Product Markets in PAM: Policies that Raise Prices

Scott Pearson
Stanford University

Scott Pearson is Professor of Agricultural Economics at the Food Research Institute, Stanford University. He has participated in projects that combined field research, intensive teaching, and policy analysis in Indonesia, Portugal, Italy, and Kenya. These projects were concerned with studying the impacts of commodity and macroeconomic policies on food and agricultural systems. This effort culminated in a dozen co-authored books. These research endeavors have been part of Pearson’s longstanding interest in understanding better the relationships between a country’s policies affecting its food economy and the underlying efficiency of its agricultural systems.

Pearson received his B.S. in American Institutions (1961) from the University of Wisconsin, his M.A. in International Relations (1965) from Johns Hopkins University, and his Ph.D. in Economics (1969) from Harvard University. He joined the Stanford faculty in 1968.

In many countries, including most industrialized nations, governments choose to raise agricultural prices to farmers. Typically, this is done for reasons of equity – to protect farmers’ incomes as agriculture goes through the painful adjustment process of becoming a smaller part of the economy. Farmers in developing countries often view agricultural protection in industrialized countries with anger (because subsidized production depresses world prices of agricultural commodities) and envy (because they would like their governments to protect them to offset the advantages gained by their richer competitors).

This lecture introduces approaches to study the impacts of government policies that raise prices in agricultural markets on government objectives – efficiency, equity, and food security.
A divergence on output prices, causing private revenues (A) to differ from social revenues (E), creates an output transfer (I = (A – E)). This divergence can be either positive (causing an implicit subsidy or transfer of resources in favor of the agricultural system) or negative (causing an implicit tax or transfer of resources away from the system). This lecture addresses positive output divergences by examining policies that raise the prices of agricultural commodities. The following lecture (lecture 6) looks at policies that lower agricultural commodity prices and thus cause negative output transfers.

International trade restrictions are taxes or quotas that limit either imports or exports. By restricting trade, these price policy instruments change domestic price levels. Import restrictions
raise domestic prices above comparable world prices, whereas export restrictions lower domestic prices beneath comparable world prices.

Two types of international trade restrictions are used to raise prices. A tariff, a tax on imports (but not on domestic production), raises the domestic price level by the full percentage of the tariff rate if the policy is fully enforced (and smuggling is prevented). A quantitative restriction on imports, a quota limiting the quantity of imports to some specified maximum, raises the domestic price level to the extent that it is enforced by customs officials. The percentage by which a quota raises the domestic price is called the equivalent (or implicit) tariff rate of the quota.

Taxes and subsidies on agricultural commodities result in transfers between the public budget and producers and consumers. Taxes transfer resources to the government, whereas subsidies transfer resources away from the government. For example, a direct production subsidy transfers resources from the government budget to agricultural producers.

Slide 5

![Diagram](attachment:Effects_of_Trade_Restrictions.png)

The diagram portrays an importable commodity. The domestic price before any policy is imposed, OP\(_1\), is determined by the behavior of producers and consumers – the supply and demand schedules – and by the availability of imports at the cif import parity price, OP\(_1\).
Effects of Trade Restrictions on the Price of Importables – Discussion

- without policy, import parity price sets domestic price at OP_1
- policy makers seek higher target price at OP_2
- trade restriction used to fill gap of P_2P_1
  - tariff (tax on imports) of P_2P_1 Rupiah/ton
  - import quota of Q_3Q_4 tons

In the absence of government policy, the domestic price, OP_1, is determined by the import parity price (lecture 4, slides 9 and 10).

The target domestic price with policy is set by policy makers to be OP_2. The required implicit subsidy – to be achieved through the trade restriction policy – is P_2P_1, the difference between the desired target price (OP_2) and the actual price (OP_1).

The policy instrument could be either a tariff of P_2P_1 (measured in domestic currency per unit or Rp/ton) or a quota of Q_3Q_4 units (tons). If implemented effectively, either instrument would achieve the target policy price of OP_2.
The effects of the trade restriction policy are found by comparing quantities, transfers, and efficiency effects. The initial conditions are set by the price equilibrium before policy (the “no policy” case). Then a new price equilibrium is found with the trade restriction in place (the “trade restrictions” case). A comparison of these two cases yields the impacts of the restrictive trade policy on the initial conditions (the “effects of policy” case).

