cent higher than it would otherwise have been. Employment in the industry is projected to be 1.18 per cent higher. The increase in activity and employment in this sector is due largely to the fall in the costs of this industry (-3.51), which in turn stimulates price-sensitive demands for the industry's output. The cause of the favorable prospects for this industry can be traced directly to the fact that it is one of the industries which experience the 5 per cent improvement in primary factor productivity. Approximately 68 per cent of the sector's inputs are primary factors, hence the immediate effect of the productivity shock experienced by this industry is to reduce the per unit price of Banks output by 3.4 per cent (0.68 x -5.0 = -3.4).

Of the sectors subject to the productivity improvement, Banks is the most export oriented. Approximately 38 per cent of the output of Banks is sold to foreigners. Of the subject industries, Communications has the next-highest export share, at 13.6 per cent. As discussed in Section 2.2, in TARFCOM only those commodities that have an export share of 15 per cent or more are modelled as facing a unique export demand schedule. Changes in the exports of all other commodities are indexed to movements in the aggregate of all such exports, which are in turn a function of the overall price index for the aggregate of all such exports. Since - of the subject industries - only Banks faces its own unique export demand schedule, the volume of Banks exports is rendered relatively more sensitive to changes in its own cost conditions. After account is taken of margins and indirect taxes on export sales, the fall in the per-unit cost of Banks output is reflected in a fall in its foreign currency export price of 3.12 per cent. This causes Banks exports to increase by 12.80 per

cent. On its own, the increase in Banks exports causes the output of Banks to increase by 4.8 per cent (0.38 x 12.8 = 4.8).

The remainder of the expansion in Banks activity can be traced to the overall expansion in national economic activity, and a reduction in the share of the usage of imported Banks in total domestic usage of Banks. The expansion in the size of the national economy adds approximately 0.7 per cent to the size of the Banks sector, as domestic agents increase their usage of Banks. Finally, the Banks sector expands by a further 1.4 per cent as domestic agents substitute away from imported Banks and towards the now relatively cheaper domestic Banks.

*4.2.3.4 Insurance (second most favorably affected)*

The long run output of the insurance sector is projected to be 2.08 per cent higher than what it would otherwise have been in the absence of the productivity improvements in the subject industries. The per-unit costs of Insurance output are projected to be 3.76 per cent lower than otherwise. This reflects the primary factor saving productivity improvement experienced by this industry. Primary factor inputs represent approximately 75 per cent of Insurance's total costs. Hence, on its own, the improvement in primary factor productivity is sufficient to lower per unit production costs in Insurance by 3.8 per cent (0.75 x –5.0 = 3.8). The fall in per unit costs in Insurance (3.76 per cent) is comparable to that experienced by Banks (-3.51). However the changes in output are not comparable – the expansion in Insurance output is less than a third of that of Banks. This reflects differences in the pattern of sales of these two sectors and a resulting lower overall implicit price elasticity of demand for Insurance output. Insurance sells the bulk of its output to three main types of use: intermediate inputs (14 per cent of sales); household consumption (46 per cent of sales); and margin services (37 per cent of sales).

The major intermediate input user of Insurance's output is Banks. This sector accounts for 58 per cent of total intermediate usage of Insurance output. Interestingly, total usage of Insurance as an intermediate input by all the subject industries accounts for approximately 70 per cent of total intermediate sales of domestic Insurance. On its own, and before taking into account price-induced substitution effects, the expansion of the downstream industries which use Insurance as an intermediate input will have increased Insurance's intermediate sales by approximately 1.4 per cent. This effect alone accounts for approximately 0.20 (0.14 x 1.4 = 0.20) percentage points of the total expansion experienced by this industry.

The largest user of Insurance is households, which accounts for approximately 46 per cent of the sector's output. The increase in the

demand for domestic Insurance by households can be traced to three effects: an increase in household demand for Insurance in general arising from the expenditure effect; an increase in household demand for Insurance in general arising from a price-induced substitution towards the consumption of more Insurance; and an increase in demand arising from a substitution away from the relatively more expensive imported substitute. In the first instance we consider only the first two of these effects.

In the model's database, the household expenditure elasticity for Insurance is 1.48. With real household expenditure projected to be 0.66 per cent higher in the long run, the expenditure effect contributes approximately 0.45 percentage points (0.66 x 1.48 x 0.464 = 0.45) to the industry's total output response.

Households also substitute towards the consumption of Insurance in general. With the price of domestically sourced Insurance falling, the price of the Insurance composite faced by households also falls, by 3.33 per cent. The household own-price elasticity of demand for Insurance in general is –0.32. Hence the household substitution effect contributes approximately 0.49 percentage points (-3.33 x –0.32 x 0.464 = 0.49) to the industry's total output response.

After sales to households, margin usage accounts for the next-highest share of domestically-sourced Insurance, at 36.5 per cent. Approximately 75 per cent of the margin sales of Insurance are used to facilitate intermediate input usages. Approximately 12 per cent and 13 per cent of the margin sales of Insurance facilitate sales to households and exports respectively. Margin usages of Insurance which are facilitating exports and consumption are each projected to increase by approximately 0.65 per cent, tracking the projected increases in aggregate real consumption and exports. However margin sales of Insurance on intermediate inputs are projected to increase by 1.4 per cent - a rate of increase significantly higher than that projected for aggregate economic activity. This higher increase reflects the relative importance of margin sales of Insurance on intermediate input usages by those sectors that are expanding the most under this simulation – that is, the utility, finance, and service sectors. Overall, the growth in the industry's margin sales contributes approximately 0.44 percentage points ( [0.75 x 1.4 + 0.25 x 0.65] x 0.365 = 0.44) to the industry's overall growth rate.

Together, the various effects outlined above account for just under 1.6 percentage points of the total expansion in Insurance output. The remaining half a percentage point of the total expansion in Insurance

output is attributable to the substitution by domestic agents away from imported Insurance and towards domestically-sourced Insurance. The domestic currency price of the imported Insurance is unaffected by the shock. However the basic price of the domestically-sourced Insurance is projected to be 3.76 per cent lower than otherwise. This induces domestic users to substitute towards domestically-sourced Insurance, providing a further fillip to this industry's activity.

*4.2.3.5 Trade (largest industry sector)*

The Trade industry accounts for the highest share (14 per cent) of GDP at factor cost. Output of Trade is projected to be 0.68 per cent higher than what it would have been in the absence of the productivity shocks, and the price of its output is projected to be 0.24 per cent lower. The expansion in the activity of this sector is driven largely by an increase in the demand for Trade as a margin service - sales of domestic Trade as a margin service account for approximately 67 per cent of the total sales of domestic Trade. The demand for margins in TARFCOM are modelled as being proportional to the various expenditure flows that they facilitate. The demand for margin services is only indirectly related to the price of margin services, via the effect of changes in the price of margin services on the overall purchaser's price of the good the exchange of which they are facilitating. Since demands for Trade as a margin are inelastic with respect to the price of Trade, and since the demand for Trade as a margin is proportional to the commodity flows that Trade facilitates, we would expect the output of Trade to move in line with aggregate economic activity. This is indeed the case - with real GDP rising by 0.72 per cent and real absorption rising by 0.66 per cent we find output of Trade rising by about the same amount: 0.68 per cent.

