

## Lecture 8: Government Policies and Distortions as Determinants of Trade

1. Distinguishing among producer, consumer, and world prices.
2. Autarky equilibrium, where does tax revenue go?
3. Small economy facing fixed world prices: distortions as a basis for (bad) trade.
4. Two identical economies, except one has a distortion.
5. Gains-from-trade analysis: the expansion condition revisited.
6. Factor market distortions.

Autarky

$p$  - producer prices,

$q$  - consumer prices

$$(1) \quad \begin{aligned} q &= p(1 + t) > p && \text{tax} \\ q &= p(1 - s) < p && \text{subsidy} \end{aligned}$$

Note the equivalence of a tax on one good and a subsidy on the other.

$$\frac{q_x}{q_y} = \frac{p_x}{p_y(1+t)} < \frac{p_x}{p_y} \quad \text{tax on } Y$$

(2)

$$\frac{q_x}{q_y} = \frac{p_x(1-s)}{p_y} < \frac{p_x}{p_y} \quad \text{subsidy on } X$$

Assume that tax revenues are redistributed back to consumers lump sum.

Then the value of consumption at consumer prices, equals the value of production at producer prices plus (net) tax revenue.

$$(3) \quad q_x X_c + q_y Y_c = p_x X_c + p_y(1+t)Y_c = [p_x X_c + p_y Y_c] + [p_y t Y_c]$$

$$\begin{aligned} \text{consumer expend} &= \text{prod revenue} + \text{tax rev} \\ &= \text{factor payments} + \text{tax rev} \end{aligned}$$

Figure 1: Represents either a tax on Y or a subsidy on X.

