



WORKING PAPER 02.01

IMPACTS OF TRADE POLICY REFORM ON INCOME DISTRIBUTION AND POVERTY IN INDONESIA

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A joint research project on

**Linkages Between Indonesia's Agricultural Production, Trade and the Environment
funded by the Australian Centre for International Agricultural Research,**

between

CASER (Bogor) • CIES (Adelaide) • CSIS (Jakarta) • RSPAS (ANU, Canberra)

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**CASER/CSIS/CIES/ANU
joint research project on**



**Policy analysis of linkages
between Indonesia's agricultural
production, trade and
environment**

Rapid economic growth in Indonesia has been accompanied by significant structural changes, including for its agricultural sector and its unique natural environment. Recently questions have been raised about the impact of Indonesia's agricultural, industrial, trade and environmental policies on sustainable rural development. The nature of interactions between the economic activities of different sectors and the environment are such that an intersectoral, system-wide perspective is essential for assessing them. An international perspective also is needed to assess the impact on Indonesia of major shocks abroad, such as the implementation of the Uruguay Round agreements, APEC initiatives, or reforms in former centrally planned economies. There is increasing pressure on supporters of liberal trade to demonstrate that trade reforms at home or abroad affecting countries such as Indonesia will not add to global environmental problems (e.g., deforestation, reduced biodiversity). Again, this requires system-wide quantitative models of the economy and ecology, because typically there are both positive and negative effects at work, so the sign of the net effects ultimately has to be determined empirically.

To begin to address these issues, the Australian Centre for International Agricultural Research (ACIAR) has generously provided funds for a collaborative 3-year project (to mid-1999) involving the University of Adelaide's Centre for International Economic Studies (CIES) as the lead institution, Bogor's Centre for Agro-Socioeconomic Research (CASER) which is affiliated with the Ministry of Agriculture, Jakarta's independent Centre for Strategic and International Studies (CSIS), and the Economics Division of the Research School of Pacific and Asian Studies (RSPAS) at the Australian National University in Canberra. Being based on Indonesia with its rich diversity of environmental resources (and on which there are relatively good data) and its rapid economic growth, the project could also serve as a prototype for similar studies of other developing countries in Southeast Asia and elsewhere.

The key objective of the project is to assess the production, consumption, trade, income distributional, regional, environmental, and welfare effects of structural and policy changes at home and abroad particularly as they will or could affect Indonesia's agricultural sector over the next 5-10 years. Among other things, the analysis will focus both on the effects of economic changes on the environment, and on the impacts on Indonesia's agricultural production and trade of resource and environmental policy changes. The implications of regional and multilateral trade liberalization initiatives and Indonesia's ongoing unilateral trade reforms will be analysed, along with other potential domestic policy changes and significant external shocks such as the entry of China and Taiwan into the World Trade Organization. The analysis will draw on and adapt computable general equilibrium (CGE) models such as the national INDOGEM Model (built as part of an earlier ACIAR project) and the global GTAP Model.

The project is being undertaken in close collaboration with the Indonesian Ministry of Agriculture and ministries involved in trade, planning, and the environment. A Research Advisory Committee has been established to encourage close collaboration of representatives from those and other ministries.

ACIAR INDONESIA RESEARCH PROJECT

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**IMPACT OF TRADE POLICY REFORM ON
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Globally, markets have become much more integrated in recent years. Such integration creates enormous opportunities for the world economy, bringing vast benefits for some, but losses, and maybe even suffering, for others. The tendency among trade economists for much of the last fifty years has been to argue that trade is Pareto improving, increasing the national income of all countries engaging in trade and eventually boosting all households when there has been sufficient time for re-structuring and adjustment to the changing circumstances. However, the focus on Pareto improvement and the ‘trickle down’ effect of trade reform appears no longer sufficient to justify opening up to global markets. Rather, recent debate has seen the focus shift specifically to how poor households are affected by the opening of markets – even though we know from economic theory that trade is not the first-best income re-distribution measure except under limiting circumstances (Corden 1997).

Whilst a number of different groups could be harmed by changing commodity and factor prices, many argue that what is happening to poor households should be of primary importance since they are most vulnerable and because the re-distributive nature of trade policy is marginalising and impoverishing poorer people relative to wealthier people in many parts of the world. There are fears that trade policies are causing price increases for basic necessities, employment losses for poor people working in contracting industries, and declining unskilled wage rates, all contributing to worsening poverty.

A series of recent papers have sought to quantify the effects of increasing global integration on the poor using quantitative modelling and detailed household consumption and income survey data¹. This paper considers the issue in the single country context for Indonesia. Indonesia has been pursuing trade liberalisation policies since the 1970s. Unlike some countries whose dismantling of trade barriers has been across the board, Indonesia’s pattern of protection removal has been highly selective. Well into the 1990s tariffs remained high in certain sectors of the Indonesian economy such as certain basic chemicals, motor vehicles, plastics, leather, textiles and cosmetics. In addition, non-tariff barriers to trade, in the form of restrictive licensing and marketing arrangements, remain high in key intermediate industrial goods and strategic food sectors.

For decades Indonesia has been committed to poverty alleviation. Up until the Asian financial crisis of the late 1990s, Indonesia had experienced substantial reductions in poverty. Agricultural research, rural education and health policies, pricing policy for basic consumption goods (such as rice), and a fairly successful family planning program contributed to substantial

¹ See McCulloch, Winters and Cirera (2001) and Reimer (2002) for surveys of the emerging literature that seeks to quantify how international trade affects the poor in developing countries.

improvements in living conditions for poor families. Due to the increase in absolute poverty at the time of the Asian financial crisis, awareness has been diverted more strongly than ever to ways in which reform and rebuilding could improve the welfare of poor families, who tend to be concentrated in rural areas, particularly on the Western islands.

Given the commitment to liberalisation and poverty reduction, this paper asks how would further trade liberalisation affect poverty alleviation and income distributional goals. Further trade reform is likely to have considerable re-distributive consequences. From existing theories, we might expect unskilled labour to benefit in real terms. Indonesia's comparative advantage lies in unskilled labour intensive goods, whose price would be expected to rise with more openness to trade (Stolper-Samuelson, 1941). Specific capital used intensively in benefiting sectors might also experience real gains (Jones, 1971). In order to get more definite answers, we need to know about the structure of the Indonesian economy and the protection schedule. The WAYANG computable general equilibrium (CGE) model of the Indonesian economy (see Appendix 1 of this volume) captures that information. The model has seven rural and ten urban household groups classed according to factor ownership, enabling us to study between- and within-group income distributional issues.

This paper is structured as follows: the first section describes the CGE model and the methodology for analysing welfare changes, poverty, and income distribution following a trade policy shock. The second section presents the base trade simulation and the results, under a standard and alternative closure. The third section considers two important model extensions, first to see some regional disaggregation of the results, and second to see how the results change when imperfect competition and increasing returns to scale are introduced. The final section addresses some caveats on the results and concludes.

A CGE framework for analysing income distribution, poverty and trade policy

This paper employs the WAYANG CGE model, developed initially by Warr and Azis (1997) and adapted by Wittwer (1999). The particular aggregation of the model chosen for this paper has 82 industries each producing a single commodity (listed in Appendix Table 10A). The advantage of the WAYANG model in its original form for this paper is the inclusion of ten broad household groups. The household disaggregation allows the determination of the impact of policy changes on the welfare of different households classed according to socio-economic categories that are recognisable for policy purposes and that exhibit relatively stable characteristics. Table 10.1 shows the household classification.

Table 10.1: Classification of households in WAYANG

| Household | Household description | Population share (%) |
|-----------|-------------------------------|----------------------|
| rural1 | Landless | 10.0 |
| rural2 | Small Cultivator (< 0.5ha) | 27.3 |
| rural3 | Medium Cultivator (0.5 – 1ha) | 6.2 |
| rural4 | Large Cultivator (> 1ha) | 6.4 |
| rural5 | Non-Ag Labour: Low Income | 8.8 |
| rural6 | Non-Labour: Rural | 13.0 |
| rural7 | Non-Ag Labour: High Income | 1.5 |
| urban1 | Urban Labour: Low Income | 12.4 |
| urban2 | Non-Labour:Urban | 11.8 |
| urban3 | Urban Labour: High Income | 2.6 |

SOURCE: Warr and Azis (1997).

The sources of income for the ten household groups are exogenous in the model, shown in Table 10.2. Unskilled labour is the most important factor in the rural 1, rural 5 and urban 2 households. Besides the non-labour households, these groups are also the highest recipients of transfers. As expected, skilled labour contributes significantly to the wealthiest four household groups. With few exceptions, fixed capital is the most significant income source for all household income portfolios. This category includes interest, rent other than land rent (buildings etc.), dividends, imputed rent on housing and enterprise income from non-agricultural production.

Each household group also has a consumption profile that is exogenous in the model. In the original WAYANG model, the consumption shares were identical across the ten household groups. The shares were revised, to be more reflective of actual consumption patterns, for the purpose of analysing the poverty dimensions of trade policy. SUSENAS² 1993 data was used from Levinsohn et al. (1999)³.

² SUSENAS is an extensive household consumption survey conducted every three years by the Central Bureau of Statistics (Badan Pusat Statistik, BPS).

³ The more detailed consumption profile for the 82 commodities in WAYANG, and how it was adapted, is reported in Croser (2002).

