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Research Article
An Assessment of the Impact of Government Policies on Broiler Production in Peninsular Malaysia

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Abstract

Objectives: This study was designed to assess the impact of Malaysian government policies on broiler production in Peninsular Malaysia. **Methodology:** The study compared contract and non-contract farmers who produced and sold chickens according to three different production sizes. A policy analysis matrix containing policy protection indicators was used to evaluate the impact of government protection on broiler production in Peninsular Malaysia. Data were collected from 310 farms in Peninsular Malaysia using a field survey. **Results:** The results suggest that broiler production under contract farming is more profitable than under non-contract farming. Calculation of the nominal protection coefficient reveals that producers are not protected by the existing policies. **Conclusion:** The broiler industry is in need of government assistance in order to enhance its competitiveness.

Key words: Policy protection, broiler production, nominal protection coefficient, social profitability, Malaysia

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Malaysia has different policy objectives and has emphasized different policy instruments over the last several decades than those of developed countries. In Malaysia, there have been government interventions in agriculture in the form of subsidies, taxation and regulatory restrictions on the production and trade of commodities, since the majority of poverty in Malaysia is concentrated in rural areas[1] where most agriculture occurs.

The government realized that it was vital to develop the agricultural farm sector in order to alleviate rural poverty. This has led to the above mentioned applied intervention by the government that focuses on poverty as it relates to agriculture. Agricultural development programs were designed to improve the economic and social well-being of farming communities in particular and rural populations in general. Agricultural policies are also proposed to enhance output and productivity as a means of addressing Malaysia's growing population. The primary objective was to increase agricultural production and a secondary objective was to enable exports of a particular agricultural commodity. These programs and policies were expected to boost the agricultural productivity, employment and income of smallholder farms and foster food security[2].

To achieve these objectives, seven five-year development plans have been rolled out since independence, carefully designed to promote the country's social stability and economic growth. In each plan, the government incorporated financial and fiscal strategies, as well as provided administrative assistance, to encourage investment, expand export activities, promote research and development and train the workforce to increase competitiveness[3].

The primary livestock development policies [1st and 2nd Five-Year Plan of Malaya (1956-60) and (1961-65)] focused mainly on animal farming and disease control. Throughout the relevant periods, the national level of self-sufficiency (SSL) for poultry was 100%. In the 1st Malaysia Plan (1MP, 1966-70), the aim of the livestock development policy was to support, on an absolute and ongoing basis, a study on all aspects of livestock production. To this end, the Department of Veterinary Services (DVS) was put in charge of all aspects of animal health, animal production and veterinary public health[4].

The objective of the national livestock policy is to increase domestic production of meat-based protein, to reduce dependence on imports and to supply meat-based protein to consumers at affordable prices. The government interventions in support of its import substitution strategy have considerably developed the livestock sector. Examples of this have been the general provision of an efficient animal health service, research and development activities, licensing and the regulation of slaughter. Livestock production in Malaysia relies on a larger share of imported materials (breeding stock, feed-grains and feedstuffs and animal vaccines[5]) than do other food production sectors.

Because of its continued dependence on imports, the development of the broiler industry was again highlighted in the National Agriculture Policy (1998-2010) and the National Agro-food Policy (2011-2020[4]). Today, developing the broiler industry is imperative to sustaining food security for the nation. The National Agricultural Policy (1998-2010) emphasizes broiler production in its plans to ensure a sufficient supply of broiler meat. Consistent with this focus, an effort to integrate the industry and stimulate efficiency among small-scale poultry farmers was highlighted as a main strategy. In addition, the National Agro-food Policy (2011-2020) contained several mechanisms to ensure the competitive operation of the broiler industry. These plans include a plan to reinforce broiler production activities by promoting modern technology along with good farming practices, such as a closed-house system and automation. In summary, the Malaysian government has outlined sound policies, plans and strategies to promote the agricultural sector.

