A PAM Analysis of Livestock Policies in Indonesia

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With the rapid increase in consumption of some livestock products in Indonesia, expansion of domestic production of these commodities may enhance smallholders' incomes, increase rural employment and add to the country's trade balance. Policy analysis matrices (PAMs) were constructed to estimate divergences between private and social costs and returns in poultry and pig production in selected regions of Indonesia. In each case, producers' use of capital was subsidised but feed input private costs exceeded social values, and output prices received by producers fell short of values based on world prices. Production of all products as import substitutes was socially profitable, but in many instances private returns to farmers were negative. Product price and feed cost divergences were the major policy-induced distortions. Reform of these policies was estimated in a static partial equilibrium framework to lead to supply expansions of each livestock product, a contraction in livestock product consumption, and therefore additional net foreign exchange earnings from the poultry and pig sectors of around $320 million.

Introduction

A considerable body of evidence has been constructed in recent years on the impact of government policies on the agricultural sectors of developing and newly-industrialising countries. These policies may directly provide incentives or disincentives to food production, or may indirectly impact on the profitability of that sector through the effects of interventions in non-agricultural sectors. Much of this evidence has been published by the World Bank in a recent set of volumes (Krueger, Schiff and Valdes; Schiff and Valdes; Krueger) although a notable omission from the volume on Asia is Indonesia, a country of some 180 million people. Analyses of pricing policies and Indonesian agriculture have been published elsewhere however, such as for food crops (Rosegrant et al) and sugar (Nelson and Panggabean). This paper examines similar issues in the Indonesian livestock sector.

Background

Due in part to their sustained rapid income growth, food consumption patterns are noticeably changing in the developing and industrialising countries of Northeast and Southeast Asia.[1] The trend is away from traditional cereals such as rice, to livestock and horticultural products. Income elasticities of demand for rice are negative in some of these countries (Ito et al, Huang et al, Bouis) while those of livestock products sometimes exceed unity (Sarma). Thus between the early 1970s and the mid-1980s, per capita consumption of cereals declined 0.7% per year in South Korea and 2.6% in Taiwan (Huang and Coyle), while annual consumption increases in each country averaged, respectively, 10% and 5% for meat, 5% and 7% for eggs and 20% and 7% for milk products.

Consumption levels are less-completely documented in Southeast Asia, but the trends appear to be moving in a similar direction. Income elasticities for rice are negative in Malaysia and Thailand (Huang and Coyle) and per capita consumption of livestock products is increasing. Average consumption across the ASEAN countries increased between 1984 and 1987 at rates of 6.4% per year for milk products, 5.7% per year for chicken meat, 4.3% per year for eggs, 2.2% per year for beef and 0.9% per year in the case of pork (Setboonsarng).

Given that growth in livestock product consumption is likely to continue expanding for some time in Southeast Asia (where per person con-

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[1] These regions include Korea, Taiwan, Malaysia, Indonesia, Thailand and the Philippines.

sumption levels are well below those in Northeast Asia), an opportunity exists to expand domestic production with benefits to rural incomes and employment, human nutrition and the balance of payments. However, government intervention in the region in some cases had provided disincentives to such expansion. This was particularly the case in Indonesia, where policies drove up feed costs but depressed livestock product prices, relative to world prices. Following sections discuss these policies and quantify the disincentives and policy transfers that resulted.

Policies and Protection

Indonesia was a minor net exporter of some livestock products and feedgrains until the early 1970s. Due to changes in food consumption patterns this situation had been reversed a decade later, since when Indonesia has been a net importer of some of these commodities, especially maize and soybeans. That production did not keep pace with demand was due in part to government policies being biased towards rice production. But since Indonesia achieved rice self-sufficiency in 1984, policies have aimed to encourage a more

diversified agriculture including livestock production.

Policies have been implemented by the Indonesian government with the intention of providing incentives to domestic production of livestock and feedgrains and shielding consumers from international market instability. Government regulated both international and domestic trade in livestock products, as well as domestic interregional trade in live pigs and cattle. Controls over the export of chicken meat, pork and eggs provided assistance to domestic consumers by depressing prices below international levels. Table 1 indicates the lack of trade in these products. The government, through its National Logistic Agency (BULOG) may also intervene directly in domestic meat markets for purposes of price stabilisation.

Turning to livestock feed ingredients, Indonesia is a net importer of major livestock feed ingredients—maize, soybeans and soybean meal. Monopoly import rights for these products reside with BULOG whose importing and stockholding policies reflect product price support and domestic price stabilisation objectives. Resulting price distortions have been most severe for soybeans with domestic prices 50% to 75% above prevailing world prices.