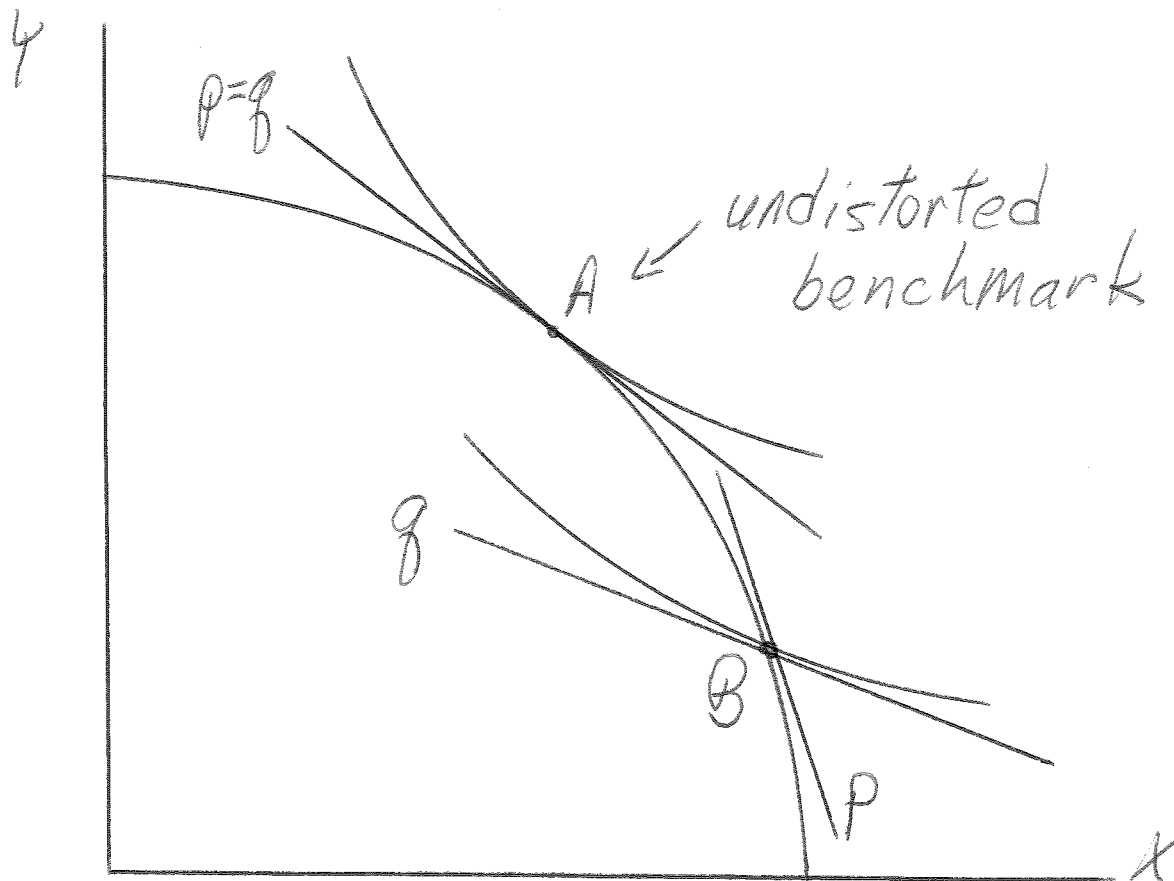


Fig 1

Small Economy: fixed world prices = undistorted domestic autarky prices.

Now there will be a very significant difference between production and consumption taxes.

Let “neutralize” all other causes of trade. Assume that the country’s autarky price ratio equals the (fixed) world price ratio.

Consumption Tax on Y (subsidy on X)  $p^*$  = world prices (Figure 2)

$$(4) \quad \frac{q_x}{q_y} = \frac{p_x}{p_y(1+t)} = \frac{p_x^*}{p_y^*(1+t)} \quad \text{or} \quad (1+t)\frac{q_x}{q_y} = \frac{p_x}{p_y} = \frac{p_x^*}{p_y^*} > \frac{q_x}{q_y}$$

Equilibrium requires:

- (1) Trade balances at *world* prices, implying that the consumption and production points are connected by the world price ratio.
- (2) Producer prices = world prices, implying that world prices are tangent to the production frontier.
- (3) Consumers optimize with respect to the *consumer* price ratio, so that the slope of an indifference curve is equal to the consumer price ratio.

Production Tax on Y (subsidy on X) (Figure 3)

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$$(5) \quad \frac{p_x}{p_y(1+t)} = \frac{q_x}{q_y} = \frac{p_x^*}{p_y^*} < \frac{p_x}{p_y}$$

Equilibrium requires:

- (1) Trade balances at *world* prices, implying that the consumption and production points are connected by the world price ratio.
- (2) Producer prices do *not* equal world prices, implying that the world price ratio cuts the production frontier.
- (3) Consumers optimize with respect to the *consumer* price ratio, so that the slope of an indifference curve is equal to the consumer price ratio = world price ratio.