Table 10.2: Factorial sources of income for households in Indonesia (%)

| Household | Unskilled labour | Skilled labour | VCA ^a | VCN ^b | FCN ^c | Land | Transfers |
|-----------|------------------|----------------|------------------|------------------|------------------|------|-----------|
| rural1 | 48 | 1 | 0 | 8 | 26 | 1 | 15 |
| rural2 | 25 | 6 | 1 | 15 | 45 | 1 | 6 |
| rural3 | 14 | 3 | 1 | 16 | 54 | 7 | 5 |
| rural4 | 8 | 4 | 1 | 18 | 57 | 7 | 6 |
| rural5 | 40 | 6 | 0 | 8 | 28 | 5 | 12 |
| rural6 | 13 | 25 | 0 | 11 | 33 | 2 | 16 |
| rural7 | 5 | 22 | 1 | 13 | 47 | 10 | 3 |
| urban1 | 24 | 13 | 1 | 14 | 42 | 3 | 4 |
| urban2 | 35 | 18 | 0 | 6 | 19 | 2 | 19 |
| urban3 | 1 | 24 | 1 | 17 | 52 | 3 | 1 |

SOURCE: Wayang Database. (a) Variable Capital used in Agricultural Sectors. (b) Variable Capital used in non-Agricultural Industries. (c) Fixed Capital used in non-Agricultural industries. (d) Transfers including inter-household, government and foreign transfers.

Modifications to incorporate income distribution

Examining distributional issues in a multi-household model can take the form of between-group studies or between-&-within-group studies. WAYANG contains information on between-group differences in consumption and factor earnings. However, the model reveals nothing about within-group inequality, which is assumed to be exogenous. Assuming distributional neutrality within-groups can be justified by arguing that certain types of economic changes affect between-group distributions whilst leaving within-group relative distributions unchanged (Dervis et al., 1982). Azis et al. (2001) provide empirical support for this proposition for Indonesia by looking at actual distributions before and after the Asian financial crisis. They conclude that the overall shape of income distribution remains stable through periods of adjustment.

In choosing the distributional function, the majority of household studies assign a Pareto or lognormal distribution to accord with socio-economic characteristics of households (see for example, Dervis et al. 1982). In recent studies, use has been made of a more flexible beta distribution which can take on various asymmetric forms (for example, Decaluwe et al., 1999). Contrary to the lognormal, the beta function can be left-skewed, right-skewed or symmetric, enabling the distribution for, say, rural landless households to differ markedly with that for, say, large landowners. Bordley et al. (1996) provide empirical support for use of the beta distribution as a more appropriate functional form for income distribution analysis.

The functional form of the beta distribution is given by:

$$\text{Eq 1: } I(y; p, q) = \frac{1}{\beta(p, q)} \frac{(y - mn)^{p-1} (mx - y)^{q-1}}{(mx - mn)^{p+q-1}}$$

where

$$\beta(p, q) = \int_{mn}^{mx} \frac{(y - mn)^{p-1} (mx - y)^{q-1}}{(mx - mn)^{p+q-1}} dy \quad p > 1, q > 1, mn < y < mx$$

and y is income, mn is minimum income, mx is the maximum income, and p and q are parameters which together determine whether the distribution is skewed to the left, skewed to the right, or symmetric. Values of p and q can be estimated by non-parametric methods from survey data, or derived by a method of moments process, provided two or more moments of the distribution are known. For this paper, the beta distribution parameters are taken from Azis (2000) who estimates the actual non-parametric income distribution for each of the household categories in WAYANG from the 1996 SUSENAS sample of over 200 000 households. Each of these distributions is horizontally scaled to accord with the mean household income in the 1993 database⁴. Table 10.3 shows the parameters and variables for constructing the beta distributions. Figure 10.1 shows the resulting income distributions for the ten WAYANG household groups.

Table 10.3: Variables and parameters for constructing beta distributions for Indonesia

| Household | Max Income (000 Rp) ^b | Min Income (000 Rp) ^b | Mean Income (000 Rp) ^a | p ^c | q ^c | Group poverty (%) ^d |
|-----------|----------------------------------|----------------------------------|-----------------------------------|----------------|----------------|--------------------------------|
| rural1 | 16186 | 0 | 669 | 2.37 | 60.77 | 32.1 |
| rural2 | 17170 | 0 | 830 | 3.7 | 110.54 | 29.9 |
| rural3 | 44470 | 1 | 1910 | 3.7 | 110.54 | 2.5 |
| rural4 | 75430 | 1 | 2430 | 3.7 | 110.54 | 0.5 |
| rural5 | 39612 | 0 | 1813 | 3.16 | 64.35 | 2.0 |
| rural6 | 16102 | 0 | 873 | 2.01 | 33.83 | 19.6 |
| rural7 | 54449 | 8 | 2386 | 2.53 | 53.66 | 1.8 |
| urban1 | 39751 | 10 | 1591 | 2.19 | 55.72 | 9.6 |
| urban2 | 24972 | 48 | 1488 | 1.59 | 25.33 | 13.3 |
| urban3 | 96168 | 9 | 4777 | 1.86 | 34.23 | 1.6 |
| Indonesia | | | | | | 14.0 |

⁴ Azis (2000) reports only the distribution for rural farmers combined. That is, small, medium and large cultivators are grouped together to estimate one distribution for farmers with land. Consequently, rural 2, 3 and 4 households in WAYANG all have the same shape distribution scaled to the WAYANG mean for each.

SOURCES: (a) WAYANG database. (b) Horizontally scaled to accord with Azis (2000). (c) Azis (2000). (d) Poverty headcount rate estimated at BPS poverty lines (see text).

Poverty measures

To compare poverty pre- and post-simulation, a Foster-Greer-Thorbecke (F-G-T) poverty measure can be applied to each distribution. The F-G-T measure consists of a class of additively decomposable poverty measures that capture the headcount poverty rate, the depth, and the severity of poverty. It is based on the specification of a monetary poverty line, z , as shown below. When $\alpha = 0$, the P_α measure captures the headcount rate of poverty up to the monetary poverty line. As α increases, the relative importance accorded to individuals below the poverty line increases.

$$\text{Eq 2: } P_\alpha = \int_{mn}^z \left(\frac{z-y}{z} \right)^\alpha I(y; p, q) dy$$

The F-G-T measures are dependent on, and sensitive to, the setting of monetary poverty lines. If it can be agreed where to set a poverty line, one can gauge the amount of poverty in populations by measuring the extent of poverty for each constituent household and totalling using a suitable aggregator function. However, setting a poverty line is a non-trivial exercise⁵. In this paper, the BPS monetary poverty line of 442 664 Rupiah per person per year is adopted for urban areas, and deflated by 18.5 percent for rural areas (Suryahadi et al., 2000)⁶. For comparison pre- and post-simulation, the monetary poverty line is disaggregated into a basket of n basic needs commodities according to shares reported in Pradhan et al. (2000)⁷. The monetary poverty line is then the sum of the value of each commodity in the basket of basic needs, V_n , as shown below.

$$\text{Eq 3: } z = \sum_n V_n \quad \text{where} \quad V_n = Q_n^p p_n$$

and Q_n^p is the quantity of the n^{th} basic need commodity, which is assumed invariant from one simulation to another and applies to all households, and p_n is the price of the n^{th} basic need commodity, determined endogenously in

⁵ See Dhanani and Islam (2002) for a comprehensive review of the difficulties of specifying monetary poverty lines.

⁶ Deflating urban poverty lines for rural areas is common. There is some controversy over what is an appropriate deflator. Dhanani and Islam (2002) suggest the rural poverty line is often deflated by too much and suggest that difference in the price of basic food commodities between urban and rural areas is to the order of 11 percent.

⁷ See Croser (2002) for the full specification of the basket of basic needs.

the model. In this sense, the monetary poverty line is a fixed basket of basic needs whose value is determined endogenously.

The graphs in Figure 10.1 show the poverty line for each household group. For the rural 1 household, for example, 32 percent of this group is in poverty in contrast to the higher income household groups for which less than 2 percent of the group is in poverty. For Indonesia as a whole, 14 percent of the population is impoverished, which is consistent with official headcount estimates of poverty in Indonesia in 1993⁸.

The income distributions, complete with monetary poverty lines can now be used to determine what happens to the various groups under different policy regimes. The most important determinant underpinning the resulting income distributions is factor ownership. Recall from Table 10.2 the factorial sources of income for households. When an exogenous shock is simulated, each household group changes its income, because of changes in factor rewards, and thereby increases or decreases poverty and its position in the economy's income distribution. Similarly, each household will change its expenditure depending on price movements. The consumption patterns will be important for analysing the effects of an exogenous policy shock on household welfare.

CV measures

The methodology outlined so far enables us to determine what is happening to between-group income distribution in the face of trade policy shocks. Using a small amount of additional data, this section of the paper relaxes the distributional neutrality assumption. In the earlier simulations, all individuals in a particular household group were assumed to have the same factor income profile. However, knowing something about the factor earning profile of the household at the poverty line can enable within-group comparison.

⁸ The official BPS estimate of poverty is 13.7 percent for the year of 1993.