The livestock subsector, especially the nonruminant category, is vital to expediting the development of the agricultural sector. The contribution of the livestock subsector to the Gross Domestic Product (GDP) is trending upward, increasing from 9.1% in 2012 to 11.6% in 2016, which is an annual growth of 6.6%[6]. The nonruminant category demonstrates extraordinary development. This is primarily driven by efficient and organized entities in the form of large companies that control a more significant share of the market than smallholders as a group. In 2016, the production of broilers accounted for 95% of the total livestock production, whereas duck contributed 3.3%, beef 0.27%, lamb 0.04%, mutton 0.14% and pork 0.58%[7]. Broiler meat also achieved greater than 130% self-sufficiency in the period from 2007-2012[8]. However, Shamsudin[5] argues that while broiler meat in Malaysia is self-sufficient, problems such as production accessibility, sustainability and non-optimal resource utilization still exist.

The high percentage share of broilers in the total livestock value and the increasing self-sufficiency level suggests that the broiler industry accounts for much of the protein needs of the people, which is not surprising given that Malaysia is a Muslim country with a diverse population and chicken is the only meat that is not forbidden by any world religion. However, the industry was not without problems. According

to the DVS, the cost of poultry feed to produce broilers constitutes more than 70% of the total production cost. This statistic has been confirmed by other researchers[9]. Poultry feed is typically composed of 51% corn and 49% soybean meal. These ingredients are imported and their prices vary according to global supply and demand, resulting in a higher domestic price for broiler meat compared to the world price. This study asks the following questions: "Can the feed price be reduced and is it necessary to reduce the cost of feed in order for the industry to remain competitive and sustainable?" [9-12] . The study also evaluates the impact of current policies on broiler production and the effect that government protections have on the industry. Furthermore, this study contributes to the understanding of how the industry can remain profitable and hence competitive, during times of unstable prices for agriculture commodities such as feed corn. Finally, it is interesting to note that the broiler industry is one of the most promising industries for contributing to a future food trade surplus[13], given the persistent food trade deficit Malaysia has experienced over the years.

METHODOLOGY

Study area and farm survey: This study used primary and secondary data from sources that include the Department of Veterinary Services (DVS), the Department of Statistics, Ministry of Agriculture (MOA) and Ministry of Finance (MOF). The secondary data were used to understand the industry and to frame the research.

The primary data were the main data analyzed in the study. To classify the population carefully, multistage sampling techniques were employed to select a sample of broiler farmers from among 2403 registered farms in Peninsular Malaysia[8]. First, multiple-stage sampling was used to stratify the states in Peninsular Malaysia according to region: Northern, Southern, East Coast and Central. The next stage involved selection of broiler farmers engaged in contract and non-contract farming. The third stage of selection was according to farm sizes across the regions. Lastly, simple random sampling was conducted to choose 310 broiler farmers, whom were each given a survey questionnaire to complete. This sample accounts for more than 10% of the total population of broiler farms in Peninsular Malaysia. The research instrument used in this study was carefully designed to extract variables to be used in the construction of a Policy Analysis Matrix (PAM).

Policy analysis matrix: The policy analysis matrix was developed by Monke and Pearson[14], with the comparative advantage indicators improved by Masters and Winter-Nelson[15], and is used for measuring the impact of government interventions and efficiency in production.

The main aim of PAM is to measure private and social profitability. Since PAM is an accounting matrix, it does not identify behavioral relationships but it helps in policy-making and decision-making. Thus, it is used to assess the effects of government policy interventions. PAM is also used to analyze income generated by protections and other market disruptions. Yao[16] described PAM as a product of two accounting identities. First, PAM is based on a simple accounting identity: Profit = Revenue - cost. The second identity measures the effect of divergences as the difference between the observed parameters and the parameters that would exist if distortions were removed.

The PAM compares two types of prices: private and social. Private prices are the prevailing prices in the market. Social prices, on the other hand, are prices that reflect the level of insufficiency of resources (input or products output). The difference between private and social prices indicates the transfer size of the system in terms of taxes and subsidies.