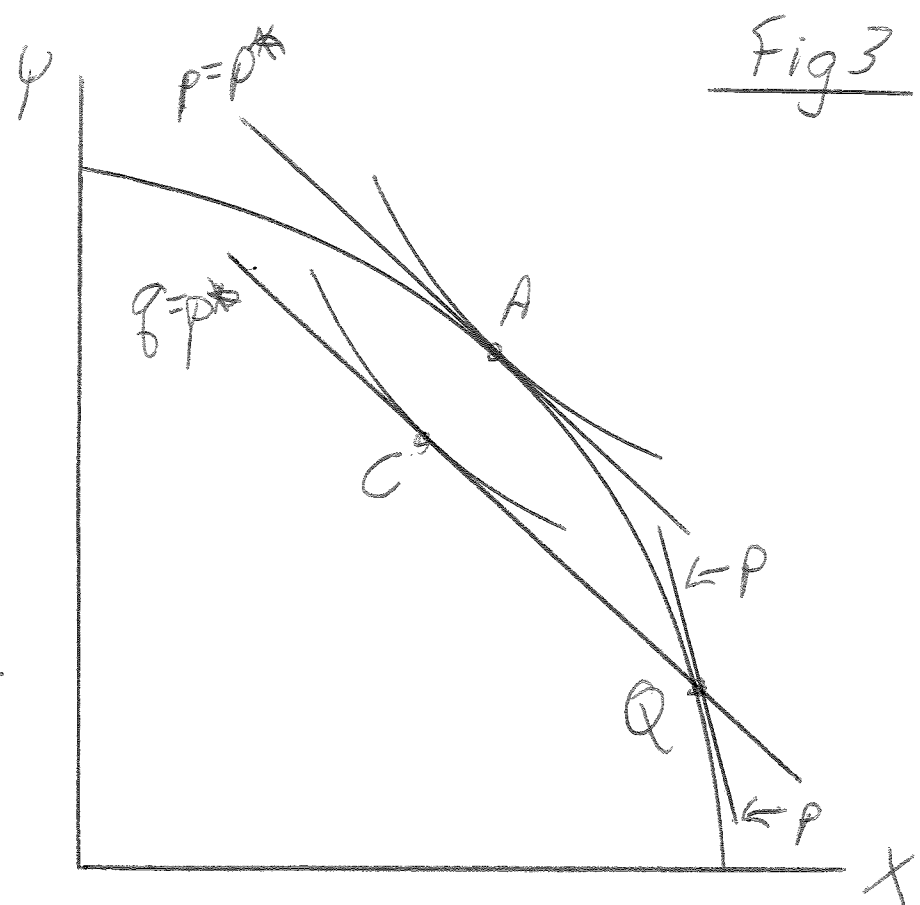
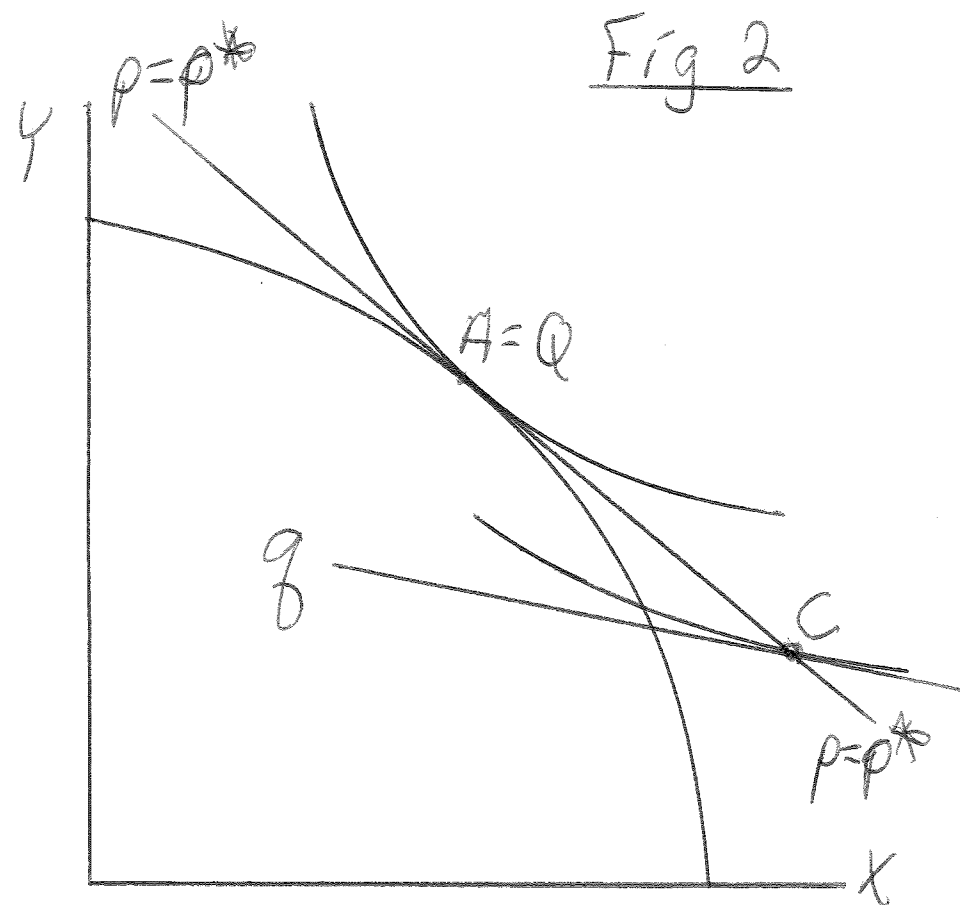
Result: Bad trade. A subsidy can generate exports, but do not confuse exports with welfare.

Small economy facing fixed world prices = autarky prices

*A = undistorted optimum Q = distorted prod C = distorted cons*

Consumption tax on Y or subsidy on X,  
 $p = p^* > q$

Production tax on Y or subsidy on X,  
 $p > p^* = q$



Result: A distortion can generate trade, but it is not "good" (welfare improving) trade. Classic American saying: "If it ain't broke, don't fix it".