Figure 10.1: Beta distributions for the WAYANG household groups

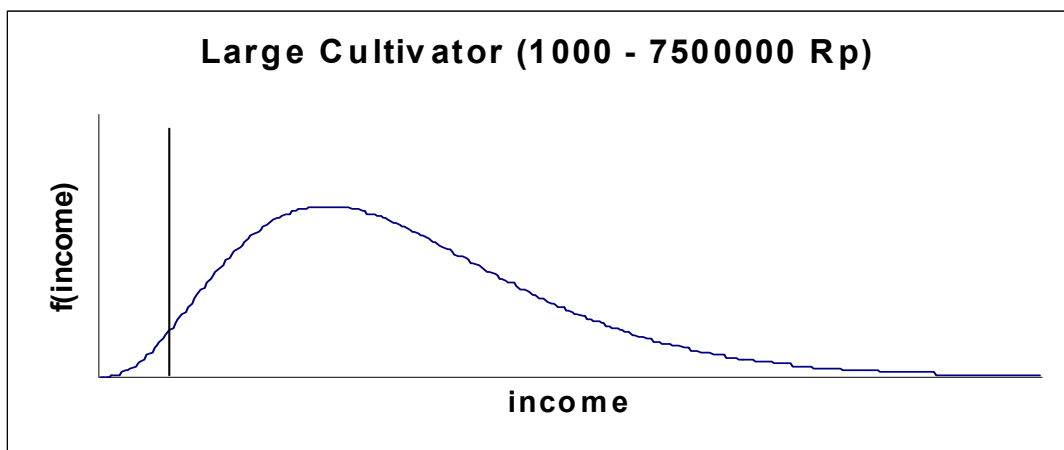
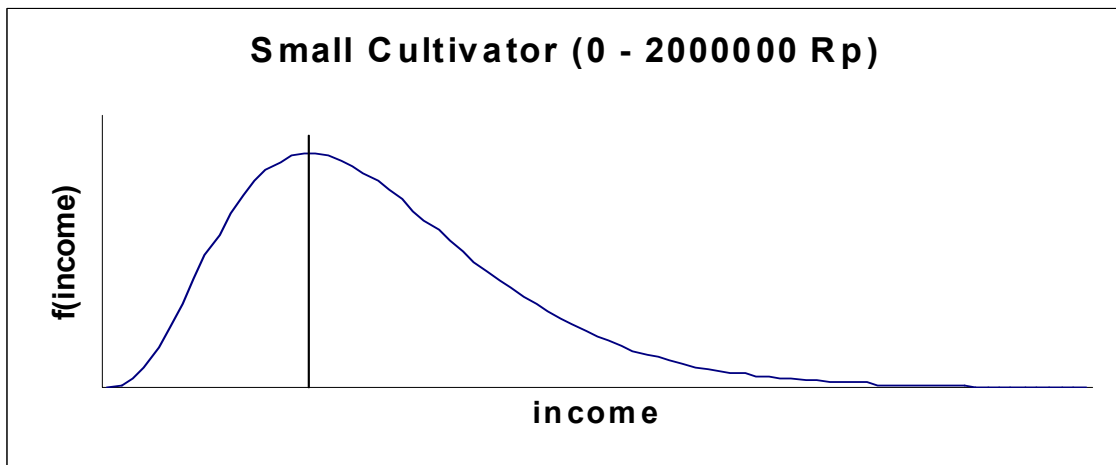
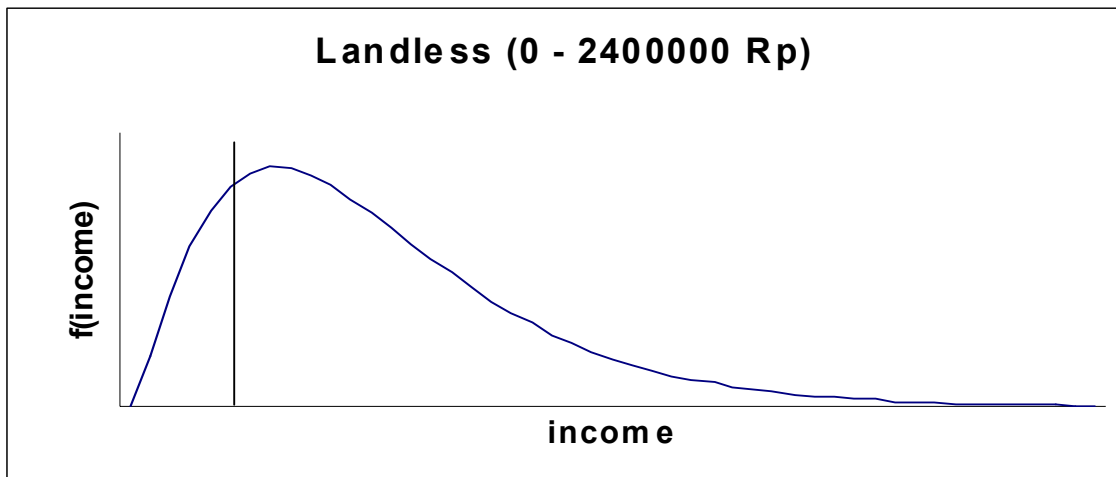


Figure 10.1 (continued)

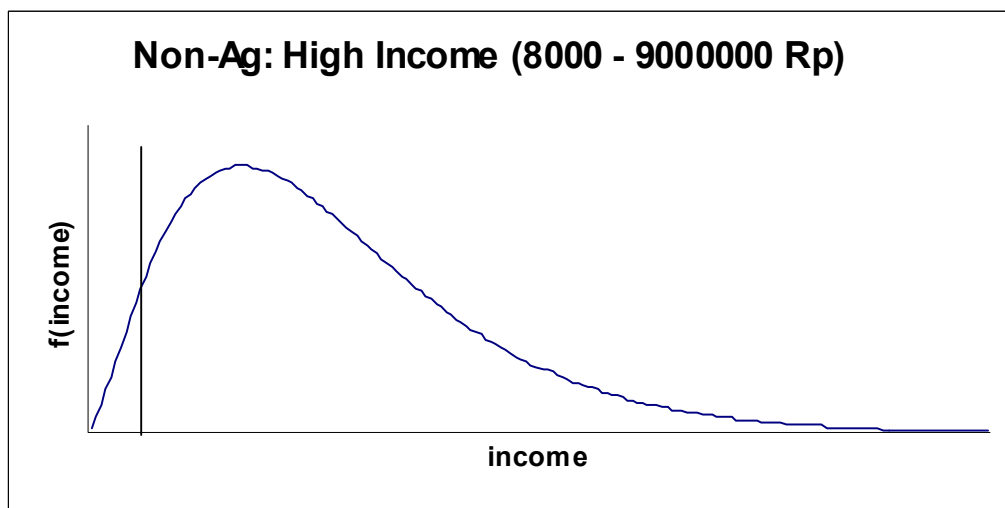
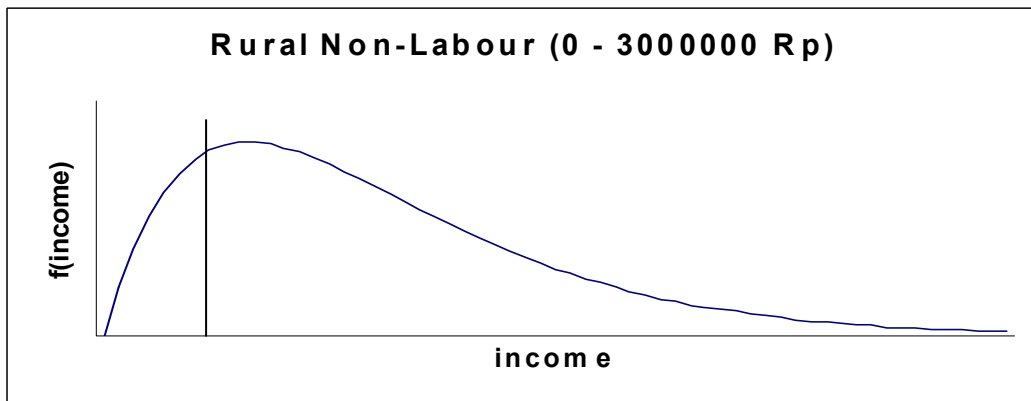
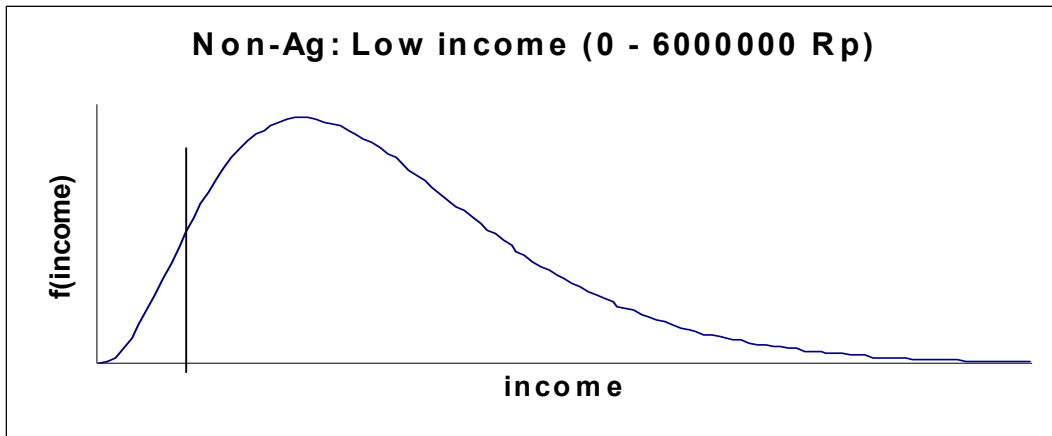
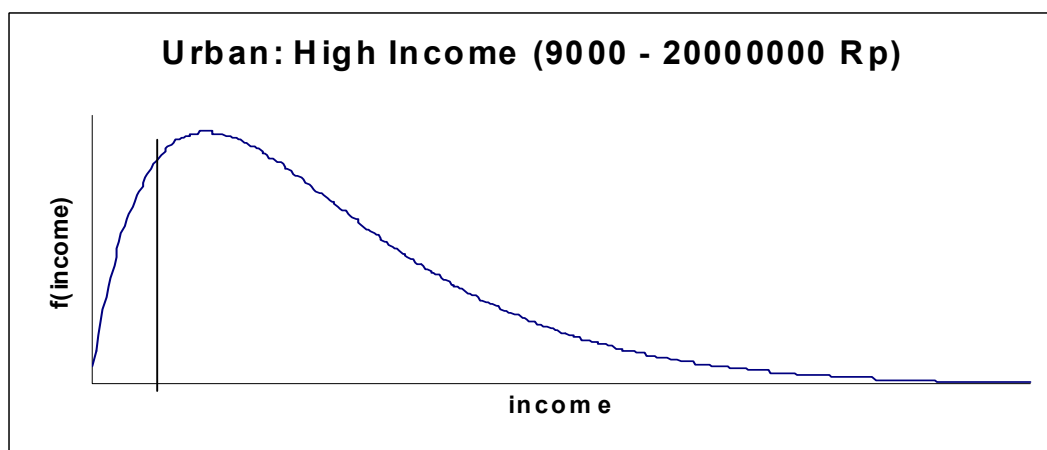
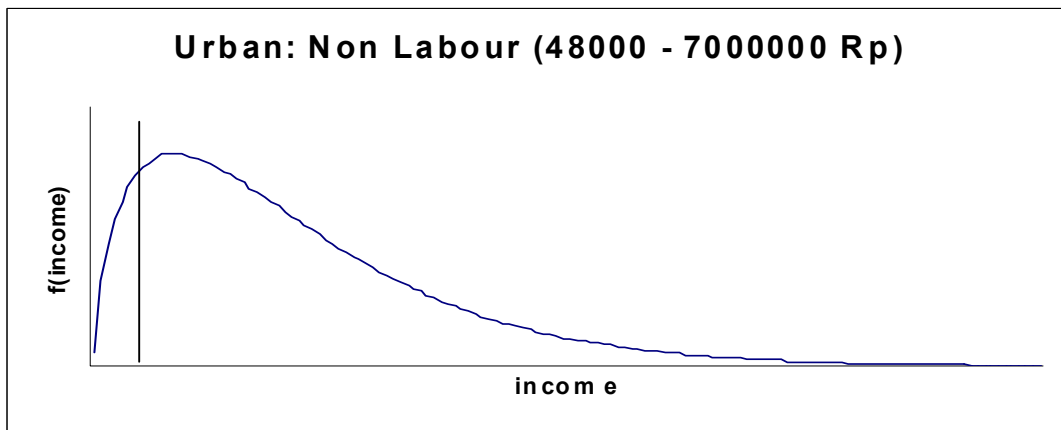
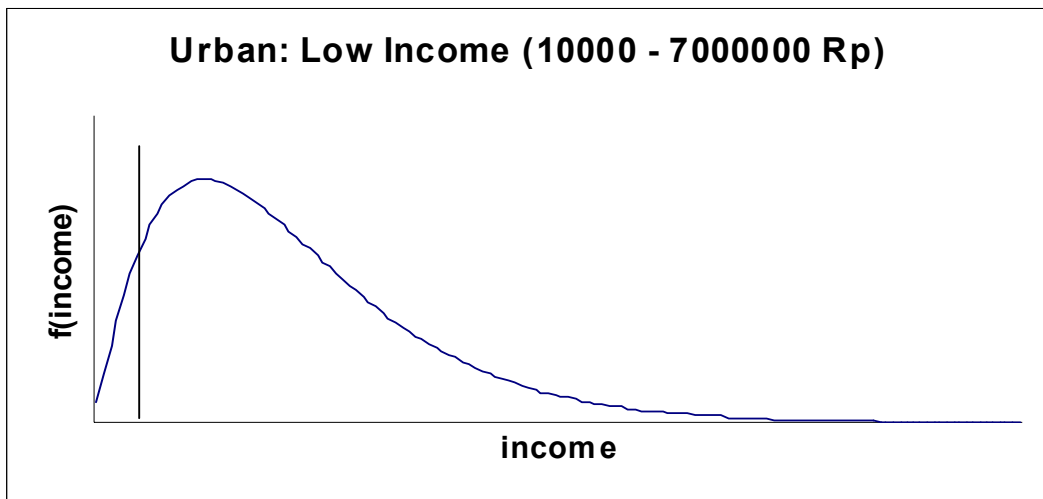