Employment in trade is projected to increase by 0.20 per cent above what it would otherwise have been. This is significantly less than the increase in the industry's output (0.68 per cent), reflecting the industry's long-run substitution away from labor and towards capital as the relative price of labor rises. Despite the increase in the price of labor, the output price of Trade is projected to fall by 0.24 per cent. Of those sectors that were not subject to a primary factor saving technical improvement, this is the largest fall in costs experienced by an industry. This reflects the relative importance in the industry's intermediate inputs of commodities that are sourced from those sectors (i.e. utilities, communications, finance, and transport) which are experiencing the primary factor saving technical improvement.

*4.2.3.6 Other Agriculture and Forestry (second largest industry sector)*

The Other Agriculture and Forestry (OAF) industry accounts for the second-highest share (11 per cent) of GDP at factor cost. Output of

OAF is projected to be 0.27 per cent higher than it would otherwise have been. The expansion in the size of this industry is due to a reasonably uniform increase in demand for its output across a number of users.

First, the industry sells approximately 51 per cent of its output to domestic firms as inputs to current production. Approximately 50 per cent of these sales are made to the Other Foods industry, which is itself expanding by approximately 0.23 per cent. Another 20 per cent of the industry's intermediate input sales are to itself.

Approximately 35 per cent of the industry's sales are to households for current consumption. Household demands for domestically sourced OAF are projected to increase by 0.28 per cent. This increase in demands is comprised of an expenditure effect (which lifts household demands for OAF from both sources by 0.38 per cent), a price-induced substitution away from OAF from all sources (which reduces household demands for OAF from both sources by 0.07 per cent), and a price-induced substitution away from domestically sourced OAF (which reduces household demands for domestic OAF by 0.03 per cent).

Another 8 per cent and 5 per cent of the industry's output are sold to capital creators and export markets respectively. With aggregate investment rising by 0.66 per cent we would expect investment sales of domestically sourced OAF to rise by only slightly less than this amount, since the import share in total usage of OAF for investment purposes is quite low (about 2 percent), thus limiting substitution possibilities. The industry's export sales are projected to increase by 0.34 per cent. This simply reflects this industry's treatment as a "low-volume" exporter in the model's export demand theory.

The basic price of the OAF commodity is projected to increase by 0.47 per cent. This price rise largely reflects the increasing costs of production in the OAF industry, which produces approximately 96 per cent of the nation's output of OAF. Production costs in the OAF industry are projected to increase by 0.45 per cent[6]. This is largely due to an increase in the price of the industry's primary factor inputs, which are projected to increase by 0.65 per cent. Primary factor inputs account for approximately 68 per cent of the industry's total production costs. Hence, on its own, the increase in the industry's

[6] Production costs in the other two main sectors that produce OAF (Coconut and Palay) rise by more than do production costs in the OAF industry. Production costs in Coconut and Palay are projected to rise by 0.66 and 0.49 per cent respectively. This explains why the increase in the basic price of the OAF commodity (0.47 per cent) is slightly higher than the increase in production costs in the OAF industry (0.45).

primary factor costs cause an increase in total costs of 0.44 per cent (0.68 x 0.65 = 0.44).

The increase in the industry's primary factor input costs are due to the increasing price of labor (up by 1.28 per cent), and the rise in the rental price on the industry's land (up by 1.20 per cent). Together, these two inputs account for 50 per cent of the industry's primary factor inputs, and explain approximately 0.63 percentage points (0.38 x 1.28 + 0.12 x 1.2 = 0.63) of the increase in average primary factor input prices experienced by the industry. With the relative prices of both labor and land rising sharply, the industry substitutes capital for labor in the long run (industry supplies of land are fixed). Hence, in the long run, the industry's capital stock is projected to increase by 0.58 per cent, while employment is projected to decline by 0.04 per cent.

*4.2.3.7 Government services (third largest industry sector)*

The Government Services industry accounts for the third-highest share (8 per cent) of GDP at factor cost. Output of Government Services is projected to be 0.66 per cent higher than it would have been in the absence of the productivity shocks. The Government Services industry sells effectively all of its output to government and faces no import competition. As discussed in Section 4.2.2, real government expenditure increases by 0.66 per cent. This translates directly to a 0.66 per cent increase in activity in the Government Services industry.

Approximately 96 per cent of the Government Services industry's primary factor input costs are accounted for by labor. Hence the increase in employment experienced by the industry (0.63 per cent) is commensurate with the increase in activity experienced by the industry (0.66 per cent). The increase in employment is slightly below that of the increase in activity because, with the price of labor rising relative to that of capital, the industry moves towards a slightly higher usage of capital inputs in the long run.

## 4.3 Long run macroeconomic effects of efficiency gains in Electricity

In Sections 4.3 and 4.4 we concentrate on the effects of a 5 per cent improvement in primary factor productivity in Electricity. In generating the results in Tables 3 and 4, we assume that the improvements in efficiency in Electricity are occurring against a background of simultaneous improvements in primary factor

efficiency in the remaining subject industries discussed in Section 4.2[7].

Table 3 contains the contributions made by efficiency gains in Electricity to a selection of key macroeconomic variables. At the macroeconomic level, the direction and relative values of the impacts of efficiency gains in Electricity are very similar to those reported in Section 4.2 with reference to the total effects of efficiency gains in all the subject industries. Hence, the explanation for the results in Table 3 follows closely the explanation of the results for the overall simulation in Section 4.2. The 5 per cent improvement in primary factor productivity in Electricity is projected to lift real GDP at market prices 0.14 per cent above what it would otherwise have been. This increase in long run real GDP can be traced to two factors. First, the primary factor productivity improvement in Electricity represents an improvement in the economy's overall endowment of effective primary factor inputs. Primary factor inputs in Electricity account for approximately 2.5 per cent of GDP at factor cost. Hence the improvement in primary factor productivity in Electricity on its own contributes approximately 0.13 per cent (0.025 x 5 = 0.13) to real GDP. Second, the simulation causes a small expansion in the economy-wide stock of capital. The share of aggregate capital rentals in GDP at factor cost is 63 per cent. Hence, with the economy's stock of capital projected to be higher by 0.018 per cent, real GDP is higher by 0.01 per cent (0.018 x 0.63 = 0.01). Again, the rise in the aggregate capital stock in this simulation arises from the shock to primary factor productivity in Electricity causing an expansion in the relative size of the more capital intensive sectors of the economy. As these sectors expand and absorb a higher share of the economy's exogenous endowment of labor, the economy-wide capital-labor ratio increases. With aggregate economic activity expanding with the economy-wide availability of labor exogenous, the real wage rises. The economy-wide real consumer wage is projected to increase by 0.32 per cent.

As discussed in Section 4.2, our assumption relating to the balance of trade / GDP ratio is equivalent to requiring that the percentage change in nominal domestic absorption be equal to the percentage change in nominal GDP. However the results for real GDP and real domestic absorption can diverge if the relative changes in the price deflators for these aggregates diverge. This explains why, while real GDP

[7] In a separate simulation (not reported upon in this report) a 5 per cent improvement in primary factor productivity in the Electricity industry was administered in the absence of improvements in primary factor productivity in the other subject industries. The results generated under this simulation were not materially different from those reported in Tables 3 and 4.

increases by 0.14 per cent, real absorption only increases by 0.13 per cent: the GDP deflator is falling faster than the implicit deflator for domestic absorption. While the former is projected to be 0.0230 per cent lower than it would otherwise have been, the latter is projected to be 0.0117 per cent lower than it would otherwise have been. As we found in Section N, the reason for this can be traced to a decline in the terms of trade. As productivity improvement in Electricity causes the Philippine economy to expand, so too does the volume of imports. Aggregate import volumes are projected to increase by 0.1329 per cent. With the balance of trade in deficit in the initial database, our long run assumption regarding the balance of trade / GDP ratio requires that the volume of exports expand at a faster rate than the volume of imports. This requires a decline in the terms of trade, which depresses the GDP deflator relative to the overall deflator for domestic absorption. The fall in the GDP price deflator is also reflected in our index for the real exchange rate, which records a real devaluation of 0.023 per cent.