Note especially:

- (1) The production tax (subsidy) and consumption tax (subsidy) have opposite effects on the direction of trade.
- (2) The consumption tax (subsidy) has no effect on production (depends on the small, open economy assumption). Producers supply the export market instead of domestic consumers.
- (3) The production tax discourages consumption of the taxed good only indirectly through a negative income effect.
- (4) If the government wants to discourage production use a production instrument, if it wants to discourage consumption, use a consumption instrument.

## Two Identical Economies - country h has a distortion

Country h taxes Y, or subsidizes X

Consumption Distortion - Figure 4

- (1) Country h imports X, exports Y.
- (2) Country h is worse off relative to undistorted equilibrium.
- (3) Country f is better off.

Production Distortion - Figure 5

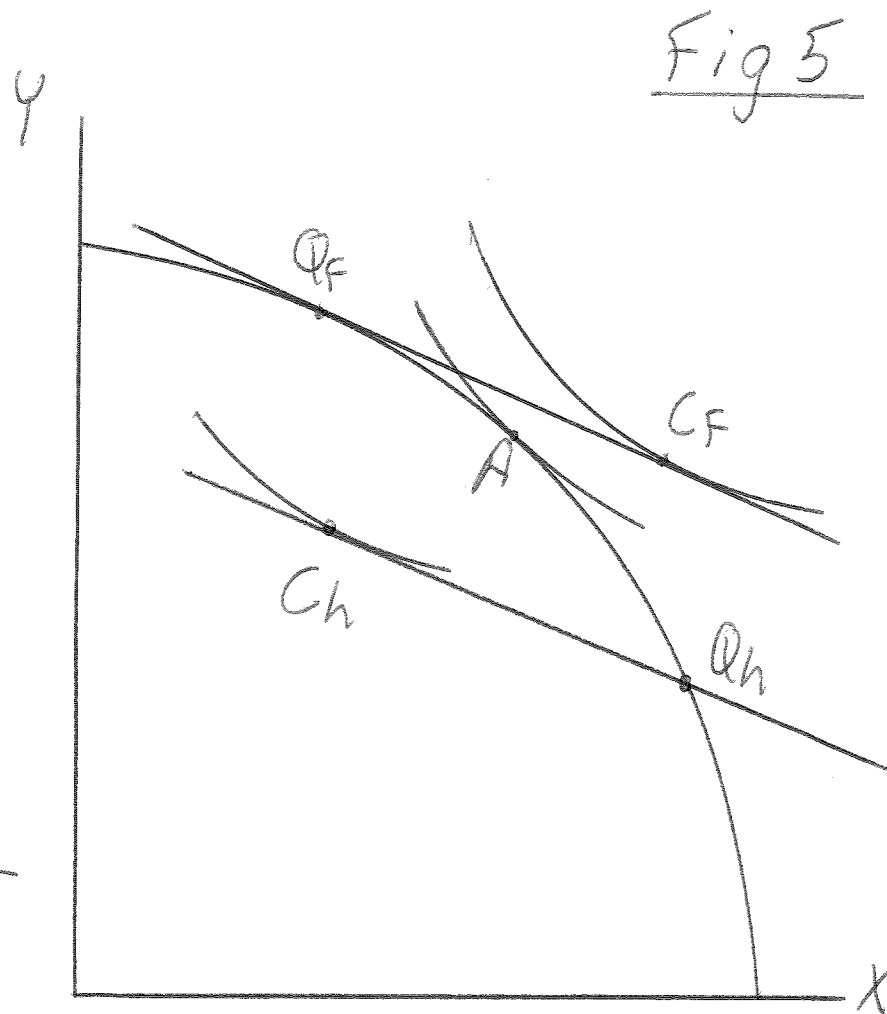
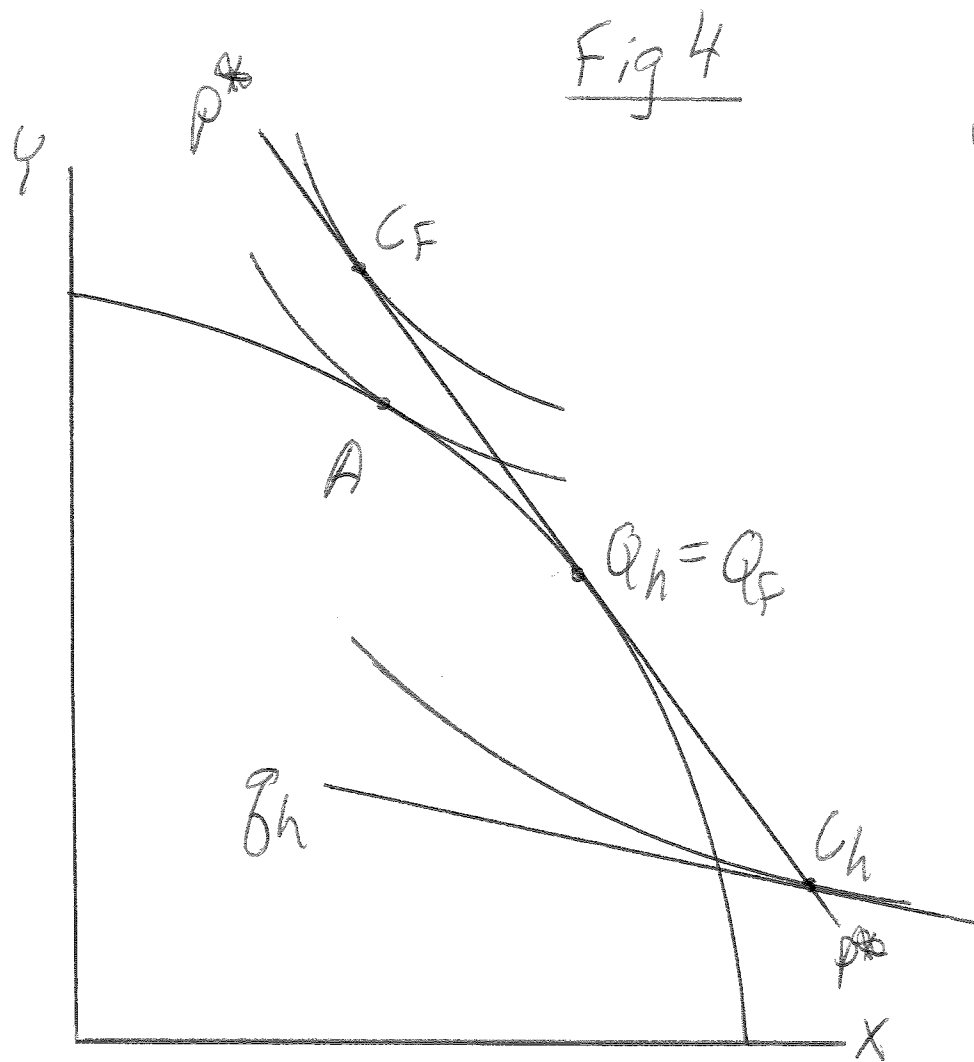
- (1) Country h imports Y, exports X.
- (2) Country h is worse off relative to undistorted equilibrium.
- (3) Country f is better off.
- (4) Factor used intensively in the untaxed sector or in the subsidized sector is better off (HO model).

