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A Comparison of the Welfare Impacts of Thai Rice Price Support and Deficiency Payment Programs

Uchook Duangbootsee^a and Robert J. Myers^b

^aDepartment of Agricultural and Resource Economics, Kasetsart University, Lad Yao, Jatujak, Bangkok 10900, Thailand

^bDepartment of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing, MI 48824, USA

Abstract

The objective of this study is to compare welfare impacts of the price support program (PSP) and deficiency payment program (DPP) by applying a computational model to calculate counterfactual values of quantity and price that would have occurred under alternative policy scenarios. The results indicate that replacing the PSP with DPP, while keeping the target price under DPP at the same level as the support price under PSP, results in an increase in total supply and a decrease in market price. The transfer to farmers in the form of an increase in producer surplus is more efficient under DPP while consumer surplus shrinks considerably under PSP. Deadweight loss accounts for as much as 11-13.6% of Government spending under PSP while it is less than 1% under DPP. Thus, DPP is more efficient because it results in a larger percentage increase in producer surplus and smaller deadweight loss than PSP.

Keywords: *Price support program; Deficiency payment program; Thai rice market; Partial equilibrium modeling*



1. Introduction

Rice is the most important sector in Thai agriculture in terms of area planted and number of farm households and Government policy has played a significant role in influencing rice prices and farmer returns. During the 1970s and 1980s an export tax was applied to keep domestic prices low in an environment of rising food prices as the economy was thriving. A number of studies have investigated the effect of this program on farm income and economic welfares (Trairatvorakul, 1984; Siamwalla and Setboonsarng 1987; Deaton 1989; Warr 2001). However, manufacturing and other sectors eventually surpassed rice and other agricultural products in terms of export revenue share, and rising food prices became less of an issue. So the orientation of rice policy changed towards stabilizing farm incomes through a price-support program. Government involvement in the price-support program has increased significantly since 2000 due at least in part to the intensity of political competition for farmer votes. Two main policies emerged as a result, namely the price support program (PSP) and deficiency payments program (DPP). The PSP had been used for over a decade before its termination in 2014. The DPP was first introduced in 2009 but the program was terminated in late 2011.

Debates among policymakers are centered on the questions of which program is most “suitable” in the current rice market environment, and which has the most exposure in terms of Government expenditure. Under the PSP, farmers are allowed to sell their paddy rice to the Government at the support price, which is administratively determined. Then farmers are given four months to redeem the pledged paddy, otherwise they have to deliver the paddy to the Government. In contrast, the Government does not buy rice under DPP. The program requires the Government to make deficiency payments to farmers when the market price falls below a specified target price. The deficiency payment amount equals the product of a provincial fixed yield and the difference between the target price and the *estimated* market price. Thus, the DPP program payments depend on how much land farmers have in rice production, and the Government’s estimates of yield and market price. Critics argue that the Government not only has to bear the high costs running the PSP, but that it also creates market distortions throughout the rice supply chain. Furthermore, most program benefits are likely to accrue to large-sized farms and wealthy farmers due to the nature of program participation (Poapongsakorn and Charupong, 2010). Due to these differences in program attributes and operations, it would be valuable to compare the impacts of both programs on the Thai rice market, rice farmers, and Government expenditures.

Despite high public attention, only a few studies have investigated the effect of tradeoffs between these programs. One approach to assessing the economic impacts of PSP and DPP is to use aggregate-level data on prices and quantity, together with estimated elasticities of supply and demand, to calculate the changes in producer surplus (PS), consumer surplus (CS), Government expenditure, and deadweight



loss (DWL) associated with each program. Poapongsakorn and Charupong (2010) have provided estimates of these welfare components under PSP for the 2005/06 cropping season. The results from their study suggest that the PSP is very costly and inefficient in term of the distribution of program benefits. Yet, no comparison between the PSP and other alternative policies has been made. The objective of this study is to compare welfare impacts under PSP and DPP using a partial equilibrium model in which counterfactual values of quantity and price that would have been observed had the former been replaced by the latter are calculated. The findings from this study should inform the Government about the gains and losses in economic welfare when switching a regime from PSP to DPP or vice versa.

2. Conceptual Framework

PSP and DPP are similar in a sense that they provides an incentive to farmers to increase production whenever the price set by the government is higher than the expected market price. Under PSP the effective market price (P^C) is equal to the higher between the support price (P^S) and the market price (P^M): $P^C = \text{Max} \{P^S, P^M\}$.¹ Theoretically, if the support price is higher than the market price, assuming that farmers incur no additional cost when selling to the government, then the farmers will divert all their production to the government purchase until the market price has risen to the support price.

Unfortunately, farmers face some transaction and opportunity costs when selling to the Government.² As a result, some farmers are willing to accept the market price that makes them indifferent between the two marketing channels. This market price is typically lower than the support price. Therefore, in equilibrium, the effective market price facing both the participants and nonparticipants of the PSP is simply the actual market price observed in the market which is also equal to the support price less the additional costs associated with the program. When the support price is high, total production increases and the government has to buy all the excess supply which later is sold in the world market. The impact on aggregate welfare depends on the relative sizes of price-elasticity of demand and supply and also on the amount of government stock of rice unsold.