Figure 10.1 (continued)



This small step towards understanding the within-group changes, inspired by Hertel et al. (2000), is facilitated through the use of compensating variation (CV) measures. The aim of a CV measure in this study is to try to grasp how households in different parts of the income distribution behave in response to trade policy changes.

Consider the most basic CV measure:

$$\text{Eq 4: } cv^i = -[y^i - \sum_n \vartheta_n^i p_n]$$

where y^i is the percentage change in income, ϑ_n^i is the i^{th} group's budget share of good n and p_n is the percentage change in the price of good n . Let us define a marginal household as a household whose income is equal to the monetary poverty line. For a marginal household, the CV measure is given by:

$$\text{Eq 5: } -cv^m = (y - CPI) + \sum_f (\Omega_f^m - \Pi_f) \varpi_f - \sum_n (\Theta_n^f - \lambda_n) p_n$$

On the right hand side, the first bracketed expression is the per-capita change in income relative to initial expenditure. The second bracketed expression is the change in the marginal household income relative to the mean household, where Ω_f^m is the share of primary factor f in the marginal households income, Π_f is the share of primary factor f in per capita household income, and ϖ_f is the percentage change in the return to factor f . The third term is the change in the marginal household CPI relative to per capita CPI, where the marginal households share of each commodity is given by Θ_n^f whilst the mean households share is λ_n . This expression can be reduced to the basic CV measure.

Equations 4 and 5 represent a CV measure for the mean household and the marginal household in each of the ten WAYANG groups. The factor income profile and consumption shares for the mean household are in the WAYANG database, as reported earlier. The consumption bundle for the marginal household in each group is the basket of basic needs. The factor income profile for each of the ten marginal households comprises mainly unskilled labour. Land is considered important for the poor households in the medium and large cultivating groups. However all other groups at the poverty line rely exclusively on unskilled labour. Hertel et al. (2000) and Friedman (2002) reveal how important unskilled labour and transfers are for the poorest people in the Indonesian economy. This is unlikely to differ significantly across the household groups.

Using the model to examine the effects of trade policy reform

The removal of tariff and non-tariff barriers to trade

Given that non-tariff barriers (NTBs) are the key to Indonesia's protectionist policies, the simulation performed on the model's base year equilibrium comprises the complete removal of all import tariffs and the most widely used non-tariff barriers, import licenses. Import licences are

modelled as tariff-equivalent barriers⁹. Table 10A shows the tariff and NTB schedule. Closure is defined by a set of constraints that represent a short-term framework¹⁰.

The removal of all trade barriers results in real GDP expanding by 1.4 percent, owing mainly to an expansion of exports (Table 10.4). The industries to experience the greatest output gains are leather, carpet and rope, yarn and kapok, fertiliser and pesticides, knitting mills and clothing. An increase in exports drives this expansion. Service sectors enjoy expansions as a result of the expansion of the local market.

Most industries previously protected suffer when trade is liberalised. Households and producers substitute cheaper imported goods for domestic goods. Most noticeably output falls for other manufactures, manufactured metals, construction equipment, manufactured electrical, manufactured chemicals, manufactured non-metals and communications equipment. The most significant changes in agricultural industries are the fall in soy and other beans and ground nuts output due to the removal of very high NTBs.

9 Details of how the differences between a tariff and an import licence are handled in the WAYANG model are contained in Croser (2002). Of particular importance, however, is the assumption that quota rents accrue to the wealthiest urban households who rely heavily on capital in non-agricultural sectors for a significant proportion of their income.

10 Land and fixed capital are specified as sector specific. Variable capital in agriculture can move between the 15 agricultural industries but the total stock is fixed. Similarly, variable capital in non-agriculture can move between non-agricultural sectors, but the aggregate stock is fixed. In the labour market the total employment level is fixed exogenously. However, employment in individual industries and the wage rate can adjust to give some indication of which wage earners will be the net winners and losers from trade policy changes. Technical change and other shift variables are assumed to not undergo any change. The exchange rate is held fixed as the numeraire. The macroeconomic closure specifies aggregate investment as fixed, whilst private consumption and government spending move with real income. The trade balance absorbs variations in real income.

Table 10.4: Estimated effects on Indonesia's macroeconomy and on factor returns
(% change in variables*)

| Variable | Base simulation | Alternative closure | IRTS and imperfect competition |
|--|-----------------|---------------------|--------------------------------|
| Real GDP (Exp) | 1.41 | 1.52 | 3.49 |
| Export Volume Index | 11.11 | 8.92 | 14.01 |
| Import Volume Index | 8.02 | 8.96 | 7.90 |
| Export Price Index | -2.65 | -2.13 | -3.38 |
| Import Price Index | -11.09 | -11.04 | -11.09 |
| Balance of Trade * | 0.94 | 0.95 | 1.40 |
| Consumer Price Index (CPI) | -3.78 | -2.82 | -3.28 |
| Employment of Unskilled Workers | 0.00 | -2.39 | 0.00 |
| Real Return to Unskilled Labour | 0.19 | 2.82 | 3.37 |
| Real Return to Skilled Labour | 1.80 | 1.78 | 4.31 |
| Real Return to Land | 1.93 | 2.47 | 4.55 |
| Real Return to Fixed Capital in Non-Ag. | 3.63 | 3.00 | 5.11 |
| Real Return to Variable Capital in Ag. | 2.01 | 2.47 | 4.54 |
| Real Return to Variable Capital in Non-Ag. | 1.75 | 1.17 | 4.87 |

SOURCE: WAYANG Simulation Output. * Balance of trade is expressed as a fraction of GDP, not as a percentage.