Two identical economies, no trade in the absence of a distortion.



Consumption tax on Y, subsidy on X in country h.

Production tax on Y, subsidy on X, in country h



Clearly, if we start out in an optimum, the introduction of a tax or subsidy can only reduce welfare.

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Different question: How does autarky with a distortion rank relative to free trade with the distortion.

Think of autarky as a second distortion: a prohibitive trade barrier.

What happens if we remove one of the two distortions?

Consumption distortion: compare free trade with the domestic consumption distortion to autarky with the distortion.

The value of free-trade production is maximized at free-trade prices.

$$(6) \quad p_x^* X_p^f + p_y^* Y_p^f > p_x^* X_p^a + p_y^* Y_p^a$$

Use the balance-of-trade constraint on the left and the autarky market clearing conditions into the right-hand side.

$$(7) \quad p_x^* X_c^f + p_y^* Y_c^f > p_x^* X_c^a + p_y^* Y_c^a$$

But in order to evaluate welfare, we need to have consumption at *consumer prices* not producer prices. 11

This can be accomplished by adding several terms to both sides of the inequality (7) such that the inequality must continue to hold.

(8)

$$p_x^* X_c^f + p_y^* Y_c^f + p_y^* t Y_c^f - p_y^* t Y_c^a > p_x^* X_c^a + p_y^* Y_c^a + p_y^* t Y_c^f - p_y^* t Y_c^a$$

Inequality (8) can be rearranged to yield

$$(9) \quad p_x^* X_c^f + p_y^* (1 + t) Y_c^f > p_x^* X_c^a + p_y^* (1 + t) Y_c^a + p_y^* t (Y_c^f - Y_c^a)$$

Using our definition of consumer prices, this becomes simply

$$(10) \quad [q_x X_c^f + q_y Y_c^f] > [q_x X_c^a + q_y Y_c^a] + [p_y^* t (Y_c^f - Y_c^a)]$$

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A sufficient condition for gains from trade is that consumption of the tax-distorted good increases (or subsidy-distorted good decreases).

To put the matter the other way around, a country may fail to gain from trade when trade further reduces the consumption of a taxed good (or increases consumption of a subsidized good).

Production distortion: compare free trade with the domestic production distortion to autarky with the distortion.

The value of free-trade production evaluated at the *producer* price ratio  $p$ , is greater than the value of any other feasible production bundle evaluated at these prices.

$$(11) \quad p_x X_p^f + p_y Y_p^f > p_x X_p^a + p_y Y_p^a$$

Recalling that  $p_y(1 + t) = p_y^*$ , we can write the producer price of  $Y$  as  $p_y = p_y^* - p_y t$ . The producer price of  $X$  equals the world price of  $X$ .

$$(12) \quad p_x^* X_p^f + p_y^* Y_p^f - p_y t Y_p^f > p_x^* X_p^a + p_y^* Y_p^a - p_y t Y_p^a$$

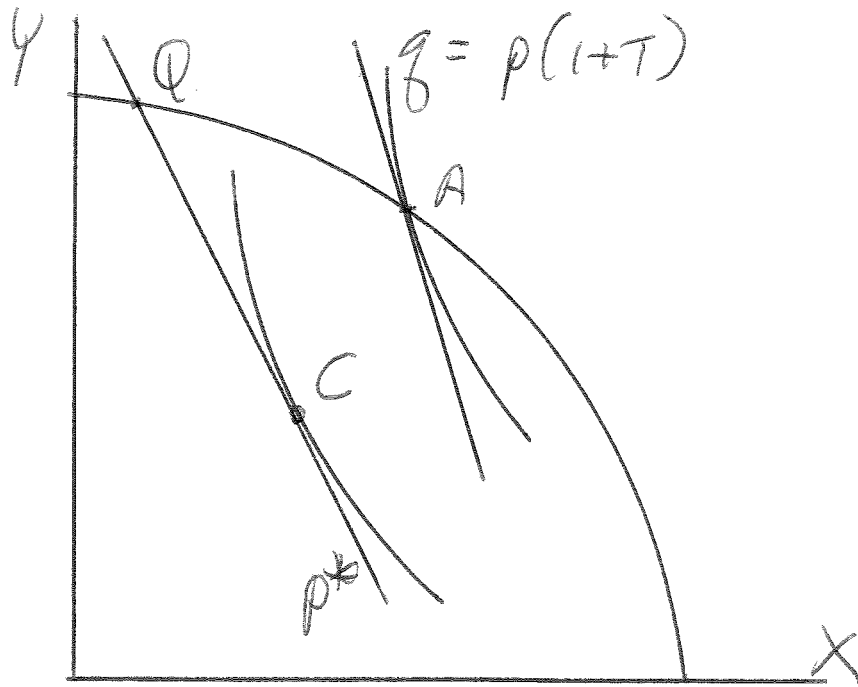
$$(13) \quad p_x^* X_p^f + p_y^* Y_p^f > p_x^* X_p^a + p_y^* Y_p^a + p_y t (Y_p^f - Y_p^a)$$

As before, use the balance-of-trade constraint to replace the left-hand side of (13) with the value of consumption, and use the autarky market-clearing conditions to replace the production quantities on the right-hand side with consumption quantities.

$$(14) \quad [p_x^* X_c^f + p_y^* Y_c^f] > [p_x^* X_c^a + p_y^* Y_c^a] + [p_y t (Y_p^f - Y_p^a)] \quad 0$$

A sufficient condition for gains from trade is that production of the tax-distorted good increases (or subsidy-distorted good decreases).