Under DPP, the effective market price (P^C) is equal to the observed market price (P^M) because all rice productions are sold in the market. The government does not engage in the purchase of rice but makes payments to farmers only when the market price falls below the target price (P^T) for which the

¹ An effective market price is defined as the price that a farmer receives when selling rice (either to the government or to traders in the market) less additional costs associated with transaction cost and opportunity cost

² It was noted under the program regulation that farmers will receive loans from the Government within few days following a delivery of paddy rice at the government depot. However, there were reports about the delay of the loans in many areas on several occasions. The delay ranges from few weeks to several months due to the shortage of the program funds, especially when the support price is set relatively much higher than the market price.



(aggregate) payment is equal to the difference between the two prices multiplied by aggregate supply (Q^T). Here an implicit assumption is that all rice lands are registered to the program so that the corresponding outputs are eligible for the deficiency payments. In response to an increase in total supply, the market price in domestic market will fall. Similarly, the world price is also expected to fall to reflect the role of Thailand as the world's largest rice exporter.

Unlike in the case of PSP, farmers are assumed to incur no additional cost when participating in DPP. Since farmers must sell rice on the open market, there is no additional transportation cost to the Government depots. The cost of delayed payment is assumed negligible. This assumption is supported by the facts that the payment made to each household is much smaller under DPP, and that the Government has knowledge regarding the amount of funds needed to be allocated to each branch of the Bank of Agriculture and Agricultural Cooperatives (BAAC) on a daily basis, which reduces the chances of having insufficient funds for making deficiency payments to farmers. Recall that the Government only has to pay the difference between the target and market prices to compensate farmers instead of buying rice from them. The target price is known to farmers prior to the start of each cropping season but the market price is unknown. The Government announces the estimated market price on every Monday during harvesting season. When signing the program contract, farmers are required to specify the date at which they want to exercise the right to receive deficiency payments. Farmers then receive deficiency payments only when the estimated market price announced on Monday of the same week as the chosen date is below the target price.

3. Theoretical Framework

3.1. Welfare impact of a price support program

In Figure 1, prior to an implementation of the PSP, a market equilibrium is represented by the intersection of total demand (D_T) and total supply (S) at point E, for which corresponding equilibrium quantity and price are (Q^* , P^*). The total demand is an aggregate sum of domestic demand (D_D) and foreign demand (not shown). Domestic consumption is Q_1^D . The amount exported is the difference between total supply and the amount consumed domestically ($Q^* - Q_1^D$). When the Government implements the PSP and sets a support price (P^S) at a level that is higher than the equilibrium market price (P^*), the support price will effectively become the market price. As a result, the market equilibrium will shift from point E to D. The corresponding quantity and price at the new equilibrium are (Q^S , P^S). In case of Thai rice market, however, farmers incur additional costs when participating in the PSP. Assuming that these costs are such that farmers are indifferent between participating and not participating in the program, this causes the observed market price to be below the support price. The effective price for non-participants is



simply the market price observed, P^M . The effective price for the program participants is the support price less the additional costs, which is also equal to the market price P^M . At the market price P^M , total output increases to Q^M . Total consumption is Q^C while the Government has net purchases of $(Q^M - Q^C)$.

Total amount of program loans ($LOAN$) are represented by the area $BCQ^M Q^C$. Domestic consumption is then Q_0^D . Private exports are calculated as $(Q^C - Q_0^D)$. Total exports (Q_0^{Ex}) are equal to the sum of private exports ($Q_0^{Ex, Prv}$) and the Government exports ($Q_0^{Ex, Gov}$) (not shown). An increase in total producer surplus (ΔPS) is equal to the area $P^M FEP^*$. A decrease in total consumer surplus (ΔCS_T) is equal to the area $P^M GEP^*$, which can be further decomposed into the change in domestic consumer surplus (ΔCS_D) represented by the area $P^M IJP^*$ and the change in foreign consumer surplus represented by the area $IG EJ$. The additional costs of program participation (AC) are represented by the area $BCFG$. Deadweight loss (DWL) from the PSP is calculated by subtracting total program loans by the sum of the additional cost of program participation, the Government revenues from the redemption of pledged paddy rice (RD), the Government revenue from sales of non-redeemed paddy rice ($SALE_P$), and the net change in producer and consumer surplus ($\Delta PS + \Delta CS_T$). $SALE_P$ includes sales of milled rice ($SALE_M$) and its byproducts ($SALE_B$) less operating expenses (EXP). Formulas for calculating the economic welfare impacts under PSP are summarized in Table 1.

3.2. Welfare impact of a deficiency payment program

This study uses a modified version of the analytical framework proposed by Schmitz and Chambers (1986) to analyze the welfare implications resulting from DPP. The impacts of the DPP on aggregate welfare in the domestic and export markets are illustrated in the left and right panel of Figure 2, respectively. Prior to an implementation of the DPP an equilibrium in the world market is at point J defined by the intersection of excess demand (D_F) and excess supply (S_E) curves as shown on the right panel. The corresponding price is P^* , which in turn constitutes an equilibrium in the domestic market at which quantity Q^* is produced, quantity Q_1^D is consumed domestically, and quantity Q_1^{EX} is exported.