Table 1. Production, Consumption and Trade in Selected Livestock Products

	Year	Livestock Numbers ('000)	Production	Imports	Exports	Consumption	Per Capita Consumption (kg)[a]
			----------------------- '000 Tonnes[a] -----------------------				
Broiler meat	1984	11,058	78.5	2	—	80.5	1.1
	1985	14,366	114.5	1	—	115.0	1.2
	1986	17,380	139.2	2	—	141.2	1.4
	1987	21,818	174.6	2	—	176.2	1.4
	1988	27,704	181.7	1	—	182.7	1.4
	1989	26,292	210.4	—	—	210.9	1.5
	1990	27,043	216.0	—	—	216.0	1.5
Eggs	1984	29,559	207.3	—	—	207.0	1.8
	1985	31,785	227.2	—	—	227.0	1.9
	1986	38,688	250.7	—	—	251.0	2.2
	1987	39,968	259.0	—	—	259.0	2.2
	1988	38,413	248.9	—	—	249.0	2.1
	1989	50,922	262.0	—	—	262.0	2.1
	1990	53,375	274.6	—	—	275.0	2.1
Pork	1984	5,112	119.0	—	—	120.0	0.5
	1985	5,530	133.0	—	—	133.0	0.6
	1986	6,216	164.0	—	—	164.0	0.7
	1987	6,339	141.0	—	—	141.0	0.6
	1988	6,424	154.3	—	1.0	153.0	0.6
	1989	6,936	136.3	—	5.6	130.7	0.6
	1990	6,838	134.4	—	14.7	119.7	0.5

[a]Carcass weight equivalent for meats.
Sources: Indonesian Ministry of Agriculture.

The above set of policies may have benefitted consumers of livestock products and feed crop producers, but at the expense of livestock farmers. Following sections will quantify the extent of these policy distortions.

The Indonesian Livestock Sector

While the agricultural sector has contributed a declining share of Indonesia's total GDP and employment (respectively 66% and 44% in 1971 compared with 55% and 23% in 1987), livestock's contribution to agricultural GDP and employment has been rising. By the late 1980s, the livestock sector contributed 10% of agriculture's net output and provided almost 4% of total agricultural employment. Provided that government price policies are conducive to continued growth, this subsector of agriculture could supply increased domestic consumption, provide further employment opportunities, enhance farmer incomes and result in eventual export surpluses.

Poultry is a major component of the Indonesian livestock sector. Traditionally involving native breeds and small-scale village-based production, modern large-scale commercial enterprises have developed since the early 1970s. The latter facilities are concentrated near the major markets in West Java, this region accounting for one-third of all broilers and one-half of the layer population. Production of broilers has increased rapidly since 1981, at an average annual rate of 11.5% (Figure 1). Egg production increased at a rate of 9.9% per year over the same period. Net trade has been negligible in both cases, due at least in part to government controls over exports. Pork production since 1981 has increased at a slower rate (8.5%) than for poultry. Port consumption levels have not shown the same increase as for broiler meat and a small export trade developed in the late 1980s. Production of pork is concentrated off-Java where a higher proportion of the population are non-Moslem.

Accompanying the growth in poultry and pig production has been a rapid increase in the use of grains and meals as livestock feed (Figure 2). Total usage increased by 14.5% and 11.5% per year re-
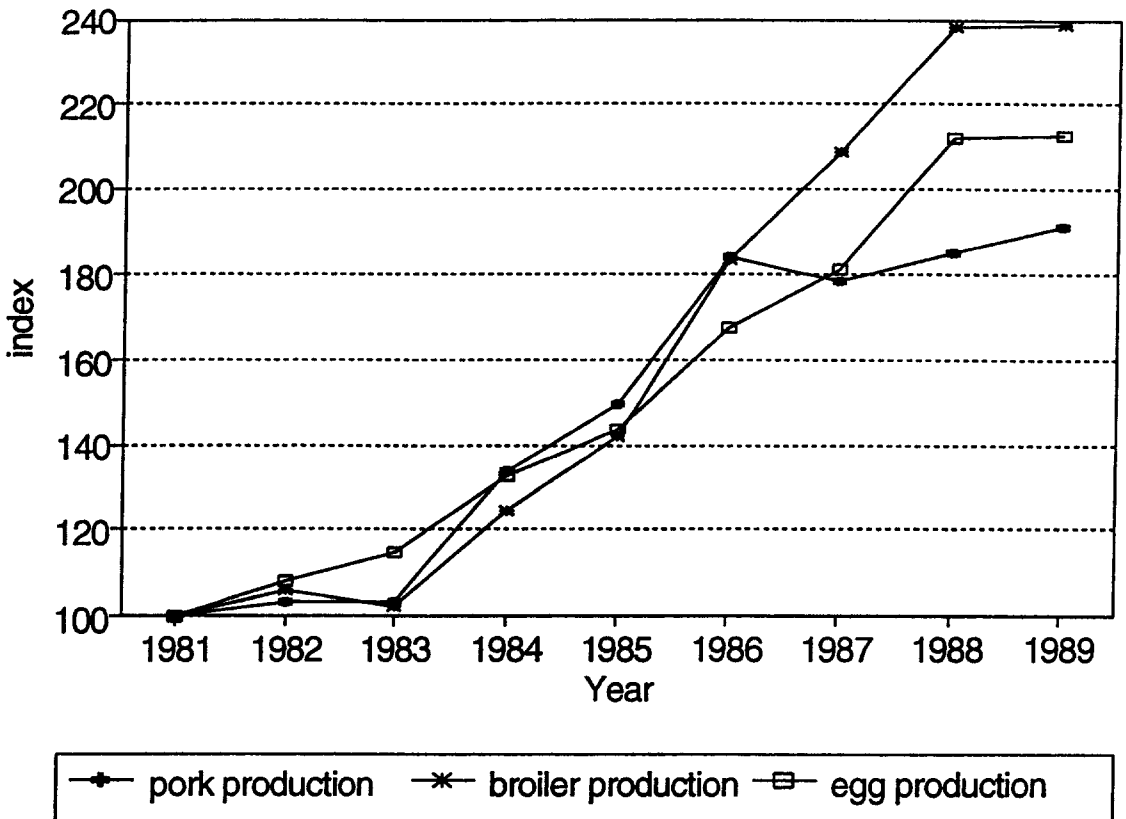

