Abstract:

There are two tariff experiments that one can conduct in the simple economy. The typical economic model implicitly assumes that the set of goods in an economy never changes and calculate loses in output that would occur if the government were to impose an unexpected tariff after firms have already made their entry decisions. Because entry costs are sunk costs, this kind of unanticipated tax will have no effect on the number of goods that are available for use in this economy. With this assumption the estimation of loss from a tariff is small. But if we assume that international trade can introduce new goods, the fraction of national income lost when a tariff is imposed can be much higher.

Keywords: Trade restrictions, new goods
**Introduction:**

Trade Policy can have large positive and normative effects because it can influence not just quantities of existing goods as international trade theory suggest, but also the number of different types of goods that are available in an economy.

Most economic theory starts from an implicit assumption that policy interventions do not affect the set of goods available in the economy. Recent theoretical work shows that this assumption keeps us from studying how trade restrictions prevent new types of goods and new types of productive activities from being introduced from abroad.

The term “good” is used here in the broadcast possible sense. A new good could take the form of an entirely new type of physical good or quantity improvement over an existing physical good. Every economy faces virtually unlimited possibilities for the introduction of new goods. Advanced nations can discover new goods. Developing countries can import them.

If there are almost limitless numbers of conceivable goods that can be introduced into any economy, there must also be some fixed cost associated with the introduction of each new good, which these fixed costs limit the set of goods. This contrast with the standard approach in which, fixed costs are assumed to be of negligible importance in markets of realistic size.

Every real economy is presented with an almost incomprehensible number of new goods that can be introduced. Some of these goods would increase utility. Many others, perhaps the great majority of all possible new goods, would not be worth introducing. The fixed costs are too high and the benefits too low. The economy must decide whether each potential new good is worth the cost it takes to bring it into existence based on the complexity of the decision to introduce a good, because the value of any particular new good will depend through complicated chains of complementarity and substitution on the other goods that are present.
Partial equilibrium analysis and new goods:

To keep things simple and frame the main message, I offer the following diagram.

![Diagram illustrating the welfare costs of trade restrictions](image)

Figure 1: New goods and the welfare costs of trade restrictions

Assume a small economy, where all agents take world prices as exogenously given. Figure 1 shows a simple demand line for a hypothetical imported good. The graph shows a point of equilibrium at a price $P_1$ and a quantity of $X_1$. The corresponding consumer surplus is given by the triangle $A+B+C$.

Now suppose that the government has imposed a tariff on the import good. The price rises by the amount of the tariff, from $P_1$ to $P_2$; the quantity demanded falls from $X_1$ to $X_2$. Further, the consumer surplus shrinks. The larger part, shown by area $B$, is the tariff revenue collected by the government. The foregone surplus $C$ is the deadweight loss. Conventional estimates of the cost of protection are based upon the size of $C$.

Romer, however, argues that such calculations may substantially understate the costs of protection arising from trade restrictions, because the set of goods that are traded is not fixed in the real world. Suppose that introducing a new good to a market incurs a fixed cost such as the cost of advertising or establishment of a service and parts supply network. The increasing-returns-to-scale technology (or, equivalently, decreasing-average-cost technology) implies a cost function $C = a + bX$, where the fixed cost “$a$” and the constant marginal cost “$b$” is assumed to be the same regardless of the tariff regime.
under which the country operates. Because of fixed selling costs, some amount of revenue is required for a good to be sold at all. Therefore, even a tiny tariff may cause a good never to appear. In other words, if a tariff (tariff removal) leads to the withdrawal (appearance) of a (new) good, then the corresponding loss (welfare gain) is not the C-triangle, but the entire social surplus, A+B+C. Likewise, this “market size” effect can be illustrated with the help of Figure 2.

![Figure 2: Protection leading to disappearance of goods](image)

We now consider the demand (D) for an imported consumption good (X). Consider imports are produced with an increasing-returns technology, whose cost function is given by $C = a + bX$. Producers of the import good suffer a loss when demand falls below $X_1$. This can be seen in Figure 2 by the fact that the demand curve stays always to the left of and below the average cost curve (AC) when demand is below $X_1$. This implies that producers will always suffer a loss if they cut production below the pre-tariff level. As a result, the foreign producer will be forced out of business and variety will disappear from the market, i.e. the tariff has a “market-size” effect. The complete withdrawal of the product again leads to the loss of the entire consumers’ surplus represented by the area $A+B+C$. 
Relative Magnitude:

To illustrate these issues in a formal model, suppose that output can be written as a function of labor $L$ and a large quantity of different types of capital goods indexed by $i$:

$$Y = L^{1-\alpha} \sum_{i=1}^{N} X_i^\alpha$$

Output is a constant return to scale function of $L$ and all $N$ of the different inputs $X_i$. Labor’s share of total income will be $1 - \alpha$, and in the aggregate, the share of all the capital goods will be $\alpha$. For each possible input in production, there is a foreign entrepreneur that contemplates paying the fixed cost $C_0(i)$ of entering the local market. $N$ is the marginal good, the one which entry costs just equal revenue.

Assume that large set of productive inputs already exists in the rest of the world, and each of them can be introduced into this economy after incurring a cost $C_0(i)$. The goods are arranged so that $C_0$ is increasing in $i$. For simplicity, we can assume that this dependence is linear $C_0(i) = \mu i$. We can also choose the units for measuring quantities of the $x_i$’s so that $C_1$, the marginal cost of one additional unit of each good, is the same for all goods.