Furthermore, private prices are those used for the exchange of goods and services and in budgets. These are also called market or financial prices. Social prices are prices that prevail in the presence of policy distortions such as taxes, subsidies, or market failures. They reveal the value to society rather than to private individuals. They are the prices used in economic analysis when the objective is to maximize national income. These are also cold shadow prices, opportunity costs or efficiency values. The determination of social price is one of the main tasks of economists because these values offer the best approach to enhancing income and social welfare. For globally traded goods, world prices [free on board (FOB)] for exports and Cost insurance and freight (CIF) for imports] were used. Since domestic factors do not affect trade on global markets, social prices difficult to calculate and one way to do so would be by discounting the effects of policy.

Policy analysis matrix indicators

Nominal protection coefficient (NPC): The nominal protection coefficient (NPC) measures the level of protection for a tradable output by calculating it as the ratio of the revenue at the private price to the revenue at the social price (NPC) = A/E. This ratio indicates the impact of policy on the divergence between tradable input (NPCI) and tradable output (NPCO). Subsidies to output are reported by NPCO (A/E) if the NPC value is greater than one and input subsidies lead to NPCI (B/F) if the NPC value is less than one[17]. An NPC above one indicates that the system benefits from protection

because the revenue generated at the private price is greater than the revenue generated at the social rate. Conversely, an NPC below one indicates that the primary output is undervalued at the private price, resulting in a transfer of wealth from the production system to the rest of the economy. The equation of NPC[18] is given below:

$$NPC = \frac{Pp+Po/tonne}{Pb} = \frac{(Pp-Pb)+Po/tonne}{Pb+1}$$

Where

Pp = Producer price, inclusive of market price support measures
Pb = Border price
Po = Payments based on output

Effective protection coefficient (EPC): The Effective Protection Coefficient (EPC) compares the added value at a private price to the added value at a social price [EPC= (A-B)/(E-F)], which provides a combined index of the level of trade distortion on both tradable inputs and outputs. EPC captures the impact of government policies, such as subsidy and tax either on the input or output market. The coefficient of EPC indicates the level of policy transfer from the output and tradable input distortion. An EPC above 1 means the selected system is protected, whereas an EPC below one means that the value generates less added value at market price than social prices or, alternatively, that it is explicitly or implicitly taxed.

Producer subsidy equivalent (PSE): The producer subsidy equivalent denotes the impact of the market policy distortion on the increase or decrease of the total revenue of the system at market price. A positive PSE is indicates a producer subsidy, whereas a negative value indicates a consumer subsidy. The PSE can be expressed as PSE = L/A in the PAM model.

Social profitability: Social profits measure efficiency or comparative advantage. To compare similar outputs, the results can be taken from the second row of the PAM matrix, where social profits is equal to social revenues minus social costs, H = (E-F-G) (Table 1). If the social profits are positive, then that is an indication of an efficiency. A system cannot survive without support from the government when social profits are negative because such a system wastes scarce resources by producing at social costs that exceed the costs of importing the same commodity. The choice is clear for efficiency-minded policy makers: Ratify new policies or eliminate existing ones to offer private incentives for systems that generate social profits, subject to non-efficiency goals.

General assumptions: In theory, social prices are those that would exist in a perfect market situation without government intervention. Such rates are estimated using a variety of methods. Examples include the identification of measurable market interventions that create variances in observed and free market prices, the calculation of border equivalent or parity prices and the estimation of shadow prices[14]. Tradable inputs consist of those inputs that can be traded in the global marketplace, e.g., medicine and vaccines, feed and DOC. Non-tradable inputs are mainly domestic inputs that cannot be traded internationally, e.g., labor and local capital. Some inputs, however, are a mixture of tradable and non-tradable components.