Factor returns

Industry expansions and contractions place upward and downward pressure on the real returns to factors used intensively in their production or specific to those industries. In general, firms experiencing increases in output increase demand for fixed factors, which now become relatively scarcer, placing upward pressure on the real return to these factors. However, at the same time, falls in import-competing sector outputs decrease the demand for these fixed factors, placing downward pressure on the real returns.

Aggregate employment was held fixed in this simulation, even though labour was able to move between sectors. As expected, the results indicate that labour moves out of contracting sectors and into sectors expanding in line with Indonesia's international competitiveness. The results indicate that the real return to the labour composite is increasing under this trade policy scenario by 1.2 percent (

Table 10.4). However, interestingly the real wage for skilled labour is increasing by 1.8 percent, much more than the real wage rate for unskilled labour, increasing only marginally by 0.2 percent. This result appears contrary to the expected results for Indonesia. We would expect unskilled labour intensive sectors to expand, placing upward pressure on the unskilled wage rate. Industry results reveal that the industries which experience the largest expansions in output (listed above), with the exception of fertiliser and pesticides, are sectors that intensively employ unskilled labour and variable capital. Industries experiencing the greatest output falls are overwhelmingly the protected manufacturing industries, which are similarly intensive in unskilled labour and fixed capital. Their contraction mitigates the upward pressure placed on the unskilled wage rate.

One explanation for this result has to do with the capacity for tradeable sectors to expand. In this model we are seeing a movement of resources away from the previously protected import-competing sectors to those that are internationally competitive exporters. However, in the WAYANG model, modest export demand elasticities allow only limited expansion of overseas demand¹¹. Consequently, when the resources from inefficient industries are freed up they do not necessarily go to the tradeable export sector. Instead, some of the sectors experiencing gains are actually the service sectors that are non-tradeable and intensive in the use of skilled labour.

The conclusion to draw is that unskilled labour does not do as well in the single country model context for two reasons; firstly because the structure of protection in Indonesia protects unskilled labour in manufacturing industries and secondly because unskilled labour intensive industries have only limited expansion potential. Industries selling to the domestic market experience increases in output because domestic demand elasticities are higher, in absolute terms, than the export demand elasticities.

For landowners, the real return to land falls significantly for two industries; ground nuts and soy and other beans. These two industries were previously highly protected and the removal of trade barriers results in a contraction of output in these industries and the resulting downward pressure on returns to land specific to these sectors. Households producing these commodities or owning land employed in these sectors not only lose in the form of decreased demand for their goods and decreased quota rents, but also from the falling return land. There is upward pressure on the real return to land in most other sectors, especially other food and fibre crops

¹¹ Armington elasticities are specified as 6 and export demand elasticities as -4 in line with Dixon and Rimmer (2001). Sensitivity analysis of export demand elasticities reveals that higher absolute export demand elasticities allow greater expansion of export industries. The real unskilled wage rate increases by more suggesting that poor households may fare better than reported in the base simulation.

and raw rubber, such that the aggregate real rate of return to land increases by 1.9 percent.

For specific capital owners, those who benefit own capital specific to expanding industries whilst there are significant downward pressures on the returns to specific capital in contracting industries. This accords with the hypothesized results from the Jones-Neary specific-factors model (Jones, 1971). If we aggregate across all fixed capital in non-agriculture, there is a 3.6 percent increase in the real rate of return. Variable capital owners in non-agricultural and agricultural sectors experience increases in the real rate of return of 1.8 and 2.0 percent respectively.

Households

The decline in the price of most imports and the follow-on decline in the price of most domestically produced goods forces the aggregate consumer price index (CPI) down by almost 4 percent. Nominal income similarly falls for all ten household groups. This corresponds to a leftward horizontal shift of the beta income distribution (shown in Figure 10.2 for household rural 1). The most substantial shifts occur for the urban 3 household, whose nominal take-home income falls 7.4 percent, due mainly to the decline in quota rents. The rural 1, rural 5 and urban 2 groups also experience above average declines in nominal income, due to their reliance on unskilled labour as a source of income.

Figure 10.2: The beta distribution and monetary poverty line for the Rural 1 household group pre- and post-trade policy reform

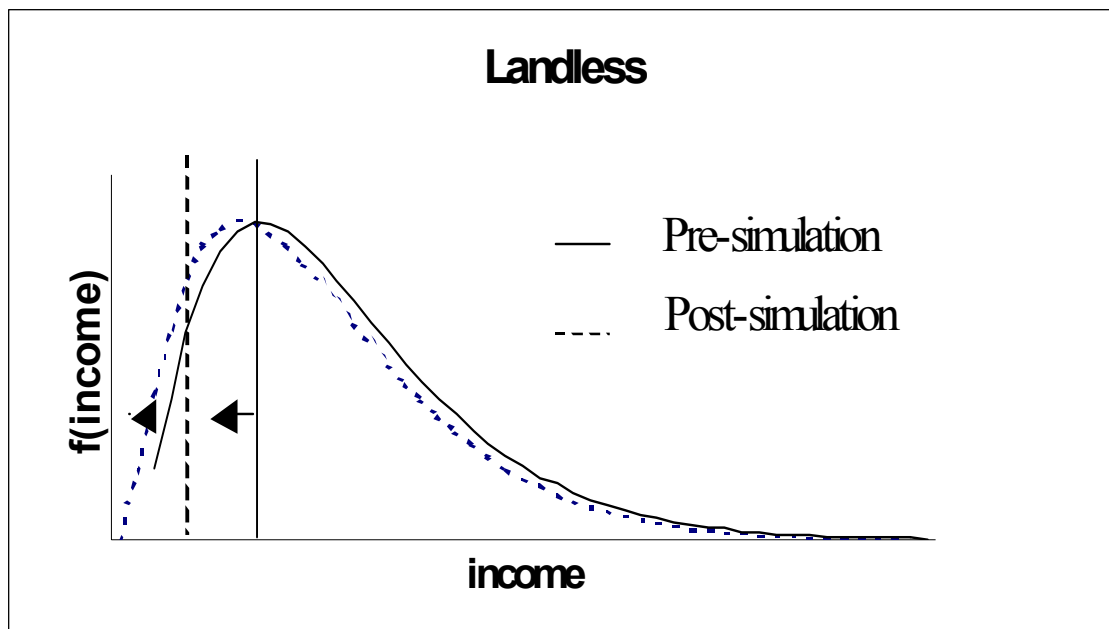


Table 10.5: Poverty headcount measures in Indonesia following policy reform

(%, with improvement in poverty in parentheses)

| Household | Base simulation | | IRTS and imperfect competition | |
|-----------|-----------------|--------|--------------------------------|--------|
| rural1 | 31.5 | (-0.6) | 30.6 | (-1.5) |
| rural2 | 28.9 | (-1.0) | 27.9 | (-2.0) |
| rural3 | 2.3 | (-0.1) | 2.2 | (-0.3) |
| rural4 | 0.4 | (0.0) | 0.4 | (-0.1) |
| rural5 | 1.9 | (-0.1) | 1.8 | (-0.2) |
| rural6 | 19.1 | (-0.5) | 18.6 | (-0.9) |
| rural7 | 1.8 | (-0.1) | 1.7 | (-0.2) |
| urban1 | 9.2 | (-0.3) | 8.9 | (-0.6) |
| urban2 | 13.0 | (-0.3) | 12.7 | (-0.6) |
| urban3 | 1.7 | (0.1) | 1.7 | (0.1) |
| Indonesia | 13.6 | (-0.4) | 13.1 | (-0.9) |

SOURCE: Author's Calculations from WAYANG simulation output.

The poverty implication of the fall in nominal income can be gauged by reference to new monetary poverty lines, which are 4.1 percent lower than the initial lines. This is a larger shift than the CPI shift, owing to large reductions in the price of soy and other beans and ground nuts. The fall in the nominal income of households coupled with the even bigger fall in the monetary poverty line lifts people from poverty in nine of the ten household groups. For households beginning with large incidences of poverty, rural 1, rural 2 and rural 6, there is significant poverty alleviation of 0.6, 1.0 and 0.5 percent respectively. The poverty line is relatively near the mode for these groups, such that the sensitivity of the headcount poverty rate to the poverty line is quite high. Headcount poverty increases for the urban three household group due to the very large fall in the nominal income. Overall, there is a 0.4 percent improvement in Indonesia's poverty headcount rate.

CV measures

CV measures are reported in Table 10.6. For nine of the ten mean household groups the measure is negative indicating that no compensation is required for the household group to achieve the same level of utility after the trade policy shock. The urban 3 mean household has a positive CV measure

indicating that this group would need to be compensated to the extent of 3.5 percent of their initial expenditure to enjoy the same level of utility as before the shock.¹²

Decomposition of these measures reveals that it is factor income differences which drive the results. Mean households deriving their income from skilled labour do best under this simulation: rural 6, rural 7 and urban 2. Conversely, the least gain accrues to the rural 1, rural 2, rural 5 and urban 1 households which rely on unskilled labour. The other household groups, with a diversified income portfolio, fare somewhere in between. The urban 3 mean household is the only household to require compensation to enjoy the same level of utility as before the liberalisation, owing mainly to the loss in quota rent income. Turning to the marginal household in each socio-economic group, the results suggest that tariff liberalisation is sufficient to improve the utility level of each. Taking the difference between the per capita and marginal household reveals that the gap between the two is widening for nine of the ten groups. The mean household has a more diversified income portfolio and therefore fares better when trade is liberalised. On the other hand, the marginal household, reliant on unskilled wages facing downward pressure, fares less well.