Each of the elements of domestic absorption (household consumption, investment, and government consumption) are projected to increase by 0.13 per cent. This reflects our assumptions regarding the determination of real investment and real government consumption in the long run. As discussed in Section 4.1, the percentage changes in both aggregate real investment and aggregate real government consumption are assumed to move with the percentage change in real household consumption in the long run.

## 4.4 Sectoral effects of efficiency gains in Electricity

The sector that experiences the most pronounced effects from efficiency gains in Electricity is Electricity itself. Electricity prices are projected to decrease by approximately 2.67 per cent. Nearly all of this price fall can be traced to the direct effects of the improvement in the industry's primary factor productivity. Approximately 51 per cent of the costs of Electricity are primary factor inputs. Another 34 per cent of the industry's costs are intermediate inputs, and of these, 14 per cent are inputs of Electricity. Hence the initial effect of the improvement in primary factor productivity in this industry is to reduce Electricity costs and hence Electricity prices by approximately 2.68 per cent ( [0.52 / (1 - 0.34 x 0.14)] x -5.0 = -2.68).

The large fall in Electricity prices does not translate into a significant rise in Electricity output. This can be seen in Table 3.

**Table 3: Long run macro effects of efficiency gains in Electricity**

| | Description | Code | Change |
|---|---|---|---|
| 1 | Real GDP | x0gdpexp | 0.14 |
| 2 | Employment | employ_i | 0.00 |
| 3 | Aggregate capital stock | x1cap_i | 0.02 |
| 4 | Real household consumption | x3tot | 0.13 |
| 5 | Real investment | x2tot_i | 0.13 |
| 6 | Real government consumption | x5tot | 0.13 |
| 7 | Exports (volume) | x4tot | 0.17 |
| 8 | Imports (volume) | x0cif_c | 0.13 |
| 9 | Real wage | f1lab_io | 0.32 |
| 10 | Consumer price index | p3tot | -0.04 |
| 11 | GDP price index | p0gdpexp | -0.02 |
| 12 | Ordinary change in balance of trade / GDP | delB | 0.00 |
| 13 | Real devaluation | p0realdev | 0.02 |

The industry's output is projected to increase by only 0.26 per cent. The reason for this low overall price elasticity of demand for Electricity output is that a high proportion (approximately 84 per cent) of Electricity is sold as an intermediate input - and one which is not subject to any import competition. Hence, downstream users of Electricity only increase their intermediate input demands for Electricity by the same percentage amount as their own output increases. Since, for most downstream users, Electricity represents a small percentage of their total costs of production, the scope for price-induced increases in demand for Electricity as an intermediate input is limited. Ultimately, the expansion in intermediate input demands for Electricity (0.18 per cent) is only slightly faster than the rate of growth in real GDP. Total output of Electricity is still able to increase by 0.26 per cent however because households, who purchase approximately 15 per cent of Electricity output, are projected to increase their demand for the commodity by 0.72 per cent. Household demands for Electricity are relatively more price-responsive than intermediate demands, with the household own-price elasticity of demand for Electricity being approximately -0.24. The price faced by households for Electricity falls by -2.42 per cent. When combined with an expenditure elasticity for Electricity of 1.10, household demands for Electricity are projected to increase by 0.72 per cent (0.1267 x 1.10 + -0.24 x -2.42 = 0.72).

With the industry's output increasing by 0.26 per cent, so too must its usage of effective primary factor inputs. However primary factors are now 5 per cent more productive in the Electricity industry, hence the

industry can reduce its primary factor input (in units) by 4.74 per cent and still achieve the required increase (0.26 per cent) in effective primary factor inputs. If the prices faced by the industry for labor and capital had remained unchanged, then we would expect employment to fall by 4.74 per cent. However the nominal wage is projected to increase (by 0.28 per cent) while the rental price of capital is projected to be unchanged. Hence, while reducing inputs of both labor and capital, the Electricity industry also substitutes towards capital and away from labor. Hence the fall in employment in Electricity (-4.87 per cent) is slightly higher than the fall in the industry's usage of primary factor inputs in general.

The impact of the productivity improvement in Electricity on other industries is partly a reflection of the exposure of those industries to export markets, and partly a reflection of the importance of Electricity, labor, and agricultural products as inputs in their production costs. These impacts can be seen in Table 4 below.

## Table 4: Long run sectoral effects of efficiency gains in Electricity

| | | Price (p0com) | Output (x1tot) | Employment | Exports (x4) | Imports (x0imp) |
|---|---|---|---|---|---|---|
| 1 | Palay | 0.11 | 0.06 | -0.02 | 0.06 | 0.28 |
| 2 | Corn | 0.12 | 0.04 | -0.03 | 0.06 | 0.29 |
| 3 | Coconut | 0.17 | 0.04 | -0.02 | 0.06 | 0.00 |
| 4 | Sugarcane | 0.10 | 0.06 | 0.00 | 0.06 | 0.00 |
| 5 | Fishery | 0.04 | 0.01 | -0.09 | -0.16 | 0.16 |
| 6 | OthAgrForest | 0.08 | 0.06 | -0.01 | 0.06 | 0.25 |
| 7 | MiningEtc | 0.00 | 0.26 | 0.25 | 0.02 | 0.18 |
| 8 | CanVegFruit | 0.07 | -0.02 | -0.10 | -0.24 | 0.21 |
| 9 | CannedFish | 0.03 | 0.01 | -0.08 | -0.08 | 0.12 |
| 10 | CocoVegOils | 0.04 | -0.03 | -0.12 | -0.11 | 0.14 |
| 11 | DryCoconut | 0.07 | -0.21 | -0.28 | -0.24 | 0.00 |
| 12 | OtherFoods | -0.01 | 0.06 | -0.05 | 0.06 | 0.05 |
| 13 | Beverages | -0.07 | 0.14 | 0.03 | 0.06 | -0.05 |
| 14 | Tobacco | -0.02 | 0.12 | 0.01 | 0.06 | 0.10 |
| 15 | ClothesShoes | -0.03 | 0.24 | 0.14 | 0.31 | 0.03 |
| 16 | WoodProds | -0.01 | 0.12 | 0.04 | 0.07 | 0.13 |
| 17 | FurnitureEtc | -0.03 | 0.18 | 0.10 | 0.18 | 0.11 |
| 18 | PaperProd | -0.12 | 0.37 | 0.27 | 0.39 | 0.14 |
| 19 | Chemicals | -0.04 | 0.18 | 0.08 | 0.06 | 0.14 |
| 20 | PetrlCoalPrd | 0.00 | 0.17 | 0.06 | 0.06 | 0.18 |
| 21 | NonMtlMinPrd | -0.13 | 0.18 | 0.08 | 0.06 | -0.12 |
| 22 | BasicMetals | -0.15 | 0.74 | 0.63 | 0.78 | 0.18 |
| 23 | NonElecMchin | -0.02 | 0.14 | 0.06 | 0.14 | 0.13 |
| 24 | ElecMachin | -0.04 | 0.24 | 0.15 | 0.24 | 0.15 |
| 25 | MVP | 0.00 | 0.09 | 0.01 | 0.04 | 0.12 |
| 26 | Cycles | 0.00 | 0.13 | 0.04 | 0.06 | 0.15 |
| 27 | JewelryEtc | -0.11 | 0.49 | 0.42 | 0.56 | 0.06 |
| 28 | OtherManuf | -0.07 | 0.25 | 0.16 | 0.32 | 0.12 |
| 29 | Construction | 0.01 | 0.13 | 0.03 | 0.06 | 0.15 |
| 30 | Electricity | -2.67 | 0.26 | -4.87 | 0.06 | 0.00 |
| 31 | Water | -0.18 | 0.15 | 0.05 | 0.06 | 0.00 |
| 32 | LandTrans | 0.04 | 0.14 | 0.07 | 0.06 | 0.22 |
| 33 | AirTrans | 0.01 | 0.14 | 0.05 | 0.06 | 0.17 |
| 34 | Commnication | -0.01 | 0.15 | 0.03 | 0.06 | 0.13 |
| 35 | OthTranComms | 0.01 | 0.13 | 0.04 | 0.06 | 0.16 |
| 36 | Trade | -0.06 | 0.15 | 0.05 | 0.06 | 0.00 |
| 37 | Banks | -0.06 | 0.22 | 0.12 | 0.23 | 0.10 |
| 38 | NonBanks | -0.01 | 0.14 | 0.03 | 0.06 | 0.14 |
| 39 | Insurance | -0.01 | 0.16 | 0.06 | 0.06 | 0.15 |
| 40 | PrivRecSvce | -0.02 | 0.12 | 0.04 | 0.08 | 0.13 |
| 41 | OthServices | -0.02 | 0.16 | 0.08 | 0.06 | 0.15 |
| 42 | RealEstate | 0.00 | 0.17 | 0.04 | 0.06 | 0.17 |
| 43 | GovServices | 0.12 | 0.13 | 0.12 | 0.06 | 0.00 |