Now consider the imposition of a DPP such that the target price, P^T , is above the free market equilibrium price, P^* . For any observed market price P^C below P^T , producers will supply quantity Q^T and receive payments from the Government equal to *estimated* output and the difference between the target and market prices. The domestic supply curve now becomes $Q^T FS$ in the left panel. Corresponding to this new domestic supply is a new excess supply curve LHS_E in the right panel, with the segment below H corresponding to the perfectly inelastic portion ($Q^T F$) of the new supply curve in the domestic market. The introduction of the DPP leads to higher quantity produced (Q^T), quantity consumed domestically (Q_2^D), quantity traded (Q_2^{Ex}), and lower world price (P^C). Total deficiency payments (PMT) are



represented by the area $P^T FGP^C$. Both producers and consumers gain as a result of the DPP. The gain in producer surplus (ΔPS) is $P^T FEP^*$. The surplus gained by domestic consumer (ΔCS_D) is $P^* BCP^C$. Consumer surplus of foreign consumers (ΔCS_F) increases by $BEGC$. Hence, total change in consumer surplus (ΔCS_T) is $P^* EGP^C$. According to Coffin and Henning (1989), the increase in foreign consumers' surplus is composed of a loss in trade surplus (ΔTS) and a loss in production efficiency (PE), represented by the areas $BEDC$ and EGD in the left panel, respectively. These areas correspond to the areas $P^* JUP^C$ and JKU in right panel, respectively. The former is related to the loss that results from the target price inducing higher output and hence lowering the world price without reducing the true cost of production. The latter is the loss that arises from producing beyond the optimal level of output at which marginal cost equals marginal revenue. Since the deficiency payments are greater than the net gain from both consumer and producer surpluses combined, there is a deadweight loss of FEG . The formulas to calculate the welfare impacts under DPP are summarized in Table 2.

4. Estimation and Data

Two counterfactual scenarios, namely no Government intervention (NG) and the DPP, are investigated under the following circumstances: (i) when the target price is set equal to the support price; and (ii) when total deficiency payments are set equal to the same Government expenditures under the PSP. The comparison when target price and support price are set equal is designed to give insight into the relative effects when farmers face the same “minimum price” under each program, while the comparison when Government expenditures are set equal is designed to give insight into the “cost neutral” performance of the programs when Government costs are the same under each program. In each case, the changes in economic welfare can be calculated geometrically from relevant values of price and quantity observed in the selected period, assuming knowledge of key price elasticities of supply and demand.

4.1. Calculating welfare impacts under the PSP using price elasticities

Referring to the formulas for calculating the economic welfare impacts under PSP in Table 1, the unknown variables that must be calculated in order to compute the changes in economic welfare under the PSP include the equilibrium market price (P^*), total output (Q^*), and domestic consumption (Q_1^D) under no Government intervention. Here, P^* and Q^* can be found by solving the following equations that represent price-elasticity of total demand (ε^a) and price-elasticity of supply (ε^s) evaluated at point E in Figure 1, respectively.

$$\varepsilon^a = [(Q^C - Q^*)/Q^*]/[(P^M - P^*)/P^*]$$



$$\varepsilon^S = [(Q^M - Q^*)/Q^*]/[(P^M - P^*)/P^*]$$

P^M and Q^M , which respectively represent the equilibrium price and quantity under the PSP, are observed. So, P^* and Q^* are the only unknown variables and can be found directly by solving the system of two equations with two unknowns. In order to solve for Q_1^D , which represents domestic consumption, the elasticity of domestic demand expressed in the following equation must be solved.

$$\varepsilon^d = [(Q_0^D - Q_1^D)/Q_1^D]/[(P^M - P^*)/P^*]$$

Again, all variables except Q_1^D are known. Note that Q_0^D is known and equals total production (Q^M) less the sum of Government purchases (Q^G) and total exports (Q_0^{Ex}); Q_0^{Ex} is equal to a sum of private exports ($Q_0^{Ex,Prv}$) and Government exports ($Q_0^{Ex,Gov}$).

4.2. Calculating welfare impacts under the DPP using price elasticities

Referring to the formulas for calculating the economic welfare impacts under PSP in Table 2, the unknown variables that must be calculated in order to compute the changes in economic welfare under the DPP include the equilibrium market price (P^C), total supply (Q^T), and domestic consumption (Q_2^D) need to be computed. First, Q^T can be calculated by substituting the target price (P^T) and the set of information ($Q^*, P^*, Q_1^D, Q_1^{Ex}$), which are known from previous calculation in the case of PSP, into the equation representing the price-elasticity of supply (ε^S) evaluated at point E in Figure 2. The target price (P^T) is set equal to the support price (P^S).³ This means Q^T is the only unknown in the equation and hence it can be solved directly for a given value of ε^S .

$$\varepsilon^S = [(Q^T - Q^*)/Q^*]/[(P^T - P^*)/P^*]$$

Similarly, P^C is the only unknown in the equation below that represents elasticity of total demand (ε^A) at point E in Figure 2, so it can be solved directly for a given value of ε^A .⁴

$$\varepsilon^A = [(Q^T - Q^*)/Q^*]/[(P^C - P^*)/P^*]$$

³ Generally, the price that farmers receive when selling to the government is lower than the support price, because the price is discounted depending on moisture content and product-by-product ratio. Thus, P^S is set equal to the effective support price defined as total BAAC loans issued to farmers under price support program divided by total quantity of pledged rice.