Slide 8

<table>
<thead>
<tr>
<th>1. quantities</th>
<th>produced</th>
<th>consumed</th>
<th>imported</th>
</tr>
</thead>
<tbody>
<tr>
<td>no policy</td>
<td>Q₁, Q₂↑</td>
<td>Q₁, Q₂</td>
<td>Q₁, Q₂</td>
</tr>
<tr>
<td>trade restrictions</td>
<td>Q₃, Q₄↓</td>
<td>Q₃, Q₄</td>
<td>Q₃, Q₄</td>
</tr>
<tr>
<td>effects of policy</td>
<td>Q₁, Q₁↑</td>
<td>Q₁, Q₂↓</td>
<td>Q₁, Q₂↓</td>
</tr>
</tbody>
</table>

The “no policy” case depicts the results before any policy is introduced. At price OP₁, domestic production (at c) is Q₁ and imports are cf = Q₁Q₂. Together domestic production plus imports equal domestic consumption (at f) of Q₂ and so the market-clearing condition is fulfilled (lecture 4, slide 6).

The “trade restrictions” case portrays the outcome of introducing a tariff or import quota. At price OP₂, domestic production (at a) is Q₃ and imports are ab = Q₃Q₄. Together, domestic production plus imports equal domestic consumption (at b) of Q₄ and so the market-clearing condition is again fulfilled.

The “effects of policy” measure the differences caused by the trade restriction. At price OP₂, domestic production (at a) increases by Q₁Q₃ to Q₃Q₄, domestic consumption (at b) falls by Q₁Q₂ to Q₃Q₄, and imports decline by the sum of these two effects and fall from Q₁Q₂ to Q₃Q₄.
This diagram shows the effects of trade restrictions on transfers from or to consumers, producers, and the government treasury. The trade restriction causes increases in the domestic price and domestic production and decreases in domestic consumption and imports (slide 7). These changes in price and quantities create transfers among participants in the economy.

Prior to imposition of the trade restriction policy (the “no policy” case), the producers of the commodity enjoy a **producer surplus** (excess profits where returns exceed costs) of the triangle \( P_1 \text{cg} \), the difference between their total revenues of \( P_1 \text{cQ}_1 \text{O} \) and their total costs of \( gc \text{Q}_1 \text{O} \). Before policy, consumers have a **consumer surplus** (the difference between their satisfaction as measured by their willingness to pay and the amounts they actually pay) of
the triangle $P_1fh$, the difference between their total consumer satisfaction of $hfQ_2O$ and their total amount paid of $P_1fQ_2O$.

**Producers gain from the price increase caused by the trade restriction.** At the new price of $OP_2$, producers make excess profits (producer surplus) of $P_2ag$, the difference between their increased total revenues of $P_2aQ_3O$ and their new total costs of $gaQ_3O$. **Consumers lose heavily from the trade restriction.** At the new price of $OP_2$, consumer surplus is cut to $P_2bh$, the difference between their reduced total consumer satisfaction of $hbQ_4O$ and their higher total amount paid of $P_2bQ_4O$.

Before the policy is introduced, there is no impact on the government budget. With the trade restriction in place, the budget stands to gain revenue. **If the policy is a tariff, the government gains tariff revenue of abed, because a tax of $P_2P_1$ (or ad) per ton is collected on $Q_3Q_4$ (or ab) tons of imports.** If instead the policy is an import quota, the government would have to auction off the rights to the quota to obtain roughly that amount of revenue.

In total, the transfer effects of this policy are: from consumers, $P_2bfP_1$; to producers, $P_2acP_1$; to the government treasury, abed (if tariff revenues are collected or import quotas are auctioned); a production efficiency loss, cad; and a consumption efficiency loss, bfe.

**Slide 11**

![Diagram](image)

This diagram shows the effects of trade restrictions on efficiency. The trade restriction causes increases in the domestic price and domestic production and decreases in domestic consumption and imports (slide 7). These changes in price and quantities in turn create transfers among participants in the economy (slide 9). The losses suffered by consumers are greater than sum of the gains to producers and the government budget. The difference consists of efficiency losses, shown by the two orange triangles, cad and bfe.
In the absence of market failures, the most efficient outcome is achieved without policy. The introduction of a trade restriction thus creates efficiency losses.

The production efficiency loss, cad, arises because the expanded domestic production, $Q_1Q_3$, costs $caQ_3Q_1$ in scarce resources, whereas the replaced imports cost only $cdQ_3Q_1$.