Those industry's which sell a significant proportion of their output to export markets; have relatively low usages of Electricity; have relatively high labor input shares; and use agricultural inputs (which are in turn using industry-specific fixed supplies of land as an input), are among the industries worst affected by productivity improvements in Electricity. Again, as we found with reference to the total effects of the productivity scenario (as discussed in Section 4.2.3), the worst affected sectors are the Dry Coconut and CVO sectors. These, and other sectors such as Canned Vegetables and Fruit, Fishery, and Canned Fish, sell relatively high proportions of their outputs to price-sensitive export markets while simultaneously facing rising costs caused by a combination of increasing wages and increasing intermediate input prices (as rental prices on land increase).

The majority of the "middle-ranked" (in terms of their output response) industries are projected to grow by between 0.04 per cent (Coconut) and 0.18 per cent (Non Metallic Mineral Products). The one feature that tends to distinguishes these middle-ranked industries from the fastest and slowest growing industries is the proportion of their output which they sell to foreign markets. There are 29 industries with growth rates between 0.04 and 0.18 per cent, and of these only 5 sell more than 15 per cent of their output to export markets. Hence the output of the middle-ranked industries tends to be far less responsive to changes in their cost conditions, relative to those industries which are projected to experience the largest contractions and expansions in activity.

The largest expansions in activity are typically experienced by those industries that sell a relatively high share of their output to export markets, while also making relatively high usage of Electricity and capital in their input structures. The fastest growing industries include Basic Metals, Jewellery, Paper Products, Electricity, Mining, Other Manufacturing, Clothes and Shoes, Electrical Machinery, and Banks. With the share of Electricity as an input being higher for these industries, and the share of labor as an input being relatively lower, these industries typically experience an overall fall in production costs despite the fact that wages are increasing. Since these industries typically also sell a relatively high share of their output to export markets, their overall output levels are relatively sensitive to changes in their cost conditions. An exception to this story is Mining. The price of Mining output is projected to be unchanged by the productivity improvement in Electricity, and yet its output is projected to expand by 0.26 per cent. This is largely a reflection of the fact that Mining sells approximately one quarter of its output to the Basic Metals industry, which is itself projected to expand by 0.74 per cent.

## 4.5 Regional Effects From Efficiency Gains

Table 5 reports impacts on real Gross Regional Product (GRP) for sixteen regions. Two sets of results are reported. The first (column 1) contains the total results for the impacts on GRPs from the complete set of productivity shocks to each of the subject industries. The second (column2) contains the results for the impacts on GRPs arising only from the direct and indirect effects of the improvement in primary factor productivity in the Philippines' electricity sector. Both sets of results are discussed below.

**Table 5 Real Gross Regional Product Impacts of Microeconomic Reform Simulations**

| Region | All shocks | Electricity only |
|---|---|---|
| 1 NCR | 1.15 | 0.17 |
| 2 CAR | 0.40 | 0.15 |
| 3 Ilocos | 0.54 | 0.12 |
| 4 Cagayan | 0.52 | 0.11 |
| 5 Cent Luzon | 0.47 | 0.12 |
| 6 South Luzon | 0.52 | 0.12 |
| 7 Bicol | 0.58 | 0.11 |
| 8 West Visayas | 0.48 | 0.12 |
| 9 Cent Visayas | 0.56 | 0.14 |
| 10 East Visayas | 0.52 | 0.13 |
| 11 West Mindanao | 0.33 | 0.09 |
| 12 North Mindanao | 0.47 | 0.14 |
| 13 South Mindanao | 0.47 | 0.13 |
| 14 Cent Mindanao | 0.42 | 0.12 |
| 15 ARMM | 0.38 | 0.08 |
| 16 Caraga | 0.44 | 0.11 |

Turning first to the results in column 1, the most obvious feature of these results is that the projected expansion in output for only one region (NCR, at 1.15 per cent) is higher than the projected expansion in national output (at 0.72 per cent). Not only are all other regions projected to expand by less than the projected increase in national output, but the results for these regions are grouped within a relatively narrow range (0.33 - 0.58 per cent). The two most important factors contributing to this result are both the rapid growth in the output of the Banks industry (6.95 per cent) and the concentration of the national activity of this sector in the NCR region (Banks accounts for 6 per cent of NCR output, while accounting for only 2 per cent of national output). The concentration of this fast growing industry in

this region causes the expansion in the total real output of NCR to exceed that of the nation as a whole by just over 0.2 percentage points. At the same time, the relatively low proportions of the total output of all other regions accounted for by the Banks industry causes the growth in the output of these regions to fall below that of the nation as a whole by between -0.08 (South Luzon) and -0.15 (ARMM) percentage points. In a similar way, the expansion of the Insurance industry also contributes to the relative expansion of the NCR sector. With a projected expansion of 2.08 per cent economy-wide, the Insurance sector - like Banks - is among the industries projected to expand the most from the productivity shocks. The Insurance industry accounts for approximately 3 per cent of NCR's GRP, while accounting for only about 1 per cent of national GDP. The concentration of this fast growing sector in this region causes NCR's real GRP to expand by approximately 0.03 percentage points more than national real GDP.