⁴ ε^A is a weighted average of price elasticity of domestic and export demand (ε^d and ε^x , respectively)



The last unknown variable to solve for is the domestic consumption under deficiency payment program (Q_2^D). It can be found by solving the equation of price-elasticity of domestic demand (ε^d) at point B in Figure 2 in which Q_2^D is the only unknown variable.

$$\varepsilon^d = [(Q_2^D - Q_1^D)/Q_1^D]/[(P^C - P^*)/P^*]$$

4.3. Data

The 2005/06 cropping season, in which the PSP was operational, is used to evaluate how alternative policies would have performed. This period was chosen mainly because it has the most detailed information on revenue and cost of the PSP which are drawn from the study by Poapongsakorn and Charupong (2010). The support price (P^S), and target price (P^T) are the weighted average of all rice types obtained from Thailand Department of Internal Trade Office (DIT). The market price (P^M) are the weighted average of monthly prices from November 2005 to February 2006 calculated from three types of rice, including white rice, jasmine rice, and glutinous rice. Total supply (Q^M) and private export quantity ($Q_0^{Ex,Prv}$) are the sum of monthly quantities of all rice types. These data are obtained from Thailand Office Agricultural Economics (OAE). The exports of the Government rice stock ($Q_0^{Ex,Gov}$) in 2005/06 are calculated as an aggregate sum of monthly exports from November 2004 to February 2005 of non-redeemed rice from the operation of the PSP in previous cropping season (2004/05).⁵

Two sets of estimates of price elasticity of total supply, domestic demand, and export demand are drawn from the same sources as referenced in the study by Poapongsakorn and Charupong (2010). The combination of these estimates is used to create eight scenarios for sensitivity analysis. Specifically, estimates of price-elasticity of total supply ($\varepsilon^S = 0.086$) and domestic demand ($\varepsilon^D = -0.392$) are obtained from the study by Isvilanonda and Kongrith (2008). This study provides the most recent estimates of these elasticities in case of the Thai rice market. In their study, price-elasticity of demand was estimated using an Almost Ideal Demand System (AIDS) model while price-elasticity of supply was estimated by seemingly unrelated regression estimation (SURE) in which the dependent variables are production share of major crops. The models were estimated using price and quantity data from 1970-2000. The other set of estimates of price-elasticity of total supply and domestic demand come from the

⁵ The information on the government exports of non-redeemed rice retained from the operation of PSP in 2004/05 is not available. Instead, the government exports of non-redeemed rice retained from the operation of PSP in 2005/06, made available by Poapongsakorn and Charupong (2010), are used to derive the amount of government exports in 2005/06. Specifically, we assume that it also takes the Government three years to sell the rice stock retained from the 2004/05 PSP as did in 2005/06. Furthermore, the monthly exports by the government throughout the course of the three-year span are assumed equal. For a given rate of export, the amount of government exports in 2005/06 can be calculated accordingly.



studies by Konjing (1980) ($\varepsilon^S = 0.0453$) and Siamwala and Pattamasiriwat (1989) ($\varepsilon^D = -0.12$).

Estimates of price-elasticity of export demand are obtained from two sources-- Siamwala and Pattamasiriwat (1989) ($\varepsilon^X = -4$) and Suntayoom (1981) ($\varepsilon^X = -7.04$). These ranges of price elasticity are quite reasonable for several reasons. The estimates of price-elasticity of supply indicate an inelastic supply of Thai rice, which is consistent with the fact that land is limited in Thailand so that an increase in production by land expansion is difficult. Because rice is the only staple food in the Thai diet, domestic demand for rice consumption is more inelastic than export demand.

5. Results

5.1. *The impact of PSP on economic welfare*

Table 3 shows the summary of market data under the PSP observed during the 2005/06 cropping season. Table 4 reports the estimated effects of the PSP and DPP under eight combinations of supply and demand elasticities used in evaluating sensitivity of results to the elasticity assumptions. The last two columns of the table report the upper and lower bound of computed values of welfare change. These values are the minimum and maximum corresponding to the welfare changes reported in the table. The counterfactual values of total supply and market price under NG (Q^* and P^*) are lower than those observed under the PSP as expected. The PSP has raised total supply by between 0.45-1.54% and the market price by between 10.40-20.58% compared to the NG case. Because all outputs must be consumed domestically or exported, total exports (Q_1^{Ex}) and domestic consumption (Q_1^D) under NG are larger than those under the PSP. Given total exports by private exporters of 5.83 million tons in 2005/06, this means implementation of PSP caused private exports to fall by 41.70- 50.20%. An increase in market price under the PSP results in an increase in producer surplus ranging between 14,487-26,237 million baht and a decrease in total consumer surpluses ranging from -23,250 to -12,838 million baht. On average, consumer surplus of domestic consumers falls more than that of foreign consumers. As much as 10.94-13.53% of total Government spending on the operation of PSP are wasted as deadweight loss while 14.76% accounts for the additional cost of the program accrued in order to keep the program running.