To put the matter the other way around, a country may fail to gain from trade when trade further reduces the production of a taxed good (or increases production of a subsidized good).



Production tax on X

Consumer price ratio  $q > p^*$

Opening of trade further reduces  
production in X sector which  
is already producing too little

Basic proposition of the theory of the second best:

- (1) In the presence of one or more distortions, adding a second distortion may improve welfare (NB. it must be a carefully chosen distortion which counteracts the others)
- (2) In the presence of two or more distortions, removing one distortion could make you worse off.

This has been an important issue for the transition economies. In what order do you make reforms; that is, in what order do you remove distortions?

## Factor Market Distortions

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There are many types of such distortions. Consider the Heckscher-Ohlin model, and assume that the use of one factor in one sector is taxed.

Suppose capital in Y production is taxed.

Figure 7 - the economy moves off the efficient production frontier and production occurs along a distorted locus of point interior to the frontier (except at the end points).

But there is a second distortion: competitive equilibrium is not at a point of tangency between the distorted locus and an indifference curve.

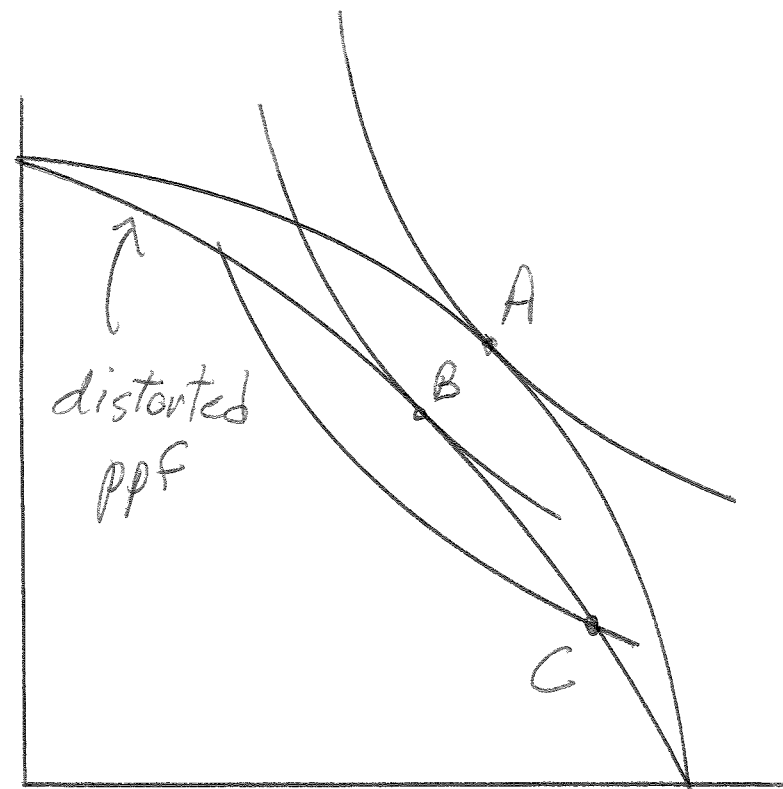
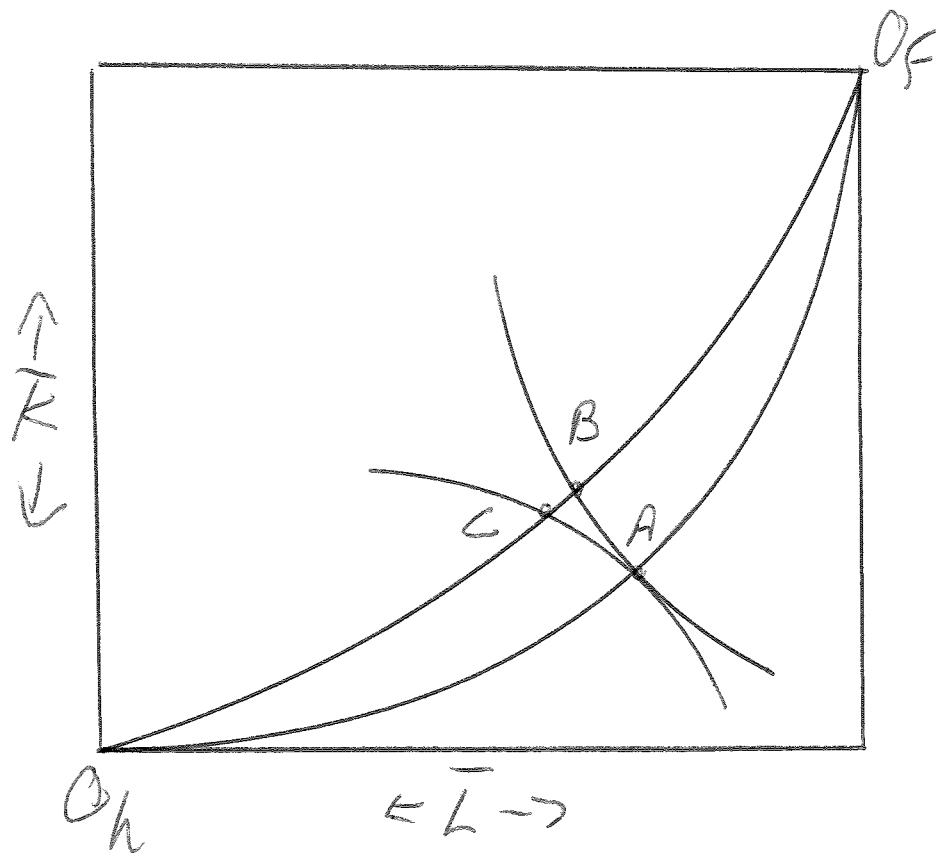
$$(15) \quad \frac{dY}{dX} = \frac{G_l dL_y + G_k dK_y}{F_l dL_x + F_k dK_x} = - \frac{G_l dL_x + G_k dK_x}{F_l dL_x + F_k dK_x}$$