¹² Alternative simulations were run in which the rural 4 (large landowner) households were assumed to be the recipients of quota rents. Macro and industry results do not differ substantially, however, the CV measure for the urban 3 household is negative and that for the rural 4 is positive. In reality, the loss of quota rents is likely to be shared across several socio-economic household groups such that we would expect those losing quota rents to be worse off but all other households could be expected to gain from the trade liberalisation.

Table 10.6: CV measures for Indonesia

| Household | Base simulation | | Alternative Closure IRTS simulation | | | |
|-----------|-----------------|-------|-------------------------------------|-------|-------|-------|
| | PC | M HH | PC | M HH | PC | M HH |
| rural1 | -1.01 | -0.68 | -1.67 | -1.77 | -3.03 | -3.17 |
| rural2 | -1.15 | -0.37 | -1.20 | -1.61 | -3.12 | -3.14 |
| rural3 | -1.40 | -0.37 | -1.32 | -1.61 | -3.16 | -3.14 |
| rural4 | -1.73 | -0.37 | -1.55 | -1.61 | -3.38 | -3.14 |
| rural5 | -1.21 | -0.68 | -1.84 | -1.77 | -3.13 | -3.17 |
| rural6 | -1.63 | -0.50 | -1.40 | -1.66 | -3.28 | -3.27 |
| rural7 | -1.73 | -0.50 | -1.56 | -1.66 | -3.52 | -3.27 |
| urban1 | -1.22 | -0.82 | -1.34 | -1.45 | -3.20 | -3.46 |
| urban2 | -1.67 | -0.82 | -2.22 | -1.45 | -3.43 | -3.46 |
| urban3 | 3.50 | -0.82 | 4.30 | -1.45 | 1.83 | -3.46 |

SOURCE: Author's Calculations from WAYANG Simulation Output. PC HH – per capita household, M HH – marginal household.

Alternative labour market closure

An alternative closure swap in which the aggregate employment of unskilled labour is set endogenously with the nominal unskilled wage rate held fixed results in increased unemployment of unskilled workers as a result of contracting import-competing sectors which intensively employ unskilled workers. For those lucky enough to remain employed, their real wage rate increases significantly, as opposed to a minor improvement in the base simulation. This is despite a smaller fall in the price of goods which intensively employ unskilled labour brought about by the smaller fall in the price of their main primary input. The CPI falls by 2.8 percent and the basket of basic needs by a smaller 1.8 percent. For households, the alternative closure results in more favourable CV measures and a closing gap between nearly all marginal and mean households (Table 10.6). However, one needs to consider the loss of employment potentially pushing many households into poverty.

Extensions

Regional results

This extension of the results considers a Leontief, Morgan, Polenske, Simpson and Tower (1965) (hereafter, LMPST) regional decomposition of the results¹³. This provides some insight into how trade liberalisation affects three broad regions: the densely populated Java and Bali, Sumatra, and the Other Islands. The regional profile (Table 10.7) indicates that much of Indonesia's industrialisation has taken place in Java and Bali where 75 and 73 percent of manufactures and services are produced respectively. Regional poverty estimates appear fairly similar in aggregate across the three regions, despite poverty being very high in some regions such as East Nusa Tenggara and Irian Jaya, and very low in others like Aceh and Riau.

The trade policy simulation results indicate that the Java and Bali region has the least to gain from further liberalisation (Table 10.8). Gross regional product (GRP) and aggregate regional employment both fall in Java and Bali, whilst output and employment expand in Sumatra and the Other islands. The sectoral changes in output analysed earlier go part way to explaining this observation. Many of the contracting import-competing manufacturing industries are highly concentrated in the Java and Bali region. Consequently the decline in these industries output adversely affects this region. Whilst the expanding industries of textiles, clothing, yarn and kapok, leather and carpet and rope are also concentrated in Java and Bali, their output expansions are insufficient to boost the entire region.

¹³ The LMPST decomposition is a top-down extension; industry, macroeconomic, and factor return changes are identical to the base simulation (see Dixon et al., 1982).

Table 10.7: Sectoral shares in regional output and poverty by region in Indonesia (%)

| Region ^a | JavaBali | Sumatra | Other Islands |
|--------------------------------------|----------|---------|---------------|
| Population share ^b | 62 | 21 | 17 |
| Urban Headcount Poverty ^b | 11 | 8 | 8 |
| Rural Headcount Poverty ^b | 25 | 21 | 27 |
| Total headcount poverty ^b | 20 | 18 | 23 |
| Share of output ^c | 60.8 | 21.9 | 17.3 |
| Agriculture | 0.42 | 0.20 | 0.38 |
| Tobacco | 0.86 | 0.08 | 0.06 |
| Tea | 0.79 | 0.21 | 0.00 |
| Raw Rubber | 0.07 | 0.70 | 0.23 |
| Palm Oil | 0.01 | 0.80 | 0.19 |
| Coffee | 0.17 | 0.71 | 0.12 |
| Forestry and Wood | 0.03 | 0.11 | 0.86 |
| Manufacturing | 0.75 | 0.15 | 0.10 |
| Services | 0.73 | 0.20 | 0.07 |

SOURCE: (a) JavaBali includes Jakarta, W Java, C Java, Yogyakarta, E Java and Bali. Sumarta includes Aceh, N Sumatra, W Sumatra, Riau, Jambi, S Sumatra, Bengkulu and Lampung. The Other Islands include W Nusa Tenggara, E Nusa Tenggara, East Timor, W Kalimantan, C Kalimantan, S Kalimantan, E Kalimantan, N Sulawesi, C Sulawesi, S Sulawesi, SE Sulawesi, Maluku and Irian Jaya. (b) Author's Calculations from data provided in Freidman (2002) at the BSP National Price Poverty Line. (c) WAYANG database.

Table 10.8: Estimated effects of reform on regional output, employment and wages (% change)

| Variable | JavaBali | Sumatra | Other islands |
|-------------------------|----------|---------|---------------|
| Gross regional product | -0.14 | 0.36 | 0.17 |
| Aggregate regional empl | -0.25 | 0.52 | 0.41 |
| Regional wage bill | -2.79 | -2.11 | -2.52 |

SOURCE: WAYANG model simulation output

Conversely, Sumatra and the Other Islands produce intensively outputs which experience significant growth. Raw rubber, palm oil and coffee are significant for Sumatra and experience output increases of 3.5, 1.5 and 0.4 percent respectively. These increases tend to be due to increased demand from the domestic market. The other islands produce sea products,

forest and hunting, wood and coconut intensively which all increase by between 0.4 and 2.2 percent. The regions of Sumatra and the Other Islands combined also account for more than 90 percent of the production of coal, crude oil, natural gas and metal ore mining. All of these sectors expand, due to increasing export opportunities.

In addition to the fall in output of manufacturing industries, the declining aggregate wage income in the Java and Bali region results in a decrease in regional consumption, thus multiplying the effect of the decline in GRP. The specification of services as local commodities means they must be consumed in the region in which they are produced. Thus, when the aggregate wage bill for Java and Bali falls, consumption of locally produced perishables and services must also decline. The result is that the decrease in GRP for Java and Bali is greater than the national average.

Increasing returns to scale and imperfect competition

It is well accepted that trade liberalisation, in the presence of increasing returns to scale (IRTS) and imperfect competition, might be more beneficial to households than reported in the base simulation. Trade tends to induce a pro-competitive effect that can reinforce the usual comparative advantage sources of a gain from trade. Of particular interest in this case study is that when trade is liberalised in the model, the decline in unskilled wages is due to contracting manufacturing industries. However, imperfect competition market structures may lead to growth of the manufacturing sectors due to the realisation of scale economies and the erosion of market power. This may offset downward pressure on unskilled wages to some extent. This fundamental indeterminacy regarding the welfare benefits of trade liberalisation for developing countries was first discussed by Devarajan and Rodrik (1991).

This simulation requires first amending the WAYANG model to incorporate features of imperfect competition and IRTS. This paper uses parts of the Abayasiri-Silva and Horridge (1996) scale model. A subset of 26 food processing, manufacturing and service industries are considered to exhibit IRTS at the firm level (denoted by * in Appendix Table 10A). Scale economies are generally inconsistent with perfect competition and therefore monopolistic competition is assumed to prevail in these industries also.

The production function for these 26 sectors is re-formulated to take account of some fixed cost in the production process as shown below.

$$\text{Eq 6: } X^f = G(\text{inputs}) = G^f(\text{inputs}) - FC$$

where X^f is firm output, FC is fixed costs of production invariant to output levels, $G^f(\text{inputs})$ is a scalar multiple of the original CRTS $G(\text{inputs})$ function. The dual function of G^f is the marginal cost (MC) of producing a unit of output at given input prices.

IRTS is characterised by a movement down the AC curve. Such a movement can be brought about by changes in firm output, fixed costs and the marginal cost of producing a unit as shown in the AC equation below.

$$\text{Eq 7: } AC = \frac{TC}{X^f} = \frac{(FC + X^f).MC}{X^f}$$

When trade liberalisation occurs, marginal and fixed costs are assumed to remain constant such that the only way a firm can experience IRTS in the short run is to have an expansion of output, spreading fixed costs over greater output. International trade could bring about this expansion by eroding the market power of imperfectly competitive firms.