5.2. *The impact of DPP on economic welfare when the target price is equal to the support price under the PSP*

The counterfactual quantities and prices under NG are used in conjunction with the assumed values of price elasticity of demand and supply to find the counterfactual values of quantities and prices under the DPP assuming that the target price (P^T) is set equal to the support price (P^S). This means that total supply (Q^*), market price (P^*), domestic consumption (Q_1^D), and export quantity (Q_1^{Ex}) under NG are as previously calculated. The target price is set equal to 8,465 baht/ton. These values of price and



quantity are presented in the top part of Table 5. The bottom part of the table contains estimates of prices, quantities and the welfare impacts under DPP. A sensitivity analysis on the calculation of welfare impacts is conducted using the combination of price elasticities of total demand and supply that constitutes eight different cases. The last two columns of the table report maximum and minimum of the welfare changes drawn from all eight cases.

Supply is estimated to have increased under DPP while market price has fallen compared to NG. The DPP is estimate to have caused total supply to increase by 1.61-3.85% and the market price to fall by 0.62-2.75%. Because all outputs must be consumed domestically or exported, total exports and domestic consumption increase. Since the target price is higher than the market price under NG ($P^T > P^*$), there is a gain in producer surplus; ΔPS ranges between 58,121-69,673 million baht. Similarly, there is a gain to consumers in term of an increase in consumer surplus as the market price under the DPP is lower than that under no NG ($P^C < P^*$). The gain to foreign consumers is higher than that of domestic consumers. Specifically, the surplus of domestic consumers increases by 474-1,893 million baht while that of foreign consumers increases by 399-1,656 million baht. Parts of the gain by foreign consumers are generated from loss in production efficiency and loss in trade surplus, which range between 7-70 million baht and between 392- 1,587 million baht, respectively. Lastly, the deadweight loss associated with the program is estimated to range between 469 and 1,376 million baht. This means the deadweight loss accounts for less than 1% of total deficiency payments.

5.3 The impact of DPP on economic welfare when total deficiency payments are equal to total

Government expenditures under the PSP

In this section, the impact of DPP on economic welfare is investigated assuming identical Government expenditures as under PSP. By setting total deficiency payments to 51,758 million, which is also total cost of the PSP in the 2005/06 season, the corresponding target price is estimated to be between 7,563 and 8,138 baht/ton, depending on elasticity assumptions (Table 6). Producer surplus increases by between 47,954 and 50,457 million baht. Domestic and foreign consumers gain as total consumer surplus increases by between 889 and 3,001 million baht. The deadweight loss is estimated between 413 and 804 million baht which is less than 1% of total deficiency payments. These results indicate that the target price can be set much lower than the support price for the same level of Government expenditure, and yet increase producer surplus under the DPP can still be twice as large of that under the PSP, while the deadweight loss is much smaller. Thus, the transfer of Government expenditures to farmers in the form of an increase in producer surplus is more efficient under the DPP than the PSP.



6. Conclusions and policy implications

Recent debate among Thai policymakers focuses on trade-offs between two rice farm policies, the price support program (PSP) and deficiency payment program (DPP). These programs are politically and economically important as they directly affect millions of rice farm households in the country and require enormous budget outlays from the Government. Despite high public attention, only a few studies have investigated the tradeoffs between these programs. So the objective of this study is to compare welfare impacts of PSP and DPP measured in terms of changes in producer surplus, consumer surplus, and deadweight loss by applying a computational model to calculate counterfactual values of quantity and price that would have been observed under alternative policies. The 2005/06 cropping season is used as a base for the calculation as the information on revenue and cost of the PSP is readily available for this period.

An identical value of the support/target price does not translate into an identical value of price received/effective market price to producers. Due to the additional cost associated with program participation, an effective market price under PSP falls below the support price. In contrast, the target price becomes an effective market price under DPP as there is no additional cost of program participation. As a result, total supply only increases by 0.45-1.54% under PSP while it increases by as much as 1.61-3.85% under DPP. Although PSP and DPP both increase total supply, their impacts on market price are opposite. PSP raises the market price by 10.40-20.58% while the market price falls by 0.62-2.75% under DPP.

Because the size of producer surplus depends on total supply and the difference between the support/target price and market price, there is a greater increase in producer surplus under DPP. The operation of PSP in 2005/06 attracted only 624,428 rice farm households while costing the Government as much as 44,797 million baht worth of loans plus operating expense of 6,614 million baht. By setting the target price identical to the support price, however, total deficiency payments are estimated between 59,462-74,166 million baht which are paid to almost all rice farm households (approximately 4 million households). For every dollar the Government spends on the PSP, only 0.28-0.51 dollars are transferred to farmers in the form of an increase in producer surplus while the transfer is as high as 0.93-0.97 dollars under the DPP. Consumers, especially domestic consumers, are much worse off under PSP as their surplus shrinks considerably as a result of a sharp increase in market price. In contrast, both domestic and foreign consumers are better off under DPP as the program results in a reduction of market price. Although, one may argue that the Government subsidizes foreign consumers at the expense of domestic consumers under DPP, the subsidy is relatively small compared to the gain in producer surplus. In contrast, domestic consumers suffer great losses in consumer surplus while an increase in producer



surplus is limited under PSP. Lastly, the deadweight loss under the PSP is approximately 10.94-13.52% of the total costs while it accounts for less than 1% of total deficiency payments under DPP.