Private values must be converted into social values before calculation of DRC. Conversion factors (CF) were used to transform private values to social values. The CF of the selected element that had direct involvement in broiler production was estimated using the formula created by Veitch[19]. The items that needed to be determined by the CF were characterized by immediate inputs and primary inputs. The immediate inputs were feed, MVS (medicine, vaccines and supplements, livestock purchased, fuel, repair and maintenance, utility and office supplies). The primary inputs were labor, depreciation, interest and land rent (Table 2).

In addition, the cost of inputs must be converted to domestic and foreign components using conversion ratios. All inputs and outputs not being traded across national borders, either because of the cost of production or limited trade practices, are called domestic components. The cost of domestic components is also considered a non-tradable cost. In contrast, all traded inputs and outputs whose production and consumption affect the country's level of imports or exports on the margin are called foreign components. The

Table 1: The general structure of the policy analysis matrix (PAM)

		Costs		
Price	Revenues	Tradable inputs	Domestic factors	Profits
Private price	A	B	C	D = (A-B-C)
Social price	E	F	G	H = (E-F-G)
Effective of divergence	I = (A-E)	J = (B-F)	K = (C-G)	L = (I-J-K) = (D-H)

Monke and Pearson[14]

Table 2: Conversion factors from private to social analysis

Item	Conversion factors
Intermediate Input	
Feed	0.95
MVS	0.88
Repair and maintenance	0.78
Water	0.75
Electricity	0.84
Fuel and oil	0.88
Livestock purchase	0.95
Office Supplies	0.90
Tax	0.00
License	0.00
Primary Input	
Labour depreciation:	0.82
Building	0.86
Equipment	0.90
Transportation	0.70
Interest	
Building	1.30
Equipment	1.30
Livestock	1.30
Transportation	1.30
Working capital	1.30
Land rent	1.00
Losses	1.00

Veitch[19]

Table 3: Allocation of costs between tradable and non-tradable components

	Non-tradable (%)	Tradable (%)
Intermediate Input		
Raw materials	10	90
Repair and maintenance	50	50
Water	90	10
Electricity	90	10
Fuel and oil	50	50
Office supplies	100	0
Primary Input		
Labor	100	0
Depreciation	67	33
Interest		
Building	100	0
Equipment	100	0
Transportation	100	0
Work capital	100	0

Veitch[19]

cost of foreign components is also known as a tradable cost. The breakdown of domestic and international components is presented in Table 3.

RESULTS AND DISCUSSION

The study used the policy analysis matrix (PAM) to evaluate the competitiveness of broiler production in the Malaysian poultry industry and to assess the impact of current policy on the broiler production system. The most prominent indicators used from the PAM were the nominal protection coefficient (NPC), the effective protection coefficient (EPC) and social profitability (SP).

Policy indicator analysis: The ratio designed to measure output transfers is the nominal protection coefficient of output (NPCO). The NPCO shows how much private prices differ from social prices. If the NPCO is greater than one, the private price is higher than the import or export price and therefore, the industry is benefitting from protection. If the NPCO is less than one, the private price is lower than the comparable world price and the industry is unprotected by policy. As seen in Table 4, the NPCO value for the broiler industry is less than one for all calculated scales of broiler farms and ranged from 0.629 for large contract farming to 0.779 for medium non-contract farming. The results indicated that policies have caused the domestic output price of the broiler industry in Peninsular Malaysia to be less than the world price by approximately 20-36%[20]. In other words, the value of total output was approximately 20-36% lower than it would have been in the absence of the policy. Thus, the current price of broiler products has indirectly provided an incentive for the development of broiler production in Peninsular Malaysia.