The consumption efficiency loss, bfe, results because the value to consumers of the $Q_4Q_2$ of foregone imports is $bfQ_2Q_4$, which is greater than the cost of these imports, $efQ_2Q_4$.

The two efficiency losses, the production efficiency loss, cad, and the consumption efficiency loss, bfe, together constitute the difference between the transfer away from consumers, $P_2bfP_1$, and the sum of the transfers to producers, $P_2acP_1$ and to the government treasury, abed (if tariff revenues are collected or import quotas are auctioned).
The impact of a trade restriction on efficiency is negative. The policy is distorting because it creates two types of efficiency losses – a production efficiency loss, by supporting inefficient domestic production, and a consumption efficiency loss, by raising the domestic price and depriving consumers of less expensive imports.

The impact of a trade restriction on equity is not clear. It depends on the weights that policy makers place on the welfare of consumers, who lose, versus the welfare of producers, who gain, and of the government treasury, which receives tariff revenue (or might earn auction income under an import quota). The equity effect might depend on whether the consumers of the commodity were relatively better off than the producers of the commodity before the policy.

The impact of a trade restriction on food security is also unclear from the analysis. The policy causes an increase in domestic output that substitutes for imports. But determination of the security effect requires further analysis of the variability of domestic supplies (prices and quantities) versus the variability of international supplies (prices and quantities).
The **strategy is to increase agricultural prices** to transfer incomes to farmers.

The **policy is to restrict agricultural trade** through tariffs or quotas.

The **constraints in the domestic economy are captured by the domestic supply and demand schedules and the import price** (reflecting the international supply schedule). A higher domestic price increases local production, reduces local consumption, and decreases imports.

The **impact of this strategy on the objectives of policy makers is mixed**. Efficiency is worsened, equity is lessened (unless producers are favored over consumers), and food security is unclear (although likely to be worsened unless international markets are highly unreliable).

Further analysis is required before policy makers can properly weigh trade-offs between objectives.

A switch to aiding farmers through direct producer subsidies is doubtful given its large budgetary cost, but it would be less inefficient (because it would avoid imposing a consumption efficiency loss).
In the absence of policy, the domestic price, OP$_1$, is determined by the import parity price. At price OP$_1$, domestic production (at b) is OQ$_1$, domestic consumption (at d) is OQ$_2$, and imports are bd = Q$_1$Q$_2$.

The target return per unit to producers is OP$_2$, and the required subsidy is OP$_2$ less OP$_1$, or P$_2$P$_1$ per unit. Under the subsidy policy, the domestic price remains unchanged at OP$_1$. For each ton produced and marketed, the producers receive OP$_2$, including the price, OP$_1$, from the domestic market and the subsidy, P$_2$P$_1$, from the government treasury.

With the producer subsidy, domestic production (at a) expands to OQ$_3$, domestic consumption (at d) remains at OQ$_2$, and imports decline to cd = Q$_3$Q$_2$. 

Slide 16

Effects of Subsidies to Producers of Importables – Discussion

- target return (OP$_2$) = price (OP$_1$) + subsidy (P$_2$P$_1$)
- effects of producer subsidy
  - quantities – production expands, consumption is unchanged, imports decline
  - transfers – from treasury to producers
  - efficiency losses – in production, but not in consumption
- limitations – feasibility, budgetary cost
If the subsidy of \( P_2P_1 \) per unit is applied to all domestic production, \( OQ_3 \), the total subsidy cost is \( P_2acP_1 \), paid entirely by the government treasury.

The transfer effects of this policy are: from the government treasury, \( P_2acP_1 \); to producers, \( P_2abP_1 \); and a production efficiency loss, \( bac \). The production efficiency loss arises because the expanded domestic production, \( Q_1Q_3 \), costs \( baQ_3Q_1 \) in scarce resources, whereas the replaced imports cost only \( bcQ_3Q_1 \). There is no consumption efficiency loss because consumers continue to face price \( OP_1 \) and thus continue to consume quantity \( OQ_2 \) at point d.

Application of the producer subsidy in developing countries is rare. It often is difficult to implement the policy among numerous farmers who seldom have bank accounts. Even when implementation of the policy might be feasible, the high budgetary cost rules out production subsidies for most developing country governments.

**Slide 17**

| Policies to Raise Tradable Food Price to Producers: Summary |
|-------------------|--------------------------------------------------|
| - tariff on imported food – cost paid by consumers, revenue earned by government |
| - import quota on imported food – cost paid by consumers, quota premium usually accrues to holders of import licenses |
| - subsidy on domestic food production – cost paid by government, not by food consumers |

Three price policy instruments are available to transfer income to producers of a food commodity.