For every dollar of Government spending, the DPP generates a larger percentage increase in producer surplus and smaller deadweight loss than PSP does. In this sense the DPP is more efficient. This claim is also supported by a cost-neutral analysis in which the DPP is found more efficient given an identical amount of Government expenditures under both programs. In addition, program benefits under DPP are more accessible as all farmers are guaranteed a minimum income so long as their lands are registered. The drawbacks of DPP include costly implementation because deficiency payments are made to almost all farmers, while no revenue is generated back to the Government. Arguably, the program tends to not only keep unproductive farmers from exiting the sector, but also encourage use of marginal lands or lands that would have been used for other purposes had there been no intervention. On the other hand, it would be beneficial to reduce the inefficiencies or the barriers to accessing program benefits if the Government chooses to continue with the PSP. Clearly, many farmers are discouraged from participating in PSP due to the additional costs of program participation. As these costs decrease, the market price should rise much closer to the support price. Consequently, the transfer from the program loans to farmers in the form of an increase in producer surplus would be more efficient. Yet, the Government could face a dilemma as these additional costs shrink because more rice will be sold to the Government while an increase in the market price will cause the sales of pledged rice in the world market to become more difficult. Thus, the support price would have to be carefully set at levels that are economically feasible given the current market environment.

Tables and figures

Figure 1: Impacts of the price support program (PSP)

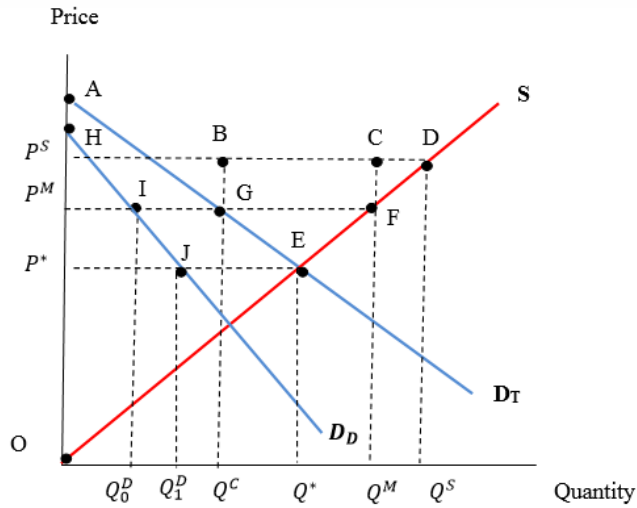


Figure 2: Impacts of the deficiency payment program (DPP)

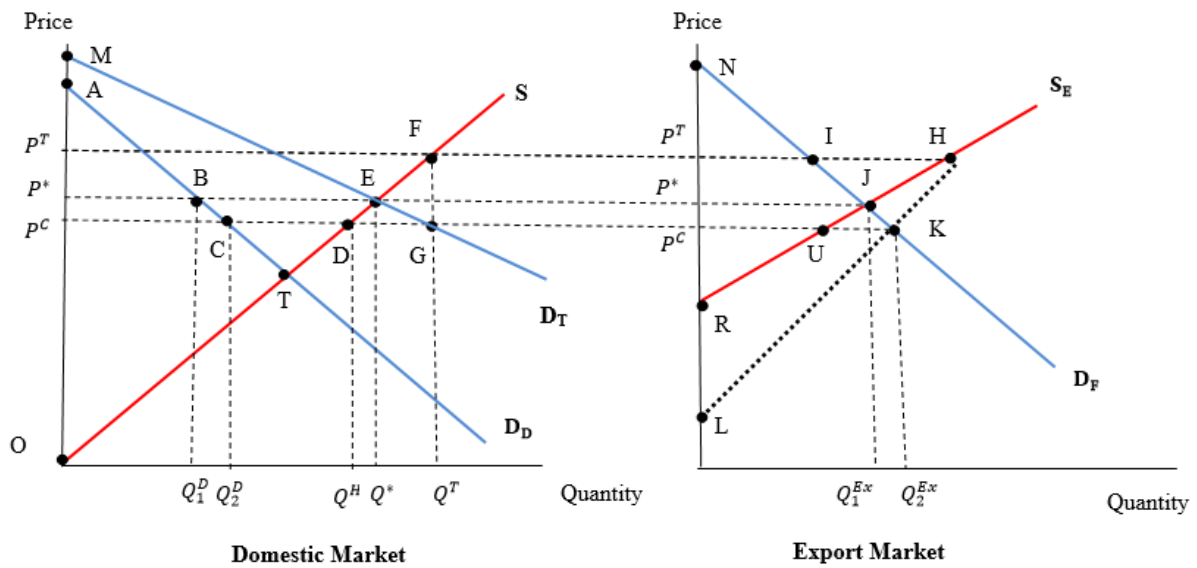


Table 1: Calculation of PSP Impacts

Welfare Impact	Notation	Representation in Figure 1.2	Formula
Total BAAC loans issued to farmers	$LOAN$	$BCQ^M Q^C$	$P^S(Q^M - Q^C)$
Change in producer surplus	ΔPS	$P^M FEP^*$	$0.5(P^M - P^*)(Q^M + Q^*)$
Change in total consumer surplus	ΔCS_T	$P^M GEP^*$	$0.5(P^* - P^M)(Q^C + Q^*)$
Change in domestic consumer surplus	ΔCS_D	$P^M IJP^*$	$0.5(P^* - P^M)(Q_1^D + Q_0^D)$
Change in foreign consumer surplus	ΔCS_F	$IGEJ$	$\Delta CS_T - \Delta CS_D$
Additional costs of program participation	AC	$BCFG$	$(P^S - P^M)(Q^M - Q^C)$
Deadweight loss	DWL	<i>Not shown</i>	$LOAN - (AC + RD + SALE_p) - (\Delta PS + \Delta CS_T)$