Values that are free of currency or commodity differences are used to compare tradable inputs. The ratio that measures tradable input transfers is called the nominal coefficient on inputs or NPCI. The NPCI indicates the extent to which private prices of tradable inputs vary from social prices. If the NPCI is greater than one, the domestic input cost is greater than the input cost at world prices and the system is taxed by policy. If the NPCI is less than one, the private price is lower than the equivalent world price and the system is subsidized by policy[21]. According to the assessment of government protection in Table 4, the NPCI of the Malaysian broiler industry ranged from 1.151-1.152. These coefficients suggest that producers were paying approximately 15% more for their tradable inputs than if they obtained them at their respective social price[22]. This difference indicates that the policy provided a 15% tax per unit of tradable input that was paid by domestic farmers[23].

The effective protection coefficient (EPC) measures the net effect of different interventions in the market and in doing so, indicates that interventions can either enhance or diminish economic efficiency[24]. The EPC measures the net effect on the product market of tradable input and output policies. From the results displayed in Table 4, there is a net tax on the producer's value added in all farm scales for both contract

Table 4: Policy analysis indicators

	Contract			Non-contract		
Scale	Large	Medium	Small	Large	Medium	Small
NPCO	0.629	0.755	0.755	0.753	0.779	0.671
NPCI	1.152	1.151	1.152	1.151	1.151	1.151
EPC	0.401	0.373	0.288	0.337	0.336	-0.075

Author calculation based on data collected in 2015

and non-contract farmers, since the EPCs all are <1. These coefficients demonstrate that the Malaysian broiler farmer is taxed on value added[16].

In summary, the results in Table 4 indicate that the government policy to increase broiler production can lead to further losses in resource allocation efficiency. The disconnect between the outcomes and government policy needs further analysis by the PAM.

The government policy in the form of a value-added tax on input production in the broiler industry is associated with a higher proportion of tradeable components in the inputs used in broiler production. This is particularly true for feed and the medicine vaccine supplement (MVS). Broiler production uses 80% of foreign components even as the input MVS for broiler production uses 80% of tradable components[11].

Producer subsidy equivalent (PSE): The PSE evaluates the impact of policies on profits as a share of revenues. Because the PSE accounts for factors affecting input and output prices, it is a complete measure of protection from trade. The PSE can be computed in the PAM as PSE = L/A.

Table 5 shows the results of the PSE in contract and non-contract farming for three different scales of farms. The negative values of the PSE indicate that the government subsidy shifted to the consumer. This means if the PSE is greater than zero, the producer was subsidized, whereas if the PSE is less than zero, then the consumer was subsidized. This is the reason why broiler meat is the cheapest source of protein in the country.

Social profitability analysis: All the social profitability values were positive (Table 6). These results indicate that both contract and non-contract broiler farms in Peninsular Malaysia are efficient. According to Table 6, the large-scale broiler farm under contract farming may produce the highest profits in the broiler sector. Although all the scales were socially profitable, the contract farmer generated profits higher than those poultry farmers engaged in non-contract farming.

Sensitivity analysis of policy indicators: The sensitivity analyses in this study were used to determine the main factors

Table 5: Producer subsidy equivalent or PSE

Kind of business/ farm scale	Producer subsidy equivalent PSE
Contract	
Large	-0.67
Medium	-0.43
Small	-0.49
Non- contract	
Large	-0.44
Medium	-0.40
Small	-0.65

Author calculation based on data collected in 2015

Table 6: Social profitability

Kind of business/farm scale	Social profitability
Contract	
Large	4459.26
Medium	2842.56
Small	2377.32
Non- contract	
Large	2880.09
Medium	2423.16
Small	1746.11

Author calculation based on data collected in 2015

that may affect current national policy. The results from the study will help to answer the questions relating to agricultural diversification in Malaysia: e.g., 1. How can the policies supporting diversification be justified under different scenarios in the future? 2. How sensitive are the NPC values to changes in key factors? 3. What are the potential costs and benefits of different government policies supporting diversification?

By calculating the NPC values under four different scenarios, the study estimated the degree of change needed in each of the evaluated factors to alter the competitiveness of the broiler industry and the effect of policy on broiler production. The descriptions of the various simulation scenarios and their results are presented in Table 7.