A **tariff on imported food** raises the domestic price of food. The cost of the policy is paid entirely by food consumers. Part of the transfer is greater producer surplus for food producers and part is tariff revenue to the government treasury. Because the domestic price is increased, the policy creates both production and consumption efficiency losses.

An **import quota on imported food** also raises the price of food. The transfer effects and efficiency losses for a quota are identical to those for a tariff with one exception. An import quota produces a quota premium rather than tariff revenue; both are equal to the price increase times the quantity of imports. In principle, the quota premium can be captured by the government treasury if the government auctions off the import licenses to private bidders.
practice, the quota premium instead typically accrues to privileged holders of import licenses who do not pay for those licenses.

**A subsidy on domestic food production** raises the return to food producers but does not increase the domestic price of food. The effects of the subsidy policy thus are different from those of either kind of trade restriction. The cost of the subsidy policy is paid entirely by the government treasury (and thus indirectly by consumers and producers who have been taxed to generate government revenue). Consumers of food are not affected directly by the subsidy policy. The transfers are from the treasury to food producers, who gain additional producer surplus, and to a production efficiency loss, arising from inefficient domestic production substituting for food imports.

The policy to impose a tariff on rice imports into Indonesia is discussed in “Rice Tariff Policy,” Policy Brief No. 2.

**Slide 18**
Note to Lecturers – Supplemental Slides

- The two following slides on empirical estimation could be discussed separately
- To include them in this lecture might make this presentation too long
- If they are excluded here, they could be discussed in a separate discussion of practical applications of PAM analysis

Empirical Estimation of Product Prices

- tradable goods (importables, exportables)
  - private prices – farm budgets, at farmgate
  - social prices – border prices, at farmgate

- nontradable commodities
  - private prices – farm budgets, at farmgate
  - social prices – private prices less divergences

Guidelines for the empirical estimation of the prices of tradable goods are identical for importables and exportables and for outputs and inputs (PAM, pp. 189-196). The private prices of tradable commodities (for the top row of the Policy Analysis Matrix) are found in the farm budgets from actual market prices at the farmgate. The counterpart social prices are border prices (comparable import prices for importables and export prices for exportables), which are adjusted to farmgate levels (detailed procedures are spelled out in the PAM Manual in the computer tutorial accompanying this lecture series).

Different guidelines are proposed for the empirical estimation of the prices of nontradable commodities. As with tradables, the private prices for nontradables are taken from the
private budgets at the farmgate level. But no border prices exist to serve as efficiency valuations for nontradables. Hence, the social prices of nontradables are estimated by correcting their private prices for divergences (distorting policies and market failures).

Slide 21

### Empirical Estimation of Social Prices for Commodities

- **social prices of tradable commodities**
  - world price – long-run trend vs. recent
  - exchange rate – equilibrium vs. recent
- **social prices of nontradable commodities**
  - correct for identifiable divergences
  - use price of close substitute
  - use price of same commodity in neighbor

The social (or efficiency) prices of tradable commodities are given by comparable world prices because the import or export price is the best measure of the social opportunity cost of the commodity. For an importable, the import price indicates the opportunity cost of obtaining an additional unit to satisfy domestic demand. For an exportable, the export price is a measure of the opportunity cost of an additional unit of domestic production since that unit would be exported, not consumed domestically.

The world price in domestic currency units is equal to the world price in foreign currency times the foreign exchange rate (the conversion ratio given in domestic currency units to foreign currency units). Hence, both the world price in foreign currency and the exchange rate are required to calculate the world price in domestic currency. **If the analysis is addressing the issue of long-run efficiency (or international comparative advantage), it is appropriate to use long-run trend measures of both the world price (in foreign currency) and the exchange rate.** Alternatively, if the study is looking at the historical experience of a recent period (for which the data for the PAM were gathered), it is appropriate to use recent historical data for both world prices (in foreign currency) and the exchange rate.

Sometimes it is very difficult to estimate the social prices for nontradable commodities. The first step is to correct the private prices of nontradables for identifiable divergences. Often, however, the effects of divergences, especially of market failures, are nearly impossible to measure. **If the effects of divergences cannot be estimated, the next step is to search for the price of a close substitute commodity to use as a proxy for the price of the nontradable commodity.** If that search fails, the last step is to seek the price of the same commodity (or a close substitute) in a neighboring country.