Table 2: Calculation of DPP Impacts

Welfare Impact	Notation	Representation in Figure 1.3	Formula
Total deficiency payments	PMT	$P^T FGP^C$	$(P^T - P^C)Q^T$
Change in producer surplus	ΔPS	$P^T FEP^*$	$0.5(P^M - P^*)(Q^T + Q^*)$
Change in total consumer surplus	ΔCS_T	$P^* EGP^C$	$0.5(P^* - P^C)(Q^T + Q^*)$
Change in domestic consumer surplus	ΔCS_D	$P^* BCP^C$	$0.5(P^* - P^C)(Q_1^D + Q_2^D)$
Change in foreign consumer surplus	ΔCS_F	$BEGC$ or $P^* JKP^C$	$\Delta CS_T - \Delta CS_D$
Loss in production efficiency	PE	$BEDC$ or IKU	$0.5(P^* - P^C)(Q^T - Q^H)$
Loss in trade surplus	ΔTS	$BEDC$ or $P^* JUP^C$	$\Delta CS_F - PE$
Deadweight loss	DWL	FEG	$0.5(P^T - P^C)(Q^T - Q^*)$

Table 3: Summary of the data observed during the implementation of PSP in 2005/06

Variables	Value
Price & Quantity under PSP (Unit: baht/ton & million tons)	
Support price (P^S)	8,465
Quantity of pledged rice (Q^C)	5.29
Total supply (Q^M)	23.34
Effective market price (P^M)	6,614
Total consumption (Q^C)	18.05
Domestic consumption (Q_0^D)	12.21
Private exports ($Q_0^{Ex,Prv}$)	4.54
Government exports ($Q_0^{Ex,Gov}$) ⁶	1.29
Total exports (Q_0^{Ex})	5.83
Program Cost & Revenue (Unit: million baht)	
BAAC loans ($LOAN$)	44,797
Value of redeemed rice (RD)	10,706
Sales of non-redeemed rice and its byproduct ($SALE_M + SALE_B$)	24,760
Operating expenses ($EXPS$)	6,961
Value of the sales of non-redeemed paddy rice ($SALE_P$)	17,799

⁶ Government exports are calculated by multiplying total non-redeemed rice in the previous season by the Government rate of export. Since neither the redemption rate nor the export rate of the non-redeemed rice from the operation of PSP in 2004/05 is known, they are assumed equal to their 2005/06 counterparts found in Poapongsakorn & Charupong (2010). Specifically, the redemption rate is 21.93% of total pledged rice while the export rate is 6.50% of total non-redeemed rice. Given the total amount of pledged rice of 5.10 million tons, Government exports in 2005/06 are estimated at 1.29 million tons of paddy rice.

Table 4: Estimates of the impacts of the price support program (PSP)

Cases by Elasticities	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Min	Max
ε^d	-0.39	-0.39	-0.12	-0.12	-0.39	-0.39	-0.12	-0.12		
ε^x	-4.00	-7.08	-4.00	-7.08	-4.00	-7.08	-4.00	-7.08		
ε^a	-1.31	-2.09	-1.10	-1.88	-1.31	-2.09	-1.10	-1.88		
ε^s	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05		
Price & quantity under NG	(Unit: baht/ton & mil. ton)									
Total supply (Q^*)	23.02	23.14	22.99	23.13	23.17	23.23	23.15	23.23	22.99	23.23
Market price (P^*)	5,629	5,991	5,510	5,946	5,610	5,984	5,486	5,937	5,486	5,991
Domestic consumption (Q_1^D)	13.02	12.70	12.49	12.37	13.04	12.70	12.49	12.37	12.37	13.04
Export (Q_1^{EX})	10.00	10.44	10.50	10.76	10.13	10.53	10.65	10.85	10.00	10.85
Welfare Impacts of PSP	(Unit: mil. baht)									
Change in PS (ΔPS)	22,853	14,487	25,586	15,539	23,368	14,688	26,237	15,770	14,487	26,237
Change in total CS (ΔCS_T)	-20,245	-12,838	-22,663	-13,769	-20,709	-13,019	-23,250	-13,978	-23,250	-12,838
Change in domestic CS (ΔCS_D)	-12,438	-7,764	-13,642	-8,221	-12,687	-7,858	-13,944	-8,327	-13,944	-7,764
Change in foreign CS (ΔCS_F)	-7,807	-5,073	-9,021	-5,548	-8,022	-5,161	-9,306	-5,651	-9,306	-5,073
Additional cost of participation (AC)	7,639	7,639	7,639	7,639	7,639	7,639	7,639	7,639	7,639	7,639
Deadweight loss(DWL)	6,043	7,002	5,729	6,882	5,993	6,983	5,665	6,859	5,665	7,002

Table 5: The impacts of DPP when the target price is equal to the support price under PSP