The expansion of the output of NCR is also facilitated by the region having a relatively low proportion of its total activity accounted for by industries which experience either low or negative output changes from the productivity shocks. In particular, the Fishery industry (the national output of which contracts by -0.02 per cent) and the Other Agriculture and Forestry industry (the national output of which expands by only 0.27 per cent) are essentially not represented at all in the NCR region. The absence of these industries in this region allows the increase in the real GRP of this region to exceed the national average by approximately 0.08 percentage points. At the same time, the relative importance of these slow-growing industries in a number of other regions contributes to their relatively slow growth in real GRP relative to the growth in national GDP. For example, the Other Agriculture and Forestry industry accounts for relatively high proportions of the GRPs of Ilocos, Cagayan, and ARMM. The concentration of this slow growing industry in these regions causes the increases in the real GRPs of these regions to fall below that of the nation as a whole by 0.11, 0.08 and 0.08 percentage points respectively. The Fishing industry (the national activity of which contracts by 0.02 per cent) is relatively important in South Luzon, West Visayas, and West Mindanao, where it accounts for 7 per cent, 10 per cent, and 25 per cent of GRP respectively. The concentration of this slow growing industry in these regions causes the increase in the real GRP of these regions to fall below the increase in national GDP by 0.03, 0.05 and 0.16 percentage points respectively.

The results in the second column (relating to the impact of the Electricity productivity shock alone) of Table 5 are largely explicable through reference to the shares in regional economic activity of the

first seven industries listed in Table 4. The output of each of these industries, other than Mining, is projected to be relatively unaffected by the productivity improvement in Electricity. This can be seen in Table 6.

**Table 6 Regional effects of the efficiency improvement in *Electricity***

| Region | Change in Regional GDP regx1prim (in percent) | Industry shares in Regional Output (in percent) | | |
|---|---|---|---|---|
| | | Top 10[1] | Bottom 7[2] | Top 21[3] |
| NCR | 0.18 | 18.78 | 1.09 | 64.64 |
| Western Visayas | 0.15 | 12.45 | 15.07 | 60.41 |
| Central Visayas | 0.15 | 25.41 | 22.53 | 50 |
| Caraga | 0.14 | 13.51 | 25.71 | 49.97 |
| Northern Mindanao | 0.13 | 11.32 | 30.6 | 39.57 |
| Eastern Visayas | 0.13 | 14.31 | 24.01 | 51.63 |
| Central Mindanao | 0.13 | 11.07 | 32.09 | 47.76 |
| Ilocos | 0.13 | 11.53 | 30.46 | 45.43 |
| Cagayan | 0.13 | 10.77 | 34.07 | 45.44 |
| CAR | 0.12 | 13.07 | 36.77 | 38.19 |
| Central Luzon | 0.12 | 7.51 | 35.11 | 40.8 |
| ARMM | 0.12 | 10.82 | 40.84 | 36.75 |
| Bicol | 0.11 | 4.66 | 47.29 | 33.32 |
| Southern Luzon | 0.11 | 3.79 | 51.7 | 28.12 |
| Southern Mindanao | 0.08 | 5.85 | 53.22 | 28.01 |
| Western Mindanao | 0.07 | 3.18 | 63.87 | 18.32 |

Notes:

1. "Top 10" refers to the 10 industries which experienced the highest increase in output as a result of the productivity improvement (see Table 5).
2. "Bottom 7" refers to the 7 industries which experienced a contraction in output as a result of the productivity improvement (See Table 5).
3. "Top 21" refers to the 21 industries (out of 43 industries) which experienced the highest increase in output as a result of the productivity improvement.

Regions that have a relatively low (high) share of their total economic activity accounted for by the first seven industries listed in Table 4 will tend to grow faster (more slowly) than the nation as a whole. For example, the most important factor contributing to NCR's expansion relative to the nation is the almost complete absence of either the Fishing or Other Agriculture and Forestry industries in this region. On the other hand the CAR region has approximately 19 per cent of

its GRP at factor cost represented by the activity of the Other Agriculture and Forestry industry. On its own this makes it harder for this region to grow as fast as the nation as a whole in this simulation, because Other Agriculture and Forestry output is projected to expand by only 0.06 per cent. However this is offset by the region having a relatively high share (11 per cent) of Mining in total real GRP. Mining is projected to be a relatively fast growing industry (0.26 per cent increase in output) in the face of productivity growth in electricity.

The relatively lower growth in the real GRPs of the 10 slowest growing regions (i.e., those industries projected to expand by 0.12 per cent or less) is largely due to the relative importance of six of the slowest growing industries (Palay, Corn, Coconut, Sugarcane, Fishery, Other Agriculture and Forestry) to these economies. While together the value added of these industries accounts for 20 per cent of national GDP at factor cost, a higher proportion of the GRPs of the relatively slow growing regions is attributable to the activity of these industries. For example, 64 per cent, 53 per cent, and 52 per cent respectively of the GRPs of the three slowest growing regions (ARMM, West Mindanao, and Cagayan) is attributable to these six industries. The three next slowest growing regions (Bicol, Caraga, and Ilocos) also have relatively high shares (35 per cent, 40 per cent, and 47 per cent respectively) of their GRP in the aforementioned six industries. With a relatively high proportion of their aggregate activity accounted for by six industries that are not projected to be much affected by the electricity productivity shock, the projected growth in the total output of these regions must necessarily be below that projected for the nation as a whole.

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## Appendix 1: Standard Aggregation

Table A1: Aggregation of 229 Input-output sectors to 49 TARFCOM sectors

| No. | IO Sector | Code | | Aggregated Sector |
|---|---|---|---|---|
| 1 | Palay | Palay | 1 | Palay |
| 2 | Corn | Corn | 2 | Corn |
| 3 | Vegetables | Vegetables | 6 | OthAgrForest |
| 4 | Roots and tubers | RootsTubers | 6 | OthAgrForest |
| 5 | Banana | Banana | 6 | OthAgrForest |
| 6 | Pineapple | Pineapple | 6 | OthAgrForest |
| 7 | Mango | Mango | 6 | OthAgrForest |
| 8 | Citrus fruits | CitrusFruits | 6 | OthAgrForest |
| 9 | Fruits and nuts exc. coconut | FruitsNuts | 6 | OthAgrForest |
| 10 | Coconut | Coconut | 3 | Coconut |
| 11 | Sugarcane | Sugarcane | 4 | Sugarcane |
| 12 | Tobacco | Tobacco | 6 | OthAgrForest |
| 13 | Abaca | Abaca | 6 | OthAgrForest |
| 14 | Other fiber crops | OthFiberCrop | 6 | OthAgrForest |
| 15 | Coffee | Coffee | 6 | OthAgrForest |
| 16 | Cacao | Cacao | 6 | OthAgrForest |
| 17 | Rubber | Rubber | 6 | OthAgrForest |
| 18 | Other agricultural production, n.e.c. | OthAgricProd | 6 | OthAgrForest |
| 19 | Hog | Hogs | 6 | OthAgrForest |
| 20 | Cattle and other livestock | CattleOthLve | 6 | OthAgrForest |
| 21 | Chicken | Chicken | 6 | OthAgrForest |
| 22 | Hen's egg | HensEggs | 6 | OthAgrForest |
| 23 | Other poultry and poultry products | OthPoultry | 6 | OthAgrForest |
| 24 | Agricultural services | AgricSrvices | 6 | OthAgrForest |
| 25 | Ocean,coastal and inland fishing | Fishing | 5 | Fishery |
| 26 | Aquaculture and other fishery activities | Aquaculture | 5 | Fishery |
| 27 | Forestry | Forestry | 6 | OthAgrForest |
| 28 | Gold and silver mining | GoldSilvrMin | 7 | MiningEtc |
| 29 | Copper mining | CopperMin | 7 | MiningEtc |
| 30 | Nickel mining | NickelMin | 7 | MiningEtc |
| 31 | Chromite mining | ChromiteMin | 7 | MiningEtc |
| 32 | Other metal mining | OthMetalMin | 7 | MiningEtc |
| 33 | Coal mining | CoalMining | 7 | MiningEtc |
| 34 | Crude petroleum and natural gas | CrdPetNatGas | 7 | MiningEtc |
| 35 | Stone quarrying, clay and sandpits | StoneClayMin | 7 | MiningEtc |
| 36 | Salt mining | SaltMining | 7 | MiningEtc |
| 37 | Other non-metallic mining and quarrying | OthNonMtlMin | 7 | MiningEtc |
| 38 | Slaughtering & meat packing | Slaughtering | 12 | OtherFoods |
| 39 | Meat & meat products processing | MeatProcssng | 12 | OtherFoods |
| 40 | Milk processing | MilkProcssng | 12 | OtherFoods |