In the first scenario, a 30% reduction in the shadow exchange rate increased the NPC from 0.629-0.899 for large contract farms. This means that the value of the tax decreased from 0.37-0.10. For medium contract farms, the NPC increased to greater than one, changing from 0.755-1.078, which means that instead of a tax there is a subsidy. In the second scenario, a 50% decrease in the FOB price means broiler production subsidies in all scales of farms because the NPC values

Table 7: Sensitivity analysis

	Contract			Non- contract		
Scale	Large	Medium	Small	Large	Medium	Small
Scenario 1: Decreasing exchange rate by 30%						
NPC	0.899	1.078	1.079	1.076	1.112	0.959
Scenario 2: Decreasing FOB price of broiler by 50%						
NPC	1.259	1.510	1.511	1.506	1.557	1.342
Scenario 3: increasing tax in broiler production by 5%						
NPC	0.661	0.793	0.793	0.791	0.818	0.775
Scenario 4: decreasing tax in broiler production by 5%						
NPC	0.598	0.717	0.718	0.715	0.740	0.637

Author calculation based on data collection 2015

increased from less than one to greater than one and the subsidies ranged from 25-50%. When the tax on broiler production increased by 5% in the third scenario, the NPC values showed a corresponding increase in all scales of farms, meaning that the tax values increased. In the last scenario, the tax was reduced by 5%. The results show a decrease in the NPC values, indicating that all scales of farms are taxed by different tax values.

This study analyzed the competitiveness of the broiler industry and evaluated the effect of present government policies on broiler production[22]. Government protection was evaluated using the following policy indicators: the nominal protection coefficient of output, the nominal protection coefficient of input, the effective protection coefficient, social profitability and the producer subsidy equivalent[21].

The initial set of results of social profitability suggests that broiler farming is profitable and efficient, which means that it is competitive on all farm scales, especially for the contract producers who gain the highest profits. The results of the producer subsidy equivalent (PSE) calculations indicate that government subsidies shifted to the consumer, since all the PSE values were negative. The nominal protection coefficient of input (NPCI) values indicate that producers were taxed approximately 15% more for their tradable inputs than they would have paid at their relevant social price[22]. The nominal protection coefficient of Output (NPCO) calculations show that the industry was taxed because the values were less than one in all farm scales, supporting an overall conclusion that the Malaysian government is taxing the broiler production system. The effective protection coefficient (EPC) values show that there is a net tax on the producer's value added. It is, therefore, logical to conclude that diversification induced by government policies through input subsidies may further alter resource allocation efficiency. Based on the sensitivity analysis results, it can be concluded that a drop in the shadow exchange rate and FOB prices by 30 and 50%, respectively, would cause the NPC value to change to a value greater than one. This would mean that the producer is protected by government policy. In summary, the study showed that broiler production possesses comparative advantages and that contract farmers are better off than independent farmers. Given the results from various policy measurement indicators, the industry should use local inputs, especially local feed to avoid tax on inputs.

CONCLUSION

In conclusion, this study found that broiler production under contract farming is more profitable than non-contract farming. The nominal protection coefficient (NPC) results indicate that broiler producers are not protected by existing policy. In other words, there are no government interventions in broiler production in Malaysia. In addition, the inputs are taxed in the same way as any other industry. The broiler industry in Malaysia is efficient and favorably ranked among the top broiler producers in the world. A sensitivity analysis was performed to simulate the effect of government intervention on broiler production in the areas of free on board (FOB) price, shadow exchange rate and tax. The results indicate that the broiler industry needs government assistance in order to enhance its competitiveness.

SIGNIFICANCE STATEMENT

This study determined the impact of current government policies on broiler production in Peninsular Malaysia, which may be beneficial for evaluating the level of protection needed by the broiler industry and enhancing the competitiveness of the industry in Malaysia. The study may help researchers and policy makers to develop new policies that protect small-scale broiler production to ensure sustainable broiler production in the future.

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