Figure 1.   Livestock Industry Production Trends: Indonesia (indices 1981 = 100)
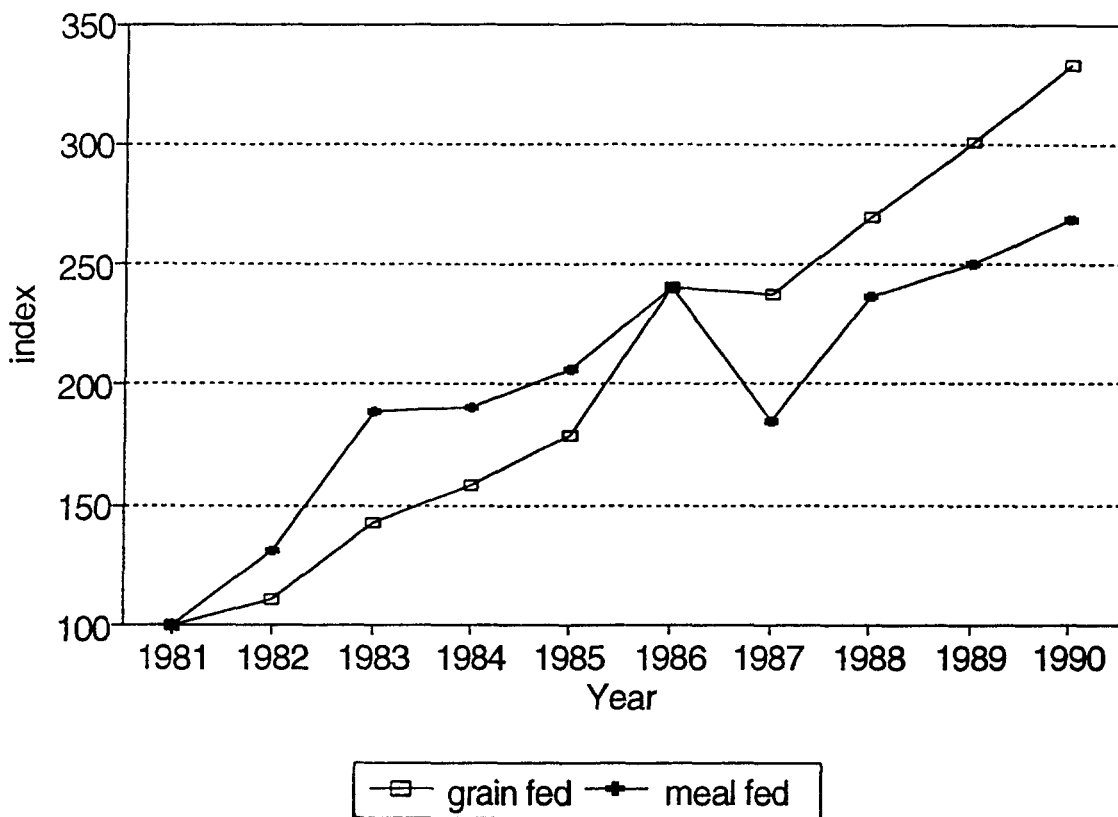
Figure 2.   Livestock Industry Feed Demand Trends: Indonesia (indices 1981 = 100)

spectively since 1981, rates that exceeded the annual growth in total livestock (poultry plus pork) output. This suggests a switch from traditional feed sources to intensive grain feeding and an increasing input of feedgrain per unit output, a trend noted in several developing countries (Sarma).

The PAM Analyses

Data and Assumptions

The Policy Analysis Matrix (PAM) as developed by Monke and Pearson provided the framework for the analyses. The generalised structure of a PAM is indicated in Table 2, where all entries are on a "per unit of output" basis. Each revenue and cost item is measured two ways—using observed market prices (private values), and then at international prices (social values). The latter purports to show what private costs and returns would be in the absence of domestic policies that affect producer incentives.

Production inputs are divided into two categories. Tradable inputs are those available in world markets, even if they are produced domestically and hence are potential exports. The second input category comprises the primary domestic factors of land, labour and capital. Some intermediate inputs are only available in domestic markets, and costs associated with these are disaggregated into their tradable and domestic factor components and entered in the appropriate cell of the matrix.

Economic profit is defined as the difference between the value of output and the costs of all inputs. When calculated at either market or international prices, the result is termed private or social profit, respectively. The social profit measure can be used to indicate the potential comparative advantage of the production activity under investigation.