Table A1 (continued): Aggregation of 229 Input-output sectors to 49 TARFCOM sectors

| No. | IO Sector | Code | | Aggregated Sector |
|---|---|---|---|---|
| 41 | Butter and cheese manufacturing | ButterCheese | 12 | OtherFoods |
| 42 | Ice cream, sherberts & other flavored ices | IceCream | 12 | OtherFoods |
| 43 | Other dairy products | OthDairyProd | 12 | OtherFoods |
| 44 | Canning & preserving of fruits and vegetables | CanVegFruit | 8 | CanVegFruit |
| 45 | Fish canning | CannedFish | 9 | CannedFish |
| 46 | Fish drying, smoking & mfg of other seafood products | DryFshOthSea | 12 | OtherFoods |
| 47 | Prod'n of crude coconut oil,copra cake and meal | CocoOilCopra | 12 | OtherFoods |
| 48 | Other crude vegetable oil exc coconut oil, fish and other marine oils | CrudeVegOil | 12 | OtherFoods |
| 49 | Manufacture of refined coconut and vegetable oil | EdblOilRefin | 10 | CocoVegOils |
| 50 | Rice and corn milling | RiceCornMill | 12 | OtherFoods |
| 51 | Flour, cassava & other grains milling | FlourOthGrns | 12 | OtherFoods |
| 52 | Mfr of bakery prods exc noodles | BakeryProds | 12 | OtherFoods |
| 53 | Noodles mfg | Noodles | 12 | OtherFoods |
| 54 | Sugar milling and refining | SugarMill | 12 | OtherFoods |
| 55 | Mfr of cocoa, chocolate and sugar confectionery | CocoaChocCnf | 12 | OtherFoods |
| 56 | Mfr of desiccated coconut | DryCoconut | 11 | DryCoconut |
| 57 | Mfr of ice exc dry ice | IceExcDryIce | 12 | OtherFoods |
| 58 | Coffee roasting and processing | CoffeeProc | 12 | OtherFoods |
| 59 | Mfr of animal feeds | AnimalFeeds | 12 | OtherFoods |
| 60 | Mfr of starch & starch prods | StarchProds | 12 | OtherFoods |
| 61 | Mfr of flavoring extracts, mayonnaise and food coloring products | FlavorColors | 12 | OtherFoods |
| 62 | Miscellaneous food products | MiscFoodProd | 12 | OtherFoods |
| 63 | Alcoholic liquors and wine | WineSpirits | 13 | Beverages |
| 64 | Malt and malt liquors | BeerMalt | 13 | Beverages |
| 65 | Softdrinks & carbonated water | SoftDrinks | 13 | Beverages |
| 66 | Cigarette mfg | Cigarettes | 14 | Tobacco |
| 67 | Cigar, chewing & smoking tobacco | CigarsTbacco | 14 | Tobacco |
| 68 | Tobacco leaf flue-curing and redrying | TobaccoLeaf | 14 | Tobacco |
| 69 | Textile, spinning, weaving, texturizing and finishing | SpinWeaveFin | 28 | OtherManuf |
| 70 | Fabric knitting mills | KnittedFabrc | 28 | OtherManuf |
| 71 | Hosiery, underwear & outerwear knitting | KnittedGrmnt | 28 | OtherManuf |
| 72 | Mfr of made-up textile goods exc. wearing apparel | TexNonGrmnt | 28 | OtherManuf |
| 73 | Mfr of carpets and rugs | CarpetsRugs | 28 | OtherManuf |
| 74 | Cordage, rope, twine and net mfg | CordsRopeNet | 28 | OtherManuf |
| 75 | Mfr of articles made of native materials | NativeProds | 28 | OtherManuf |
| 76 | Mfr of artificial leather and impregnated & coated fabrics | FakeLeather | 28 | OtherManuf |
| 77 | Mfr of fiber batting, padding, upholstery fillings incl. coir,linoleum | PaddingCoir | 28 | OtherManuf |
| 78 | Custom tailoring & dressmaking shops | Tailoring | 15 | ClothesShoes |
| 79 | Mfr of ready-made clothing | RdyMdClothng | 15 | ClothesShoes |
| 80 | Embroidery establishments | Embroidery | 15 | ClothesShoes |

Table A1 (continued): Aggregation of 229 Input-output sectors to 49 TARFCOM sectors

| No. | IO Sector | Code | | Aggregated Sector |
|---|---|---|---|---|
| 81 | Mfr of other wearing apparel exc footwear | OthClothing | 15 | ClothesShoes |
| 82 | Tanneries and leather finishing | TanLeather | 28 | OtherManuf |
| 83 | Mfr of prods of leather and leather substitutes, exc footwear and wear | LeatherProds | 28 | OtherManuf |
| 84 | Mfr of leather footwear & footwear parts | LeatherShoes | 15 | ClothesShoes |
| 85 | Sawmills and planing mills | Sawmills | 16 | WoodProds |
| 86 | Mfr of veneer and plywood | VeneerPlywd | 16 | WoodProds |
| 87 | Mfr of hardboard and particle board | ParticlBoard | 16 | WoodProds |
| 88 | Wood drying and preserving plants | WoodDrying | 16 | WoodProds |
| 89 | Millwork plants | WoodMillwork | 16 | WoodProds |
| 90 | Wooden and cane containers and small cane wares | WoodenWare | 16 | WoodProds |
| 91 | Mfr of wood carvings | WoodCarvings | 16 | WoodProds |
| 92 | Mfr of misc wood, cork & cane prods. | MiscWoodProd | 16 | WoodProds |
| 93 | Mfr and repair of wooden furniture incl upholstery | WoodFrniture | 17 | FurnitureEtc |
| 94 | Mfr and repair of rattan furniture incl upholstery | CaneFrniture | 17 | FurnitureEtc |
| 95 | Mfr and repair of other furnitures and fixtures, n.e.c. | OthrFrniture | 17 | FurnitureEtc |
| 96 | Pulp, paper and paperboard | PulpPaperBrd | 18 | PaperProd |
| 97 | Paper and paperboard containers | PaperContnrs | 18 | PaperProd |
| 98 | Mfr of articles of paper and paperboard | PaperArticle | 18 | PaperProd |
| 99 | Newspapers and periodicals | Newspapers | 28 | OtherManuf |
| 100 | Printing and publishing of books and pamphlets | Books | 28 | OtherManuf |
| 101 | Commercial & job printing & other allied industries | JobPrinting | 28 | OtherManuf |
| 102 | Mfr of basic ind'l chemicals | BasicChemicl | 19 | Chemicals |
| 103 | Mfr of fertilizer | Fertilizer | 19 | Chemicals |
| 104 | Synthetic resins , plastic materials & other man-made fibers e | SynthResins | 19 | Chemicals |
| 105 | Mfr of pesticides, insecticides,etc | Pesticides | 19 | Chemicals |
| 106 | Mfr. of paints, varnish & lacquers | Paints | 19 | Chemicals |
| 107 | Mfr of drugs and medicines | DrugMedicine | 19 | Chemicals |
| 108 | Mfr of soap and detergents | SoapDetergnt | 19 | Chemicals |
| 109 | Mfr of perfumes, cosmetics & other toilet preparations | Cosmetics | 19 | Chemicals |
| 110 | Mfr of misc chemical products | MiscChemPrd | 19 | Chemicals |
| 111 | Petroleum refineries | PetrolRefnry | 20 | PetrlCoalPrd |
| 112 | Mfr of asphalt, lubricants and misc prods of petroleum and coal | TarsLubesEtc | 20 | PetrlCoalPrd |
| 113 | Rubber tire & tube mfg | RubberTires | 28 | OtherManuf |
| 114 | Mfr of rubber footwear | RubberFootwr | 28 | OtherManuf |
| 115 | Mfr of other rubber products, n.e.c | OthRubberPrd | 28 | OtherManuf |
| 116 | Mfr of plastic furniture,plastic footwear & other fabricated plastic p | PlasFtwrFurn | 28 | OtherManuf |
| 117 | Manufacture of pottery,china & earthenware | PotteryChina | 21 | NonMtlMinPrd |
| 118 | Mfr of flat glass | FlatGlass | 21 | NonMtlMinPrd |
| 119 | Mfr of glass container | GlassContnrs | 21 | NonMtlMinPrd |
| 120 | Mfr of other glass and glass products | OthGlassProd | 21 | NonMtlMinPrd |