The imperfect competition structure assumed to exist for the 26 sectors is monopolistic competition¹⁴. Under monopolistic competition firms produce slightly differentiated products in the various markets in which they operate. The demand for each variety is less than perfectly elastic, thus firms can price as monopolists to exploit their market niche (equation 8). However, pricing must be at average cost under the assumption of free-entry and exit in the long run (equation 9).

$$\text{Eq 8: } \frac{P - MC}{P} = \frac{1}{\varepsilon}$$

$$\text{Eq 9: } P = AC$$

where P is the firm's price and ε is the perceived elasticity of demand for each variety (or each firm). Each firm's perceived elasticity of demand depends on the number of varieties, N , the share of imports in the market, S^M , the elasticity of substitution between its variant and other variants, γ , and between domestic and imported varieties, σ , as shown below.

$$\text{Eq 10: } \varepsilon = \sigma S^M (1/N) + \gamma (1 - 1/N)$$

When opening up to trade, the domestic price rises relative to import prices and the perceived elasticity of demand increases. Thus, greater competition results in an erosion of each of the domestic firms market power and greater falls in the price of commodities in industries with unrealised economies of scale and imperfect competition. The expansion of output, in the face of a trade policy shock is generally larger in these industries. For industries, such as the protected manufacturing firms in Indonesia, there is pressure to contract due to increased competition. At the same time, erosion of their market power exerts pressure to expand output.

¹⁴ There exists a wide variety of potential market structures which have been used in the literature (see Francois and Roland-Holst, 1997).

Re-calibrating the model to include IRTS and imperfect competition features¹⁵ and re-running the base simulation reveals that many of the manufacturing industries experience smaller output contractions than in the base simulation. For these industries there are two offsetting effects at play. Firstly the removal of protection is resulting in a decrease in output since this sector is no longer able to compete with cheaper import varieties of the same good. At the same time however, opening up to trade is causing an erosion of market power, stimulating firms to expand output and move down their AC curve. Overall, gross domestic product of the Indonesian economy increases by 3.5 percent (

¹⁵ This required incorporating internal economies of scale by specifying the IRTS scale parameter as exogenous and equal to a positive value to capture unrealised scale economies.

Table 10.4).

Manufacturing industries have larger price falls. Other industries tend to experience a smaller price fall than in the base simulation. This is because the price of factors increase by more than in the base simulation (Table 10.4). Overall the CPI falls by about the same amount as in the base simulation.

The enhanced performance of the manufacturing industries means the unskilled real wage rate performs much better when industrial organisation features of the Indonesian economy are incorporated into the model. Table 10.4 shows that the real unskilled wage increases 3.4 percent, as opposed to 0.2 percent with CRTS. This results in an increase in the real income of most household groups.

The increasing factor returns, coupled with the CPI fall of 3.3 percent results in an increase in the nominal income of six of the ten household groups, with a corresponding rightward shift of the beta distribution. For the remaining four households, the beta distribution shifts leftward, but only by a small amount. The monetary poverty line shifts leftward 3.3 percent. Poverty levels are significantly lower for all household groups. Overall the poverty headcount rate falls by 0.9 percent with improvements in rural households 1, 2 and 6 experiencing reductions of more than 0.9 percent (Table 10.5)

The CV measures confirm that when trade is liberalised, IRTS and imperfect competition can bring greater benefits to those at the bottom of the income distribution than CRTS and perfect competition. The only group with lower welfare after the liberalisation is the mean urban 3 household due to the loss of quota rents. All other per-capita and marginal households gain however, with the gap between the mean and marginal household closing for six of the ten socio-economic groups. This is a more positive result than the base simulation and emphasises that in Indonesia, trade liberalisation is likely to bring substantial gains from trade not only because it yields an efficiency gain but because economies of scale can be realised and imperfect competition structures are eroded.

Caveats

The results presented in this section suggest that once a new equilibrium is reached it is possible that average and marginal households in each socio-economic group will be better off, with the exception of households losing quota rents. However, the comparative static nature of the model ignores changes in poverty or income distribution during the transition to a new equilibrium. Such short-term adjustments to changes could have important consequences for poverty. For example, the effect of a contracting sector forcing household heads out of a job may result in impoverished circumstances and starvation for poor families before a new equilibrium is reached. Winters (2000a) suggests that the loss of a job is

probably the common proximate cause of households descending rapidly into poverty.

The WAYANG model is also silent on the way in which poor households respond to shocks. Whilst positive shocks may deliver great benefits if households can switch their activities to take advantage of them, WAYANG captures nothing about the ability of poor households to switch between activities and avoid impoverishing circumstances. On the other hand, a risk averse farmer may be unable to take advantage of trade liberalisation in the sense that they are not able to be entrepreneurial and benefit from switching from say subsistence farming to a cash crop. Similarly, they may be hampered by domestic market regulations, not captured in the WAYANG model, which inhibit their supply response. A priority area for further research is to analyse how poor people respond to policy changes. Under what circumstances do poor households take advantage of positive shocks and what action do households take to minimize the chances of falling into poverty.

A further limitation of the WAYANG model is the presence of only two types of labour in the model. The paper considers only one type of unskilled labour. However, in Indonesia, unskilled labour may not be completely mobile in the economy. This, for example, could result in workers in the textiles, clothing and footwear industries experiencing a higher increase in their real wage rate than the average for all unskilled labour. A more disaggregated labour profile would allow for greater insight into how trade policy changes are affecting different poor households. Studies for India reveal that rigidities in the labour market are very important in addressing poverty alleviation (Winters, 2000b).

A more problematic caveat on these results is the distribution of wealth within the household unit. Trade policy may have some potential negative effects on the family household if, for example the benefits from higher cash crop profits are not distributed equally within the household. Women and children may be especially susceptible to exclusion from such rewards. These issues should be taken very seriously but they are beyond the scope of the present study.

Conclusions

The major issues addressed in this study are: what is the effect of further trade liberalisation on poor households in Indonesia, and is the gap between mean-income and poor households closing for different socio-economic groups and for Indonesia as a whole. Since the effect of trade policy on poverty and income distribution can operate through many transmission channels - enterprises, households and governments - a CGE model for Indonesia is used which transparently identifies the direct and indirect pro- and anti-poor influences on these channels.

The model simulates the complete removal of all tariffs and tariff-equivalent import licences. The consequences for poverty alleviation are captured through between-group analysis using the flexible beta distribution and a fixed consumption bundle of basic needs. The beta distribution shifts horizontally to capture the effect of factor price changes on income distribution for the ten different household groups. Commodity price changes, for the invariant basket of basic needs, enable the monetary poverty line to shift horizontally. The gap between poor households and the average household in each of the ten socio-economic groups is captured using basic CV welfare measures.

The results suggest that trade liberalisation reduces poverty and improves the welfare of household groups. However, wealthier households may benefit by more than poorer households, thus widening the gap between the mean and marginal households in each socio-economic group. Factor price changes are the key to understanding this result. Liberalisation does not boost the wages of low skilled workers, relative to other workers and capital owners, as many might expect, owing to the initial pattern of protection, which shelters this group.

Greater welfare gains can be made once allowance is made for imperfect competition and scale economies. Whilst only one variation of these industrial organisation features is modelled in this paper, it demonstrates potential pro-competitive effects of trade liberalisation, including falling market power and expanding output in imperfectly competitive manufacturing sectors.

Further trade liberalisation would benefit the Indonesian economy not only through more efficient use of resources and specialisation but also owing to the erosion of market power and the realization of scale economies. All households stand to gain from such policy reform, except those who perhaps benefit from quota rents under the current protection regime. However, since the model is silent on the transition from one equilibrium to another, short-term government assistance may be warranted to offset any potential negative impacts of policy change.

References

- Abayasiri-Silva, K. and M. Horridge (1996), 'Economies of Scale and Imperfect Competition in an Applied General Equilibrium Model of the Australian Economy,' Preliminary Working Paper No. OP-84, Centre of Policy Studies and the Impact Project, Monash University.
- Azis, I.J. (2000), 'East Asian Crisis and Poverty : A Modeling Approach,' prepared for a High-level Symposium on Alternative Development Paradigms and Poverty Reduction, Asian Development Bank Institute, Tokyo, 8 December.
- Azis, I.J., E.E. Azis and E. Thorbecke (2001), 'Modeling the Socio-economic Impact of the Financial Crisis: The Case of Indonesia,' Research Project working paper for IFPRI and the World Bank.
- Bordley, R.F., J.B. McDonald and A. Mantrala (1996), 'Something New, Something Old: Parametric Models For the Size Distribution of Income,' *Journal of Income Distribution* 6(1): 91-103.
- Corden, W.M. (1997), *Trade Policy and Economic Welfare* (revised edition), Oxford: Clarendon Press.
- Croser, J.L., (2002). *Trade Policy Reform, Income Distribution and Poverty in Indonesia: A CGE Analysis*. Unpublished M.Ec. thesis submitted to the School of Economics, University of Adelaide, December.
- Decaluwe, B., A. Patry, L. Savard and E. Thorbecke (1999), 'Poverty Analysis Within a General Equilibrium Framework,' Working Paper 9909 – CREFA, Department d'economique Universite Laval.
- Dervis, K., J. de Melo and S. Robinson (1982), *General Equilibrium Models for Development Policy*. Washington D.C.: World Bank.
- Devarajan, S. and D. Rodrik (1991), 'Pro-competitive Effects of Trade Reform: Results from a CGE Model of Cameroon,' *European Economic Review* 35: 1157-84.
- Dhanani, S. and I. Islam (2002), 'Poverty, Vulnerability and Social Protection in a Period of Crisis: The Case of Indonesia,' *World Development* 30(7): 1211-31.
- Dixon, P.B. and M.T. Rimmer (2001), *Dynamic, General Equilibrium Modelling for Forecasting and Policy: A Practical Guide and Documentation of MONASH*, Amsterdam: North-Holland.
- Dixon, P.B., B.R. Parmenter, J. Sutton and D.P. Vincent (1982), *ORANI : A Multisectoral Model of the Australian Economy*. Amsterdam: North-Holland.
- Fane, G. and C. Phillips (1991), 'Effective Protection in Indonesia in 1987,' *Bulletin of Indonesian Economic Studies* 27(1): 105-25.
- Fane, G. (2001), 'Estimates of non-tariff barrier to trade in the WAYANG model' .har file at <http://www.adelaide.edu.au/cies/indlist.htm>