The final row of the PAM indicates the extent to which policies distort revenues and costs from international levels. These differences can also be employed to measure the familiar nominal (NPC) and effective (EPC) protection coefficients:

$$\text{NPC} = \text{A/E}$$
$$\text{EPC} = (\text{A} - \text{B})/(\text{E} - \text{F})$$

Finally, the analysis reported in this paper assumed

Table 2. Structure of the Policy Analysis Matrix

| | | Input Costs | | |
	Revenues	Tradable	Primary Domestic Factors	Profits
Private values	$A = P_j^d$	$B = \sum_{i=1}^{m} a_{ij} P_i^d$	$C = \sum_{i=n}^{N} a_{ij} v_i^d$	$D = A\text{-}B\text{-}C$
Social values	$E = P_j^b$	$F = \sum_{i=1}^{m} a_{ij} P_i^b$	$G = \sum_{i=n}^{N} a_{ij} v_i^b$	$H = E\text{-}F\text{-}G$
Divergence	$I = A\text{-}E$	$J = B\text{-}F$	$K = C\text{-}G$	$L = D\text{-}H$

Notes: P_j^d, P_j^b = market (domestic) and international (border) prices per unit of the jth output;
P_i^d, P_i^b = domestic and border prices of the ith traded input;
a_{ij} = quantity of input i required per unit of the jth output;
v_i^d, v_i^b = domestic and border prices of the ith non-tradable input;
$i = 1, \ldots, m$ = tradable inputs; and
$i = n, \ldots, N$ = primary domestic factors.

that a switch from distorted (market) to undistorted (international) prices would have no impact on the quantities of inputs used per unit output—that is, the a_{ij}'s in the first and second rows of Table 2 are identical.

Private (market) data for the analyses were obtained from surveys of farmers, processors and traders conducted during 1988 (Kasryno et al). For both broiler and egg production, a total of 110 farmers were surveyed across the regions of Bogor and Tasikmalaya (West Java) and Lampung in South Sumatra. All regions are close to Jakarta, the major consumption point, and West Java is the largest producing region in Indonesia for broilers (34% of the total bird population in 1987) and for eggs (41% in 1987). The average number of birds on these surveyed farms varied from 2500 in Bogor to 1050 in Tasikmalaya and 750 in Lampung. Processing and distribution data were based on surveys of two egg wholesalers, two broiler wholesalers, two slaughterhouses and three boiler slaughter merchants.

Data used for the analysis of pork production were collected on the island of Bali. This region is the third largest in terms of pig numbers, accounting for 14% of the animal population in 1987 although the growth rate in recent years has exceeded that of the two larger regions (North Sumatra and East Nusa Tenggara). Bali is also a significant market for pork, comprising both the mainly Hindu native population and tourists. The pig farm sample was stratified into two distinct production systems. The first (7 surveyed farms) used modern management and feed systems, and averaged sales of 55 animals during the survey year. The second group (for which 13 farmers

were surveyed) operated on a smaller scale with average sales of 5 animals. The livestock were a native crossbreed and feedstuffs were predominately crop wastes such as sweet potato leaves and rice bran. Processing and distribution data on Bali were collected from surveys of two slaughterhouses and a total of eight agents involved with livestock collection, trading and wholesaling.

Standard methodology (for example, see Gittinger) was used to convert the above data to social values. This involved adjustments for direct transfer payments, for price distortions in traded and non-traded goods, and determination of the foreign exchange premium. Direct subsidies paid to producers, and taxes, are examples of transfer payments that must be removed from the data before social values can be obtained. Other subsidies in agriculture are paid indirectly by influencing market prices, for example through quantitative trade restrictions. These distortions on traded items were removed through the use of import and export parity prices, based on cif and fob prices adjusted for internal marketing costs. Import prices were used to value imported inputs to the livestock sector (for example feeds not produced domestically) and the export price was used to value inputs that would otherwise have been exported (for example, domestically-produced feed surpluses). On the output side, livestock products were valued using either import or export parity prices, depending upon whether social profitability was to be estimated for livestock production as an import-substituting or exporting sector. The social prices of land and labour inputs were estimated as the social value of outputs foregone through use of these inputs in livestock production. Other non-traded items were

decomposed into their tradable components (valued using export and import parity prices) and their primary domestic factors.

The Indonesian Government has introduced significant deregulation policies since 1983 (Kasryno and Suryana) and the general economy is now relatively undistorted. Rural labour markets operate in a competitive manner and the shadow wage rate was assumed to equal the market rate. The foreign exchange premium was estimated by the approximate method described by Scandizzo and Bruce (page 61) to be only two percent of the official rate, using 1986 data. Therefore the official and shadow exchange rates were assumed to be equal. A social interest rate of 18% was employed, compared with the market rate of 12% (Rosegrant et al). Land rentals commonly paid in the surveyed areas provided the market price of land. Since the effects of government policies have been capitalised into land rentals, the social price of land was obtained by subtracting estimates of these impacts (Rosegrant et al).

The analyses included production, processing (where relevant) and marketing activities up to the wholesale stage, with outputs being treated as import substitutes and then as exports. Outputs were therefore valued at wholesale, with social prices of outputs being equal to estimated cif import values plus the social costs of distributing product from the entry port to the wholesale market (import-substitution), or to fob export values less the social costs of marketing from wholesale to port (export). Jakarta was defined as the wholesale point in the

case of broiler meat and eggs, and Bali in the case of pork. Where the livestock system also produced by-products, such as culled birds in egg production, the value of such by-products net of processing and marketing costs was included in the estimates of system profitability.