Table A1 (continued): Aggregation of 229 Input-output sectors to 49 TARFCOM sectors

| No. | IO Sector | Code | | Aggregated Sector |
|---|---|---|---|---|
| 121 | Cement mfr | Cementmfr | 21 | NonMtlMinPrd |
| 122 | Mfr of structural clay products | StrucClayPrd | 21 | NonMtlMinPrd |
| 123 | Mfr of structural concrete prods | StrucConcPrd | 21 | NonMtlMinPrd |
| 124 | Mfr of other non-metallic mineral prods,n.e.c. | OthNMtlMinPr | 21 | NonMtlMinPrd |
| 125 | Blast furnace, steel works and rolling mills | IronSmelting | 22 | BasicMetals |
| 126 | Iron and steel foundries | IronFoundry | 22 | BasicMetals |
| 127 | Non-ferrous smelting & refining plants, rolling,drawing and extrusion | NFerSmelting | 22 | BasicMetals |
| 128 | Non-ferrous foundries | NFerFoundry | 22 | BasicMetals |
| 129 | Cutlery, handtools, general hardware | CutleryTools | 28 | OtherManuf |
| 130 | Structural metal prods | StrucMetlPrd | 28 | OtherManuf |
| 131 | Mfr of metal containers | MetalContnrs | 28 | OtherManuf |
| 132 | Metal stamping, coating, engraving mills | MetalStampng | 28 | OtherManuf |
| 133 | Mfr of wire nails | WireNails | 28 | OtherManuf |
| 134 | Mfr of other fabricated wire & cable prods exc insulated wire & cable | NIWireProds | 28 | OtherManuf |
| 135 | Mfr of non-electric lighting and heating fixtures | NElcLiteHeat | 28 | OtherManuf |
| 136 | Fabricated metal prods exc machinery & equipment | FabMetalPrds | 28 | OtherManuf |
| 137 | Mfr of agricultural machinery and equipment | AgricMachine | 23 | NonElecMchin |
| 138 | Mfr of metal and wood-working machinery | MtalWoodMchn | 23 | NonElecMchin |
| 139 | Engines and turbines exc. for transport eq. & special ind. mach' | NTrnsEngines | 23 | NonElecMchin |
| 140 | Mfr, assembly & repair of office, computing and acctg machines | OfficeMchnes | 23 | NonElecMchin |
| 141 | Pumps, compressors, blowers and airconditioners | PumpsBlowers | 23 | NonElecMchin |
| 142 | Machine shops & mfr of non-electrical mach'y and eq. n.e.c. | OthNElMchnry | 23 | NonElecMchin |
| 143 | Mfr of electrical ind'l mach'y and apparatus | ElecMachinry | 24 | ElecMachin |
| 144 | Radio and TV receiving sets, sound recording & reproducing eq. | RadioTVsCDs | 24 | ElecMachin |
| 145 | Mfr of communication and detection equipment | CommsEquipmt | 24 | ElecMachin |
| 146 | Radio, TV & communication parts (semi-conductors) | ElctrncParts | 24 | ElecMachin |
| 147 | Mfr of appliances and housewares | HshldApplncs | 24 | ElecMachin |
| 148 | Primary cells and batteries and electric accumulators | Batteries | 24 | ElecMachin |
| 149 | Insulated wires and cables | InslatedWire | 24 | ElecMachin |
| 150 | Current-carrying wiring devices, conduits & fittings | WiredDevices | 24 | ElecMachin |
| 151 | Lamps, fluorescent tubes and other electrical apparatus | ElecLampsEtc | 24 | ElecMachin |
| 152 | Shipyards and boatyards | ShipsBoats | 28 | OtherManuf |
| 153 | Mfr and assembly of motor vehicles | MotorVhicles | 25 | MVP |
| 154 | Rebuilding & major alteration of motor vehicles | RebuildMV | 28 | OtherManuf |
| 155 | Mfr of motor vehicles parts and accessories | MVPartsAcces | 25 | MVP |
| 156 | Mfr, assembly of motorcycles & bicycles | Cycles | 26 | Cycles |
| 157 | Mfr, assembly, & rebuilding of railroad equipment, | TrainsPlanes | 28 | OtherManuf |
| 158 | Professional, scientific measuring a & controlling eq | ScientifEqip | 28 | OtherManuf |
| 159 | Mfr of photographic and optical instruments | PhotoOptInst | 28 | OtherManuf |
| 160 | Watches and clocks | ClockWatches | 28 | OtherManuf |