Expression $\frac{dy}{dx_i}$ gives the marginal productivity dissipate or industry inverse demand curve

$$P_i(x_i) = \alpha L^{1-\alpha} x_i^{\alpha - 1}$$

Suppose that the government imposes an ad valorem tax or tariff $\tau$ on all of the purchases of foreign imported goods. If the firm $i$ enters, it faces a profit maximization:

$$\max_x (1 - \tau) p_i(x) x - c_1(x) = \max_x (1 - \tau) \alpha L^{1-\alpha} x_i^\alpha - c_1(x)$$

$$FOC: P_i' = C_1 / \alpha (1 - \tau)$$

Revenue net of cost and taxes is then equal to:
\[ Rev = (1 - \tau) \frac{C_1}{\alpha(1 - \tau)} x - C_1 = \frac{1 - \alpha}{\alpha} C_1 x \]

In equilibrium, the input level \(x^*(\tau)\) will be the same for all goods and can be found by putting the expression for \(p^*\) on the left side of industry inverse demand to yield:

\[ x^*(\tau) = \alpha^{\frac{2}{1-\alpha}} c_1^{-\frac{1}{1-\alpha}} (1 - \tau)^{1/(1-\alpha)} L \]

The expressions for \(p^*\) and \(x^*(\tau)\) can then be substituted for the net revenue.

Solution for the equilibrium number of inputs \(N(\tau)\) comes from equating the fixed costs of introducing the marginal good, \(\mu N\), to the expression for net revenue:

\[ N(\tau) = \frac{1 - \alpha}{\alpha \mu} C_1 x^*(\tau) = \frac{1 - \alpha}{\mu} \alpha^{(1+\alpha)(1-\alpha)} c_1^{-\frac{1}{1-\alpha}}(1 - \tau)^{1/(1-\alpha)} L \]

Using \(Y = L^{1-\alpha} \sum_{i=1}^{N} X_i^\alpha\) and the symmetry of all of the inputs, gross domestic product \(Y_{DOM}(\tau)\) can be written in terms of \(N\) and \(x\):

\[ Y_{DOM}(\tau) = L^{1-\alpha} N(\tau)[x^*(\tau)]^\alpha \]

Because all of the capital inputs are purchased from abroad, gross national product (that is, income for the citizens of the domestic economy) \(Y_{NAT}\) is equal to labor’s share of gross domestic product plus the tax revenue collected by the government. Because the total payment by domestic firms for capital inputs is equal to a fraction \(\alpha\) of \(Y_{DOM}(\tau)\) and because the government collects a fraction \(\tau\) of these payments as tax revenue, national income can be written as

\[ Y_{NAT}(\tau) = (1 - \alpha) Y_{DOM}(\tau) + \tau \alpha Y_{DOM}(\tau) = (1 - \alpha + \alpha \tau) Y_{DOM}(\tau) \]

Suppose goods are constant and only the deadweight losses from a tariff distortion. Formally, this amounts to inserting \(N(0)\) in place of \(N(\tau)\) in the expression for \(Y_{DOM}(\tau)\). A simple calculation shows that in this special example, the efficiency loss for this
economy, measured as a fraction of national income in the absence of a tariff varies exactly with the square of the tax or tariff rate:

\[
1 - \left(1 - \alpha + \alpha \tau \frac{x^*(\tau)}{x^*(0)}\right) = 1 - \frac{1 - \alpha + \alpha \tau}{1 - \alpha} \frac{x^*(\tau)}{x^*(0)}
\]

\[
= 1 - \frac{(1 - \alpha + \alpha \tau)(1 - \tau)^{\alpha/(1-\alpha)}}{1 - \alpha}
\]

The last equality holds because \(\alpha = 0.5\).

The other experiment is to consider the effects of a fully anticipated tax. In this case, the tax reduces \(N\) in addition to reducing \(x\). Firms that contemplate entry understand that the monopoly revenue collected after entry will be smaller because of the tax. In this case, the expression for the proportional loss in output increases much more rapidly with \(\tau\):

\[
1 - \left(1 - \alpha + \alpha \tau \frac{x^*(\tau)}{x^*(0)}\right) = 1 - \frac{1 - \alpha + \alpha \tau}{1 - \alpha} \frac{x^*(\tau)}{x^*(0)}
\]

\[
= 1 - \frac{(1 - \alpha + \alpha \tau)(1 - \tau)^{(1+\alpha)/(1-\alpha)}}{1 - \alpha}
\]

The difference between the welfare losses implied by these two different experiments is striking. If the tariff rate \(\tau\) is 10%, the first calculation – the one that holds constant the set of goods in use - implies that national income falls by only 1%, the square of the tax or tariff rate. The second calculation - the one that lets the set of good vary in response to reductions in anticipated revenue - implies that national income falls by 19.81%. And if \(\tau=0.25\), the first calculation implies that national income falls by 6.25%. The second implies it falls by about 47%. Gross domestic product and labor income fall by about 58% when the tax rate is 25%, but government receives revenue equal to about 11% of the no tax GDP. If part of this tariff is dissipated by collection costs and rent seeking, the loss to society could be closer to the 58% fall in GDP than to the 47% fall in national income.
**Conclusion:**

The fundamental claim in this paper is that economists have adopted a point of view and used a collection of models that has led them to substantially underestimate the costs of tariffs and other restrictions on international trade. Economists who were familiar with the experience of particular countries have often asserted that price distortions, taxes, tariffs, and bureaucratic impediments could be of decisive importance in slowing development, but they often made these claims without much in the way of theoretical backup, and without convincing important parts of the profession.

Only evidence can settle an assertion of fact such as the one made here – that trade restrictions, taxes, corruption, bureaucratic red tape, and the many other small contributions to the cost of doing business in a developing country can have very large negative effects on aggregate output because they can sharply reduce the number of productive activities that are undertaken there.