Results and Discussion

Results to be reported and discussed here relate only to farm production, rather than for the livestock system as a whole. In most cases, off-farm activities accounted for less than 25 per cent of total system (social) costs, and the major distortions in the system turned out to be feed costs and product prices and not off-farm costs.

Tables 3 to 5 contain the policy analysis matrices for farm production of broiler, eggs and pigs. Findings are rather similar across commodities. The most striking policy effect is illustrated by the divergences between private and social feed costs. The poultry enterprises paid 20% above world prices for their feeds, while the pig farms in Bali paid 31% and 75% above world values for feedstuffs in the traditional and modern systems, respectively, due largely to the rice bran content of pig feed for which the market price exceeded social value by over 100%. The only other notable distortion of tradable input prices was in pig production where controls over interregional trade in pigs and international trade in pork had driven private costs of livestock above their social value.

Table 3. Policy Analysis Matrix: Egg Farm Production 1988

| | Revenue[a] | Domestic Resource Costs | | | | | Tradable Input Costs | | | Total Costs | Profit |
| | | Land | Labour | Capital | Variable Inputs[b] | Total | Feed | Other | Total | | |
				(rupiah/kg)				(rupiah/kg)			
Eggs (Bogor)											
Private	1189	0.62	27.95	66.21	31.95	126.73	1306.75	130.35	1437.10	1564	−375
Social	1544	0.52	27.95	90.89	29.10	148.45	1087.25	147.04	1234.28	1383	161
Divergence	−355	0.10	0.00	−24.68	2.85	−21.72	219.51	−16.69	202.82	181	−536
Eggs (Lampung)											
Private	1158	0.23	45.81	53.01	21.44	120.49	884.67	87.09	971.76	1092	66
Social	1504	0.20	45.81	71.42	19.77	137.19	735.96	99.95	835.92	973	531
Divergence	−346	0.03	0.00	−18.41	1.68	−16.70	148.70	−12.86	135.84	119	−465
Eggs (Tasikmalaya)											
Private	1253	0.54	47.25	71.92	29.02	148.74	1221.97	126.33	1348.29	1497	−244
Social	1628	0.46	47.25	95.46	27.72	170.89	1016.78	145.21	1161.98	1333	295
Divergence	−375	0.08	0.00	−23.54	1.31	−22.15	205.19	−18.88	186.31	164	−539

Source: Kasryno et al.
[a]Social revenue at the farm level was estimated as the private return divided by (1 + nominal rate of protection), with the latter based on the cif price.
[b]Domestic resource content of tradable inputs.

Table 4. Policy Analysis Matrix: Broiler Farm Production 1988

	Revenue[a]	Domestic Resource Costs					Tradable Input Costs			Total Costs	Profit
		Land	Labour	Capital	Variable Inputs[b]	Total	Feed	Other	Total		
				(rupiah/kg)[c]				(rupiah/kg)[c]			
Broiler (Bogor)											
Private	1836	0.72	57.40	97.23	76.40	231.75	1195.56	566.07	1761.63	1993	−157
Social	2825	0.62	57.40	119.91	75.28	253.20	995.12	573.66	1568.78	1822	1003
Divergence	−989	0.11	0.00	−22.68	1.12	−21.45	200.45	−7.59	192.85	171	−1160
Broiler (Lampung)											
Private	2225	0.29	120.36	128.94	141.06	390.65	1199.85	832.93	2032.78	2423	−198
Social	3423	0.24	120.36	150.35	130.39	401.34	998.69	789.22	1787.91	2189	1234
Divergence	−1198	0.04	0.00	−21.41	10.68	−10.69	201.16	43.71	244.87	234	−1432
Broiler (Tasikmalaya)											
Private	2008	0.39	45.46	48.32	78.45	172.61	1310.93	525.18	1836.12	2009	−1
Social	3089	0.33	45.46	51.79	75.90	173.47	1091.08	528.05	1619.13	1793	1296
Divergence	−1081	0.06	0.00	−3.47	2.55	−0.86	219.85	−2.87	216.98	216	−1297

Source: Kasryno et al.
[a]Social revenue at the farm level was estimated as the private return divided by (1 + nominal rate of protection), with the latter based on the cif price.
[b]Domestic resource content of tradable inputs.
[c]Rupiah per kg carcass weight in the cases of broilers and pigs.

Turning to the domestic resources, the major policy impact was on capital costs which were subsidised, although the level of this transfer was insufficient to compensate for the excess of private over social costs of tradable inputs. Overall, private costs of production exceeded social costs by around 9% for pig production (traditional technology), 9–13% for poultry farming and 33% for the modern pig farming system.