Table A1 (continued): Aggregation of 229 Input-output sectors to 49 TARFCOM sectors

| No. | IO Sector | Code | | Aggregated Sector |
|---|---|---|---|---|
| 161 | Mfr & repair of furniture & fixtures, made primarily of metal | MtlFurniture | 28 | OtherManuf |
| 162 | Mfr of jewelry & related articles | Jewelry | 27 | JewelryEtc |
| 163 | Mfr of musical instruments | MusiclInstrm | 28 | OtherManuf |
| 164 | Mfr of sporting and athletic goods | SportingProd | 28 | OtherManuf |
| 165 | Mfr of surgical,dental,medical and orthopedic supplies | MedicalSpply | 28 | OtherManuf |
| 166 | Mfr of opthalmic goods | Spectacles | 28 | OtherManuf |
| 167 | Mfr of toys and dolls exc. rubber and plastic toys | NonPlasToys | 27 | JewelryEtc |
| 168 | Mfr of stationers', artists' and office supplies | OfficeSupply | 28 | OtherManuf |
| 169 | Miscellaneous mfg | MiscManufact | 28 | OtherManuf |
| 170 | Construction | Construction | 29 | Construction |
| 171 | Electricity | Electricity | 30 | Electricity |
| 172 | Steam | Steam | 30 | Electricity |
| 173 | Water | Water | 31 | Water |
| 174 | Wholesale & retail trade | WholslRtlTrd | 36 | Trade |
| 175 | Railway transport services | RailTransprt | 32 | LandTrans |
| 176 | Busline operators | BusTransport | 32 | LandTrans |
| 177 | Public utility cars and taxicab operation | Taxis | 32 | LandTrans |
| 178 | Jeepney and autocalesa operation, trycycle and other road transport op | JeepneyEtc | 32 | LandTrans |
| 179 | Operation of tourist bus and cars and rent-a-car services | TourBusCars | 32 | LandTrans |
| 180 | Road freight transport & supporting services to land transport | RoadFreight | 32 | LandTrans |
| 181 | Ocean passenger and freight transport | OceanTranspt | 35 | OthTranComms |
| 182 | Interisland shipping including inland water | IslandShips | 35 | OthTranComms |
| 183 | Stevedoring, supporting services to water transport | Stevedoring | 35 | OthTranComms |
| 184 | Air transport | AirTransport | 33 | AirTrans |
| 185 | Tour and travel agencies | TravelAgency | 35 | OthTranComms |
| 186 | Customs brokers and other services allied to transport | CustomsBrokr | 35 | OthTranComms |
| 187 | Storage & warehousing | Storage | 35 | OthTranComms |
| 188 | Telephone | Telephone | 34 | Commnication |
| 189 | Telegraph service | Telegraph | 34 | Commnication |
| 190 | Postal,Messengerial and other comm services, n.e.c. | PostalEtc | 34 | Commnication |
| 191 | Banking | Banking | 37 | Banks |
| 192 | Investment, financing & other non-banking services | NBnkFinSrvcs | 38 | NonBanks |
| 193 | Pawnshops | Pawnshops | 38 | NonBanks |
| 194 | Life insurance | LifeInsurnce | 39 | Insurance |
| 195 | Non-life and other insurance activities | OthInsurance | 39 | Insurance |
| 196 | Real estate development | RealEstDevel | 42 | RealEstate |
| 197 | Letting and operating real estate | RealEstLease | 42 | RealEstate |
| 198 | Ownership of dwellings | OwnDwellings | 42 | RealEstate |
| 199 | Legal services | LegalSrvices | 41 | OthServices |
| 200 | Bookkeeping, acctg., and auditing services | Bookkeeping | 41 | OthServices |

Table A1 (continued): Aggregation of 229 Input-output sectors to 49 TARFCOM sectors

| No. | IO Sector | Code | | Aggregated Sector |
|---|---|---|---|---|
| 201 | Engineering,architectural & technical services | ArchEngSrvcs | 41 | OthServices |
| 202 | Advertising services | Advertising | 41 | OthServices |
| 203 | Machinery and equipment renting and leasing | EquipLeasing | 41 | OthServices |
| 204 | Employment/recruitment agencies | JobAgencies | 41 | OthServices |
| 205 | Business mgt & consultancy and market research services | BusRsrchSrvc | 41 | OthServices |
| 206 | Detective & protective services | SecuritySrvc | 41 | OthServices |
| 207 | Other business services, n.e.c. | OthBusSrvces | 41 | OthServices |
| 208 | Sanitary and similar services | SanitarySrvc | 41 | OthServices |
| 209 | Private education services | PrvEducation | 41 | OthServices |
| 210 | Private hospitals, sanitaria & similar institutions | PrivHospital | 41 | OthServices |
| 211 | Private medical,dental,veterinary & other health clinics and laborator | PrivClinics | 41 | OthServices |
| 212 | Other social and related community services | OthSocialSvc | 41 | OthServices |
| 213 | Motion picture production | FilmMaking | 40 | PrivRecSvce |
| 214 | Motion picture distribution and projection | FilmShowing | 40 | PrivRecSvce |
| 215 | Radio and TV programming | RadioTVprogs | 40 | PrivRecSvce |
| 216 | Theatrical production and entertainment | Theatrical | 40 | PrivRecSvce |
| 217 | Other recreational and cultural services | OthRecSrvces | 40 | PrivRecSvce |
| 218 | Repair shops for motor vehicles | MVRepairs | 41 | OthServices |
| 219 | Other repair shops, n.e.c. | OthRepairs | 41 | OthServices |
| 220 | Laundry, dry cleaning and dyeing plants | LaundryDryCl | 41 | OthServices |
| 221 | Barber and beauty shops | HairBeauty | 41 | OthServices |
| 222 | Photographic studios including commercial photography and related serv | Photographer | 41 | OthServices |
| 223 | Other personal services, n.e.c. | OthPersSrvce | 41 | OthServices |
| 224 | Restaurants, cafes & other eating and drinking places | Restaurants | 41 | OthServices |
| 225 | Hotels and motels | HotelsMotels | 41 | OthServices |
| 226 | Other lodging places | OthLodgings | 41 | OthServices |
| 227 | Public education services | PublicEducat | 43 | GovServices |
| 228 | Public health services | PublicHealth | 43 | GovServices |
| 229 | Public administration and defense | PublicAdmin | 43 | GovServices |

## Appendix 2: 1995 Estimates of Direct Effect of Competition Policy Reforms in Australia (adapted from Madden 1995)

| Reform | Estimate of Direct Effect |
|---|---|
| Government Business Enterprises (Utilities) | |
| Interstate electricity grid, free trade in bulk electricity and competitive sourcing of generation capacity. | Improvement in labor and capital productivity sufficient to move all states to best practice. Labor productivity improvement of 50 per cent and capital productivity improvement of 4 per cent. Replacement cost of new electricity generating capacity falls by 20 per cent. |
| Competitive pressures move utilities to best practice in urban water. | Improvements in labor and capital productivity in the water component of utilities by 15 and 6.7 per cent respectively. |
| Building | |
| Removal of unnecessary building regulations. | Improvement in factor and materials productivity of construction in of 0.9 per cent. |
| Removal of unnecessary approval delays. | Improvement in factor productivity in construction by 3 per cent. |
| Transport and Communication | |
| Corporatization and move to best practice in rail. | Improve factor productivity by 25 per cent in rail. |
| End legislated duopoly in telecommunications. | Improve labor productivity by 45 per cent and capital productivity by 22 per cent in telecommunications. |
| Remove Australia Post's monopoly in letter delivery. | Improve labor productivity in postal services by 12.2 per cent. |
| Commercial return on Commonwealth non-regulatory services to aviation. | A 14 per cent productivity improvement in services to aviation transport. |
| Adopt uniform vehicle regulations. | An improvement in factor productivity in road freight transport by 1.5 per cent. |
| Corporatize port authorities, separate regulatory and commercial port activities and contract out berthing and other port facilities. | An 8 per cent factor productivity improvement in services to water transport. |
| The Professions | |
| Remove restrictions on employment of dental auxiliaries. | Reduce labor costs in dentistry industry by 4.35 per cent. |
| Remove monopoly in conveyancing, restrictions on barrister contact with clients and advertising restrictions on barristers. | Improve factor productivity in legal services by 12 per cent. |
| Remove restrictions on consulting services for optical dispensers and allowing one-stop-shopping in optometry and optical dispensing | Reduce operating costs in eye health industry by 10 per cent and replacement cost of capital in industry by 20 per cent. |