Cases by Elasticities	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Min	Max
ε^d	-0.392	-0.392	-0.120	-0.120	-0.392	-0.392	-0.120	-0.120		
ε^x	-4.000	-7.080	-4.000	-7.080	-4.000	-7.080	-4.000	-7.080		
ε^a	-1.306	-2.086	-1.103	-1.883	-1.306	-2.086	-1.103	-1.883		
ε^s	0.086	0.086	0.086	0.086	0.045	0.045	0.045	0.045		
Given price & quantity under NG	(Unit: baht/ton & million ton)									
Total supply (Q^*)	23.02	23.14	22.99	23.13	23.17	23.23	23.15	23.23	22.99	23.23
Market price (P^*)	5,629	5,991	5,510	5,946	5,610	5,984	5,486	5,937	5,486	5,991
Domestic consumption (Q_1^D)	13.02	12.70	12.49	12.37	13.04	12.70	12.49	12.37	12.37	13.04
Export (Q_1^{Ex})	10.00	10.44	10.50	10.76	10.13	10.53	10.65	10.85	10.00	10.85
Price and Quantity under DPP	(Unit: baht/ton & million ton)									
Total supply (Q^T)	23.86	23.85	23.87	23.85	23.61	23.61	23.62	23.61	23.61	23.87
Market price (P^c)	5,499	5,920	5,358	5,868	5,541	5,946	5,406	5,896	5,358	5,946
Domestic consumption (Q_2^D)	13.13	12.75	12.52	12.39	13.09	12.73	12.51	12.38	12.38	13.13
Export (Q_2^{EX})	10.74	11.10	11.35	11.46	10.52	10.87	11.10	11.22	10.52	11.46
Total supply at Q^H	22.99	23.13	22.95	23.11	23.16	23.23	23.14	23.22	22.95	23.23
Welfare Impacts of DPP	(Unit: million baht)									
Deficiency payment (PMT)	70,787	60,706	74,166	61,951	69,048	59,462	72,262	60,647	59,462	74,166
Change in PS (ΔPS)	66,507	58,138	69,243	59,189	66,802	58,121	69,673	59,204	58,121	69,673
Change in total CS (ΔCS_T)	3,033	1,665	3,547	1,820	1,597	872	1,871	954	872	3,547
Change in domestic CS (ΔCS_D)	1,691	902	1,893	959	892	474	1,001	504	474	1,893
Change in foreign CS (ΔCS_F)	1,344	764	1,656	862	705	399	871	450	399	1,656
Loss in production efficiency (PE)	56	26	70	29	15	7	19	8	7	70
Loss in trade surplus (ΔTS)	1,287	738	1,587	833	690	392	852	442	392	1,587
Deadweight loss (DWL)	1,247	903	1,376	942	649	469	718	489	469	1,376



Table 6: The impacts of DPP when total deficiency payments are equal to total Government expenditures under PSP

Cases by Elasticities	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Min	Max
ε^d	-0.392	-0.392	-0.120	-0.120	-0.392	-0.392	-0.120	-0.120		
ε^x	-4.000	-7.080	-4.000	-7.080	-4.000	-7.080	-4.000	-7.080		
ε^a	-1.306	-2.086	-1.103	-1.883	-1.306	-2.086	-1.103	-1.883		
ε^s	0.086	0.086	0.086	0.086	0.045	0.045	0.045	0.045		
Given price & quantity under NG (Unit: baht/ton & million ton)										
Total supply (Q^*)	23.02	23.14	22.99	23.13	23.17	23.23	23.15	23.23	22.99	23.23
Market price (P^*)	5,629	5,991	5,510	5,946	5,610	5,984	5,486	5,937	5,486	5,991
Domestic consumption (Q_1^D)	13.02	12.70	12.49	12.37	13.04	12.70	12.49	12.37	12.37	13.04
Export (Q_1^{Ex})	10.00	10.44	10.50	10.76	10.13	10.53	10.65	10.85	10.00	10.85
Price and quantity under DPP (Unit: baht/ton & million ton)										
Target Price (P^T)	7,694	8,091	7,563	8,042	7,744	8,138	7,614	8,089	7,563	8,138
Total supply (Q^T)	23.75	23.84	23.72	23.83	23.57	23.61	23.55	23.61	23.55	23.84
Market price (P^c)	5,515	5,920	5,381	5,870	5,548	5,946	5,416	5,896	5,381	5,946
Domestic consumption (Q_2^D)	13.12	12.76	12.52	12.39	13.09	12.74	12.51	12.38	12.38	13.12
Export (Q_2^{Ex})	10.63	11.08	11.20	11.44	10.47	10.87	11.04	11.22	11.17	10.72
Total supply at Q^H	22.98	23.12	22.94	23.10	23.16	23.23	23.13	23.22	22.94	23.23
Welfare impacts of DPP (Unit: million baht)										
Change in PS (ΔPS)	48,301	49,339	47,954	49,211	49,882	50,457	49,687	50,386	47,954	50,457
Change in total CS (ΔCS_T)	2,666	1,661	3,001	1,786	1,440	889	1,627	957	889	3,001
Change in domestic CS (ΔCS_D)	1,490	900	1,607	942	805	483	871	506	483	1,607
Change in foreign CS (ΔCS_F)	1,176	761	1,394	844	635	406	756	451	406	1,394
Loss in production efficiency (PE)	44	26	50	28	13	7	15	8	7	50
Loss in trade surplus (ΔTS)	1,132	736	1,344	816	622	399	741	443	399	1,344
Deadweight loss (DWL)	792	757	804	762	436	413	444	415	413	804



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