On the revenue side, the calculations of Tables 3 to 5 have treated the livestock sector as a substitute for imports, so import (cif) prices were used (plus appropriate handling costs to the wholesale mar-

ket) to socially value outputs. Private farm profits were, in the majority of cases, negative while social profits were always positive. This is partly due to the fact that farmers paid higher costs than would have been the case had policy distortions not been present. Another contributing factor, however, was the impact of international trade controls on the domestic prices of these commodities. Border prices (based on cif values) *exceeded* wholesale market prices by 39% for pork, 35% for broilers and 24% for eggs (Table 6). The revenue and profit data in the tables assume that these percentage differences also applied at the farm level.

Table 5. Policy Analysis Matrix: Pig Farm Production 1988

	Revenue[a]	Domestic Resource Costs					Tradable Input Costs			Total Costs	Profit
		Land	Labour	Capital	Variable Inputs[b]	Total	Feed	Other	Total		
				(rupiah/kg)[c]				(rupiah/kg)[c]			
Pigs (Bali-modern)											
Private	2139	0.00	286.99	164.92	319.63	771.54	970.04	331.90	1301.95	2073	66
Social	3507	0.00	286.99	202.70	281.17	770.86	554.17	231.68	785.85	1557	1950
Divergence	−1368	0.00	0.00	−37.79	38.46	0.68	415.87	100.23	516.10	516	−1884
Pigs (Bali-traditional)											
Private	1961	0.00	764.50	219.77	871.64	1855.91	529.78	374.38	904.16	2760	−799
Social	3215	0.00	764.50	278.68	820.90	1864.08	403.90	261.75	665.65	2530	685
Divergence	−1254	0.00	0.00	−58.91	50.74	−8.17	125.88	112.62	238.50	230	−1484

Source: Kasryno et al.
[a]Social revenue at the farm level was estimated as the private return divided by (1 + nominal rate of protection), with the latter based on the cif price.
[b]Domestic resource content of tradable inputs.
[c]Rupiah per kg carcass weight in the cases of broilers and pigs.

Table 6.   Domestic and Social Prices Used in the Study (Rupiah/kg)

Commodity	Domestic Wholesale Market Price	Import Parity Price[a]	Export Parity Price[a]	NPC[b]
Poultry meat	2303	3534	3226	−35
Eggs	1150	1509	1338	−24
Pork	2433	4014	3676	−39
Broiler ration[c]	1236	1028	—	20
Layer ration[c]	1138	947	—	20
Pig ration[c]	750	479	—	57

[a]cif/fob prices adjusted for internal marketing costs between port and wholesale.
[b]NPC is the nominal protection coefficient, based on import prices.
[c]For feeds, data are from Tables 3 to 5, averaged across regions/farm types.

Thus livestock producers' incomes suffered from the effects of both those policies that were designed to provide incentives to feedcrop producers and those that were concerned with the level of consumer food prices. Based on these data, the production of poultry and pigs in Indonesia to substitute for imports can add to social net revenue but the current set of policies do not provide the private incentives for this to happen.

Impact of Policy Reform on Output, Consumption, Exports and Foreign Exchange

In this section, the impacts on output and consumption, and therefore the net trade surplus and foreign exchange earnings, of policy reforms that remove distortions in feed and product prices are estimated. The analysis is conducted within a static partial equilibrium framework that estimates how consumption, production and trade would have differed from actual values in 1988 had the distortionary policies not been in effect.

Assuming constant elasticity demand and supply functions, the percentage changes in consumption and output in response to product and feed price changes are:

$$(1) \qquad \hat{Q}_{Di} = \sum_i f_{ij}\hat{p}_j$$

$$(2) \qquad \hat{Q}_{si} = \sum_j e_{ij}\hat{p}_j + e_{if}\hat{p}_f$$

where $\hat{Q}_{Di}$ = percentage change in consumption of livestock product i

$\hat{Q}_{si}$ = percentage change in output of product i

f_{ij} = demand elasticity for product i with respect to the price of product j

e_{ij} = supply elasticity of product i with respect to the price of product j

e_{if} = supply elasticity of product i with respect to the price of feeds

$\hat{p}_j$ = percentage change in product j price for domestic price to equal the export parity price (from Table 6).[2]

$\hat{p}_f$ = percentage change in feeds price for domestic price to equal the import price (from Table 6)

Indonesia was self-sufficient in broiler meat, pork and eggs during the 1980s. Removal of policy-induced distortions of product and feed prices would lead to movements along the demand and supply curves, and a rightward shift in the product supply curves due to the lower price of feeds. These adjustments would move the country away from self-sufficiency to one of export surplus.[3] The volume of exports after liberalisation was measured as:

$$(3) \qquad \triangle X_i = \bar{Q}_i(\hat{Q}_{si} - \hat{Q}_{Di})/100$$

where $\triangle X_i$ = increase in export volume for product i

$\bar{Q}_i$ = base period volume of production (= consumption) for product i.

The foreign exchange effect included the border price valuation of exports summed over the three livestock products less the change in value of imported inputs as a result of the livestock supply expansion:

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[2] Indonesia's export experience in the study products during the 1980s was limited to minor quantities of pork (Table 1). More significant traders (as both exporters and importers) in the region were Thailand (broilers), the Philippines (pork) and Malaysia (eggs). Therefore the (cif-fob) margins for these countries and commodities were applied to the Indonesian cif values to derive estimates of export prices.