- Francois, J.F. and D.W. Roland-Holst (1997), 'Scale Economies and Imperfect Competition,' Ch. 11 in *Applied Methods for Trade Policy Analysis: A Handbook*, edited by J. F. Francois and K. A. Reinert, Cambridge: Cambridge University Press.
- Freidman, J. (2002), '*How Responsive is Poverty to Growth? A Regional Analysis of Poverty, Inequality, and Growth in Indonesia, 1984-1999*,' paper prepared for conference on Spatial Inequality and Development, London School of Economics, 17-19 June.
- Hertel, T.W., P.V. Preckel and J.A.L. Cranfield (2000), 'Multilateral Trade Liberalisation and Poverty Reduction,' mimeo, World Bank Working Paper, Washington, D.C.
- Jones, R.W. (1971), 'A Three-Factor Model in Theory, Trade and History,' Chapter 1 in *Trade, Balance of Payments, and Growth*, edited by J. Bhagwati et al., Amsterdam: North-Holland.
- Levinsohn, J., S. Berry and J. Friedman (1999), 'Impacts of the Indonesian Economic Crisis: Price Changes and the Poor,' World Bank Working Paper, Washington, D.C.
- Pradhan, M., A. Suryahadi, S. Sumarto and L. Pritchett (2000), 'Measurements of Poverty in Indonesia: 1996, 1999, and Beyond,' Social Monitoring and Early Response Unit Working Paper.
- Reimer, J.J. (2002), 'Estimating the Poverty Impacts of Trade Liberalisation,' World Bank research paper for the project on Poverty and the International Economy, Washington, D.C.
- Suryahadi, A., S. Sumarto, Y. Suharso and L. Pritchett (2000), 'The Evolution of Poverty During the Crisis in Indonesia, 1996 to 1999,' Social Monitoring and Early Response Unit Working Paper.
- Warr, P.G. and M. Azis (1997), 'INDOSAM: A Balanced and Disaggregated 1993 Social Accounting Matrix for Indonesia,' ACIAR Indonesia Project Working Paper 97.06, Adelaide: Centre for International Economic Studies.
- Wittwer, G. (1999), 'WAYANG: A General Equilibrium Model Adapted for the Indonesian Economy,' ACIAR Indonesia Working Paper 99.10, Adelaide: Centre for International Economic Studies.
- WTO (1991), *Trade Policy Review: Indonesia. Vols. I, II*. Geneva: World Trade Organization.
- WTO (1994), *Trade Policy Review: Indonesia. Vols. I, II*. Geneva: World Trade Organization.
- WTO (1998). *Trade Policy Review: Indonesia*.
http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm
- Wymenga, P.S.J. (1991), 'The Structure of Protection in Indonesia in 1989,' *Bulletin of Indonesian Economic Studies* 27(1): 127-153.

Appendix Table 10A: Tariff and NTB schedule for Indonesia, 1993

| Commodity | Tariff rate (%) ^a | NTB equivalent (%) ^b | Tariff + NTB protection (%) |
|----------------|------------------------------|---------------------------------|-----------------------------|
| * ManuWoodProd | 9.8 | 33.3 | 43.1 |
| * OthManu | 16.3 | 26.5 | 42.8 |
| VegFruit | 11.7 | 27.1 | 38.8 |
| * PreservFood | 12.9 | 23.3 | 36.3 |
| NonAlcBvrgs | 8.4 | 26.0 | 34.5 |
| * ManuRubbPlas | 7.9 | 24.8 | 32.8 |
| Meat | 6.0 | 24.0 | 30.0 |
| SoyOtBeans | 0.6 | 28.9 | 29.5 |
| AlcohTabac | 5.5 | 23.2 | 28.7 |
| WheatProd | 1.8 | 25.1 | 26.9 |
| Elec_Gas | 25.0 | 0.0 | 25.0 |
| * ManuMetal | 6.0 | 18.9 | 24.9 |
| SeaProduct | 3.2 | 21.5 | 24.6 |
| GroundNut | 0.9 | 20.8 | 21.6 |
| * ProcessFood | 8.6 | 11.6 | 20.2 |
| * ManuNonmetal | 4.3 | 14.7 | 19.0 |
| * CommunEquip | 1.0 | 16.8 | 17.8 |
| * Machinery | 2.5 | 13.8 | 16.3 |
| SugarConfect | 1.0 | 13.9 | 14.9 |
| * ManuElectric | 4.1 | 10.1 | 14.2 |
| * ConstrEquip | 1.7 | 11.9 | 13.5 |
| * ManuChemical | 3.0 | 9.6 | 12.6 |
| Quarrying | 3.5 | 8.1 | 11.5 |
| * ManuPaperPro | 2.2 | 9.2 | 11.5 |
| Coal | 4.0 | 6.7 | 10.6 |
| PetrlRefPr | 3.3 | 6.6 | 9.9 |
| Coconut | 0.0 | 9.0 | 9.0 |
| * Textile | 2.7 | 5.7 | 8.4 |
| NatGas_GThr | 0.0 | 7.3 | 7.3 |
| * Clothing | 3.5 | 3.7 | 7.1 |
| AnimalFeeds | 1.1 | 5.5 | 6.6 |
| * TransRepair | 4.5 | 1.2 | 5.7 |
| LivestoProd | 0.5 | 4.0 | 4.5 |
| * CarpetRope | 1.9 | 2.1 | 4.1 |
| OilPalm | 3.2 | 0.0 | 3.2 |
| RubberRaw | 1.3 | 1.7 | 3.0 |
| OthAgric | 0.4 | 2.4 | 2.8 |
| * ManuIronStee | 2.0 | 0.0 | 2.0 |
| * Rice | 0.0 | 2.0 | 2.0 |

| | | | | |
|---|----------------|-----|-----|-----|
| | CassOroot | 1.6 | 0.0 | 1.6 |
| * | ManuNFBM | 1.5 | 0.0 | 1.5 |
| | FertPest | 1.0 | 0.0 | 1.0 |
| | MetalOreMini | 0.9 | 0.0 | 0.9 |
| * | KnittMills | 0.9 | 0.0 | 0.9 |
| | Yarn_Kapok | 0.7 | 0.0 | 0.7 |
| | AnmVgOil | 0.7 | 0.0 | 0.7 |
| | Maize | 0.2 | 0.0 | 0.2 |
| * | Leather | 0.1 | 0.0 | 0.1 |
| | OtService | 0.1 | 0.0 | 0.1 |
| | OFooFibCr | 0.0 | 0.0 | 0.0 |
| | CrudeOil | 0.0 | 0.0 | 0.0 |
| | Paddy | 0.0 | 0.0 | 0.0 |
| | SugarCane | 0.0 | 0.0 | 0.0 |
| | Tabacco | 0.0 | 0.0 | 0.0 |
| | Coffee | 0.0 | 0.0 | 0.0 |
| | Tea | 0.0 | 0.0 | 0.0 |
| | Wood | 0.0 | 0.0 | 0.0 |
| | ForestHunt | 0.0 | 0.0 | 0.0 |
| | Agricservice | 0.0 | 0.0 | 0.0 |
| | Copra | 0.0 | 0.0 | 0.0 |
| | LiqNatGas | 0.0 | 0.0 | 0.0 |
| | WaterSupply | 0.0 | 0.0 | 0.0 |
| | Building | 0.0 | 0.0 | 0.0 |
| | AgricConst | 0.0 | 0.0 | 0.0 |
| | PublicWork | 0.0 | 0.0 | 0.0 |
| | GasElConst | 0.0 | 0.0 | 0.0 |
| | OConstruct | 0.0 | 0.0 | 0.0 |
| * | Trade | 0.0 | 0.0 | 0.0 |
| | RestHotel | 0.0 | 0.0 | 0.0 |
| * | RoadRailTrav | 0.0 | 0.0 | 0.0 |
| * | SeaAirTrav | 0.0 | 0.0 | 0.0 |
| * | SrvcToTrans | 0.0 | 0.0 | 0.0 |
| | Cmunication | 0.0 | 0.0 | 0.0 |
| | BankInsur | 0.0 | 0.0 | 0.0 |
| | BusiReales | 0.0 | 0.0 | 0.0 |
| | GeneralGovt | 0.0 | 0.0 | 0.0 |
| | GovEducation | 0.0 | 0.0 | 0.0 |
| | GovHealtSrvc | 0.0 | 0.0 | 0.0 |
| | OGovSrvc | 0.0 | 0.0 | 0.0 |
| | PrvEdSrvc | 0.0 | 0.0 | 0.0 |
| | PrvHealthSrv | 0.0 | 0.0 | 0.0 |
| | OPrvSrvc | 0.0 | 0.0 | 0.0 |
| | Simple Average | 2.2 | 6.1 | 8.4 |

SOURCES: * indicates this firm belongs to the subset of industries which exhibit IRTS and imperfect competition features. (a) Author's Calculations from the WAYANG Database. (b) Estimates based on Fane (2001), Fane and Phillips (1991), and Wymenga (1991).