(16)

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$$-\frac{dY}{dX} = \frac{p_x \left[ p_y G_l dL_x + p_y G_k dK_x \right]}{p_y \left[ p_x F_l dL_x + p_x F_k dK_x \right]} = \frac{p_x \left[ w + r(1+t) dK_x / dL_x \right]}{p_y \left[ w + r dK_x / dL_x \right]} > \frac{p_x}{p_y}$$

This result should be intuitive: *where* we are on the distorted frontier should depend on which good is taxed or subsidized.





Tax on capital in Y

Tax on labor in X

Subsidy to capital in X

Subsidy to labor in Y

In all cases this results  $MRS_x > MRS_y$ . For example, a tax on capital in Y results in:

$$MRS_x = \frac{w}{r} > \frac{w}{r(1+t)} = MRS_y$$

However, although the distorted production frontier will be the same in each case, which point is chosen depends on which good is taxed/subsidized.

## Results / Lessons for Policy

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1. Public policy can generate trade, but it is not necessarily good trade and must be welfare worsening if everything is optimal to start with (if it aint ....). *Exports must not be confused with welfare.*
2. There is a symmetry between a tax in one sector and a subsidy to the other sector. Why are governments so paranoid about foreign subsidies but not about foreign taxes?
3. There is an asymmetry between consumption and production taxes. They have *opposite* effects on the direction of trade and on factor prices.
4. Instruments and targets. Policy should be direct. If you want to discourage consumption of X, tax X consumption. If you want to discourage production of X, tax X production.

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5. Factor market distortions have two reinforcing effects. First, they generally move the economy off the efficient production frontier to the interior of the production set. Second, they move the equilibrium along the distorted frontier to an inefficient point (e.g., a point of "non-tangency").
  6. Non-distortionary factor taxes must involve taxing factors in inelastic supply, and taxing the factor equally in all its uses (e.g., labor used in leisure).
  6. Analysis illustrates the theory of the second best.
    - (a) Removing one distortion in the presence of several distortions may reduce welfare.
    - (b) Adding one distortion (e.g., trade barrier) in the presence of another distortion (e.g., production tax or subsidy) may increase welfare.