[3] Although not reported in Tables 3 to 5, social profits were also positive when broilers and pigs were assumed produced for export and export (fob) prices were used to compute social output values. In the case of eggs, production for export was socially profitable only for the Lampung region.

(4) $\Delta F = \sum_i (c_i/r) \Delta X_i - (a_i/r)\Delta Q_{si}$

where ΔF = net increase in dollar earnings from
                the poultry and pig sectors due to
                liberalisation of livestock product
                and feed policies

ΔQ_{si} = change in domestic supply of live-
                stock product i

            = $\overline{Q}_i(\hat{Q}_{si}/100)$

c_i = export price of product i

a_i = value of tradable inputs (in social
                prices) per unit of product i output

r   = official exchange rate (Rupiahs per
                dollar)

Therefore the calculation of ΔF is restricted to
the poultry and pig sectors so does not take into
account, for example, foreign exchange impacts of
any decrease in grains and soybean production in
response to lower prices other than the impacts on
feed demands. The analysis also assumed that the
volume of traded inputs, (including feeds) per unit
of output remained constant as output varied.

Elasticity Estimates

Long-run price elasticities of demand for livestock
products in Southeast Asia have been estimated by
Tyers and Anderson, FAO and Sullivan et al. The
first of these references provides an estimate for
non-ruminant meat in Indonesia, and FAO provide
own-price and cross-price elasticities for poultry
meat and pork in Indonesia but no estimates for
eggs. Sullivan et al provides no elasticity estimates
for livestock products in Indonesia or Malaysia,
and only for poultry meat in Thailand. Own-price
demand elasticities for pork and poultry meat are
given for Philippines, and for all three livestock
products in the Northeast Asian economies of
South Korea and Taiwan. Sullivan et al also esti-
mated cross-price demand elasticities for poultry
meat and pork in the latter two countries. These
data are presented in Table 7.

With the exception of Tyers and Anderson, all
demand elasticity estimates are inelastic and at
least in South Korea and Taiwan, demand for eggs
is the most inelastic. The FAO elasticities for poul-
try meat and pork in Indonesia are more inelastic
than other estimates in Table 7, and so too are their
estimates for the same product in Korea and Tai-
wan when compared with the Sullivan et al data.
The cross-elasticities of demand range from almost
zero to 0.3, with some evidence from Korea and
Taiwan that the pork elasticity with respect to the

price of poultry is smaller than that of poultry con-
sumption with respect to pork price. Based on
1987 per capita consumption values (FAO) and
wholesale prices (Kasryno et al) for Indonesia, the
share of pork expenditure in total expenditure on
pork and poultry meat was 40%. Drawing on an
approximation to the Slutsky condition, this sug-
gests that the cross-elasticity of demand for pork
with respect to poultry meat prices should be the
larger of the pair of cross-elasticities (Gardner, p.
129).

The above references also provide an incom-
plete picture of long-run elasticities on the supply
side. Data from the FAO source were not consid-
ered since they measured the short-run (one year)
response only. The USDA reference did not in-
clude supply elasticities for Indonesia, although
those for Thailand and the Philippines are pre-
sented in Table 7. Only Tyers and Anderson pro-
vide estimates for Indonesia, but only for non-
ruminant meat. The own-price supply elasticities
lie between 0.5 and unity. Cross-elasticities with
respect to prices of feed ingredients are negative,
where absolute values are less than 0.4. At least in
the Philippines the feed price cross-elasticities ap-
pear lower for pork than in the case of poultry
production. This could be expected due to the gen-
erally higher share of purchased feeds in poultry
production costs compared with costs of pork pro-
duction.

Because of the variation in these estimates, plus
the fact that not many of the required elasticities
have been measured from recent Indonesian data,
two scenarios were constructed. The first set (Sce-
nario A) were chosen to provide an upper limit to
the values of the export product surplus, while the
second set (Scenario B) provided a lower limit. All
chosen elasticity values in these scenarios lay
within the range of values in Table 7. The selected
values are displayed in Table 8.

Estimated Impacts

Results are calculated for the two elasticity scenar-
ios and reported in Table 9. While some uncer-
tainty exists over the values of the elasticities, the
ranges of outcomes estimated in Table 9 give an
indication of the likely impacts of livestock prod-
uct and feed policy liberalisation.

The combination of higher product prices and
lower feed costs was estimated to provide a con-
siderable production boost under either scenario,
especially for poultry meat and pork. Had these
prices been deregulated, domestic production of
broilers and pork in 1988 could have exceeded

Table 7.   Selected Elasticity Estimates

Item	Author	Country	Elasticity
Own-price demand elasticities			
Poultry meat	Sullivan *et al*	Thailand	−0.8
	Sullivan *et al*	Philippines	−0.5
	Sullivan *et al*	Korea	−0.7
	Sullivan *et al*	Taiwan	−0.6
	FAO	Indonesia	−0.4
	Tyers and Anderson	Indonesia	−1.4[a]
Pork	Sullivan *et al*	Philippines	−0.65
	Sullivan *et al*	Korea	−0.9
	Sullivan *et al*	Taiwan	−0.65
	FAO	Indonesia	−0.5
Eggs	Sullivan *et al*	Korea	−0.2
	Sullivan *et al*	Taiwan	−0.5
Cross-price demand elasticities[b]			
Poultry:Pork	FAO	Indonesia	0.1
	Sullivan *et al*	Korea	0.21
	Sullivan *et al*	Taiwan	0.34
Pork:Poultry	FAO	Indonesia	0.1
	Sullivan *et al*	Korea	0.04
	Sullivan *et al*	Taiwan	0.08
Own-price supply elasticities			
Poultry meat	Tyers and Anderson	Indonesia	1.0[a]
	Sullivan *et al*	Thailand	0.7
	Sullivan *et al*	Philippines	0.5
	Sullivan *et al*	Korea	0.8
Pork	Sullivan *et al*	Philippines	0.45
	Sullivan *et al*	Korea	0.7
Eggs	Sullivan *et al*	Korea	0.7
Cross-price supply elasticities[b]			
Poultry: coarse grains	Tyers and Anderson	Indonesia	−0.4[a]
Poultry: corn	Sullivan *et al*	Thailand	−0.12
	Sullivan *et al*	Philippines	−0.11
Poultry: soymeal	Sullivan *et al*	Thailand	−0.09
	Sullivan *et al*	Philippines	−0.05
Pork: corn	Sullivan *et al*	Philippines	−0.04
Pork: soymeal	Sullivan *et al*	Philippines	−0.02

[a]Non-ruminant meats.
[b]Elasticity of the first-named product with respect to price of the second.

their actual values by between 20% and 40%, while egg production could have been 10% to almost 20% above the actual 1988 level. The higher prices would have led to a decrease in total consumption of these products, particularly in the case of scenario A where demands are assumed to be relatively more elastic. These demand and supply changes would have resulted in an exportable surplus of each commodity which when valued at border (fob) prices would earn, net of the cost of tradable production inputs, between $0.20 billion and $0.44 billion at 1988 prices. In that year, Indonesia's total export receipts were $19.2 billion and total imports $13.2 billion. Livestock policy liberalisation could therefore make a contribution to the country's ability to earn foreign exchange, to the extent of around 5% of the country's trade balance in 1988.

Table 8.   Elasticity Scenarios for the Impact Analysis

Elasticity	Scenario A	Scenario B
Own-price demand elasticities		
Poultry meat	−0.9	−0.4
Pork	−0.9	−0.5
Eggs	−0.5	−0.2
Cross-price demand elasticities		
Poultry:Pork	0.10	0.20
Pork:Poultry	0.15	0.25
Own-price supply elasticities		
Poultry meat	0.8	0.5
Pork	0.7	0.5
Eggs	0.7	0.5
Cross-price supply elasticities		
Poultry:Feed	−0.4	−0.1
Pork:Feed	−0.04	−0.02
Eggs:Feed	−0.4	−0.1

Table 9.   Some Impacts of Livestock Product and Feed Price Liberalisation

Impacts	Scenario A	Scenario B	Mid-Point Value
Change in Production (%)			
Poultry meat	39	22	31
Pork	37	26	32
Eggs	18	10	14
Change in Consumption (%)			
Poultry meat	−31	−6	−19
Pork	−40	−16	−28
Eggs	−8	−3	−6
Exports ('000 tonnes)			
Poultry meat	127	50	89
Pork	119	64	92
Eggs	65	32	49
Change in net foreign exchange			
($ million)	440	196	318

Notes: (i)   Base period values were the 1988 values in Table 1.
     (ii) Official exchange rate = Rupiah 1655 per US$.
     (iii) Price changes (see Table 6) required to equate domestic prices with export parity prices (products) and import parity prices (feeds):
        products: 40% (poultry meat), 51% (pork) and 16% (eggs)
        feeds: − 17% (broilers and layers), and − 36% (pigs).

Concluding Remarks

This analysis illustrates the interactions among various policies that are targetted at different groups of farmers (e.g. livestock raisers and crop farmers) and consumers. The production of poultry and pigs in Indonesia yields social benefits that outweigh the costs, although these price signals may not be apparent to farmers. Expansion of the livestock sector could be enhanced through appropriate policy reforms and could make a worthwhile addition to foreign exchange earnings, albeit at the expense of consumers and the domestic feed crop sector. However consumers would receive benefits from the lower grain prices, an impact not included in this partial equilibrium analysis.

It would be prudent to interpret these results with some caution for a number of reasons. First, the farm surveys provided data for only selected regions of Indonesia, so may not be representative of the poultry and pig sectors as a whole. Second, the policy reform impact analysis employed uncertain elasticity parameters, assumed that the elasticities remained constant over rather large price changes, and was static rather than dynamic and therefore ignored demand and supply curve shifts that might occur for reasons other than those studied here. Third, the measurement of impacts was restricted to the livestock sector, so did not include welfare changes or foreign exchange impacts of livestock and feed policy liberalisation on other sectors, notably the cropping industry. Fourth, the simulated switch of the livestock sector from im-

porter to exporter meant that export prices had to be based on import-export price bands experienced in nearby countries. Fifth, the lack of past exporter experience meant that the product processing costs related to the preparation of import-substitute products, which could underestimate the processing costs of the same exported products.

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