Buyer Concentration in Markets for Developing Country Exports

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Abstract:

This paper explores the implications of buyer concentration in markets for primary commodity exports of developing countries. Simple partial equilibrium models of monopsony and oligopsony show that the best available policy for the exporting country may be to tax exports so as to extract some of the profits of the monopsonist, even though doing so will actually worsen the distortion caused by the buyer's market power. The paper also explores the general equilibrium implications of these results for factor markets and for patterns of trade.

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I. Introduction

This paper explores the implications of buyer concentration in markets for primary commodity exports of developing countries. This was prevalent in colonial times for countries whose trade was delegated by a foreign colonial power to a single trading company like the British East India Company. It has become relevant again today with the markets for primary-product exports of developing countries increasingly dominated by small numbers of multinational buyers. Section II presents evidence of the trend towards small numbers of dominant buyers for two primary commodities, cocoa and coffee, as an outcome of mutually reinforcing political economy and technological forces. Simple partial equilibrium models for monopsony and oligopsony in section III show that a beneficial policy, which may be the best available for the exporting country, is to tax exports so as to extract some of the profits of the monopsonist. This is beneficial even though doing so actually worsens the distortion caused by the buyer's market power. Section IV turns to models of general equilibrium to determine the broader implications of these results for factor markets and for patterns of trade. Section V concludes.

II. Buyer Concentration

The trend towards buyer market power is an outcome of expanded scales of operation at the manufacturing end, which has led to a few large-scale primary processors capturing production at source, to meet the volume and timing requirements of the final

product manufacturers.[1] Simultaneous technological developments in processing have enabled pooling of raw material of varying qualities and therefore larger scales of operation (Kieffer, 2000). At the same time, the closure in producing countries of state-controlled buying agencies, which had offered guaranteed minimum prices with buying quotas, was among the conditionalities imposed on primary producing countries as a part of structural adjustment programmes.   These two forces have mutually reinforced the trend towards a few-buyer, many-seller market. There is documented, but unsystematic, evidence across many primary commodities of "growing asymmetry in the value chain – between the fragmentation at the producing end of these chains, and the concentration at the buying and retail ends" (Kousari, 2005: 3). Morisset, 1998, documents the doubling of spreads between world and domestic (in the producing country) prices in all major commodity markets over 1975-94, and assigns the likely cause to large international trading companies with the capability to influence spreads through one or several stages of processing.

Shepherd, 2004, uses vector autoregressions to model price transmission through the coffee processing chain, for the pre-1989 period when producers exerted market power through state-controlled marketing, and post-1989, when producer intervention was minimal. He finds that price transmission is worse in the liberalized period, and ascribes the cause to market power among private actors at intermediate levels in the processing chain. Francois and Wooton, 2001, show equivalent results for shipping, and by extension for the full chain of services required to transfer exports to the importing

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[1] The primary processors convert the harvested crop, the berry in the case of coffee, to extracted, hulled and dried beans that enter as inputs into the final manufacturing stage.

destination. When these services are characterized by few rather than many players, the benefits of tariff liberalization are partially captured by the few players.

The abolition of state-run marketing boards has been a standard condition attached to structural adjustment programmes of the IMF and the World Bank (WTO, 2003:4; Fitter and Kaplinsky, 2001: 78). The market for cocoa in Cote d'Ivoire, the largest producer, is judged to have returned, after a forty-five year hiatus, to the practices of the colonial period, with the dismantling in 1999 of the Caisse de Stabilisation, the cocoa marketing board, in response to persistent pressure (Losch, 2002: 213). The commodity boards were seen as non-transparently taxing farmers. But with the removal of guaranteed minimum prices, and the affordable credit that guaranteed prices enabled, this opened the door to control by international trading companies. The cocoa market is dominated by three firms today, Archer Daniels Midland (ADM), Barry-Callebaut and Cargill, with a roughly two-third combined share of global purchasing. Concentration in coffee is somewhat less marked, with the top ten firms accounting for two-thirds of global purchases of the bean (Fitter and Kaplinsky, 2001: 79), but it goes back further in time. The four-firm concentration ratio for coffee in 1963 is estimated to have been at 52 percent (McLaren, 1996:3). The International Coffee Agreement, which ended in 1989, came into existence in 1962 paradoxically through lobbying by the primary processor oligopoly. McLaren, 1996, explains the paradox as a solution to the time consistency problem between the high sunk costs and long gestation period before the crop matures, and the inability of the oligopsony to offer a credible price commitment without the limitations of a formal agreement. The buyer concentration itself is ascribed to

economies of scale in primary processing of the coffee bean, and to the justified fear by potential entrants of predatory eviction by entrenched processors (Hilke and Nelson, 1989: 222).

Although the evidence points to oligopsony rather than pure monopsony, it is likely that market segmentation leads to the producers in any single country confronting one rather than more than one buyer. Even where there is more than one buyer active in a market, there is some evidence, for coffee, of buyer collusion on the purchase price. The objective evidence in support of this is that while the coefficient of variation in the price of coffee traded on the New York Coffee Exchange has gone up sharply since 1985, the dispersion of coffee purchase prices in the ten major exporting countries has fallen over the same period (Fitter and Kaplinsky, 2001: 78). Earlier evidence of output price manipulation is provided in Hilke and Nelson (1989).

III. Partial Equilibrium

The basic partial equilibrium model is shown in Figure 1. The exporting country is small and faces a fixed world price, P^W, of its export, which it supplies with the supply curve S_X. If it were able to export to the world market directly under perfect competition, it would export the quantity X^C. However, access to the world market is obtainable only by selling to one or more foreign firms that act as intermediaries between the domestic and world markets. We first assume that there is a single such firm, thus a monopsonist, and then consider a larger but fixed number of firms, forming an oligopsony.

Monopsony

If there is a single monopsonist firm, its profit maximization problem is illustrated in the figure. The monopsonist is assumed to have market power only in buying the good from this country, not in selling it on the world market. Thus its marginal revenue from additional purchases of the good from this country is simply the world price, P^W. However its marginal cost is not the price it pays for the country's export, since it faces the upward sloping supply curve and, if it expands its purchases, must pay a higher price not just for the marginal unit but for all infra-marginal ones as well. In the familiar manner of a monopoly seller, but reversed, it faces a marginal cost curve that, in the linear case shown, is twice as steep as the supply curve and thus is simply half the distance from the vertical axis to that supply curve.

The monopsonist then maximizes profit by buying the country's export at the quantity that equates this marginal cost to the world price, X^M. By doing so it pushes down the price it must pay the country below the world price, causing a loss of producer surplus for the country. The form this loss will take depends on the internal market structure of the country, which we will explore further when we look at general equilibrium in the next section. Suffice it to say that it is likely to include a fall in wages for workers in the country. There is also, of course, a dead-weight loss from the market distortion caused by the monopsonist, since the loss of producer surplus is larger than the profit earned by the monopsonist.

Now consider the policy options of the exporting country. The first-best allocation of resources from the world's perspective would be for the country to produce and sell X^C. But the obvious way to achieve that would be for the country to subsidize its exports, and if it did so the foreign monopsonist would add the entire subsidy to its profit. The subsidy would exceed the gain to domestic producers, and the country would only lose. More effective, if it could be done, would be to impose a price floor on the monopsonist, preventing it from purchasing the good from domestic suppliers, despite their willingness, for anything lower than a set price. If that could be enforced at a price below P^W but close to it, the country would gain. Unfortunately, getting that price right, and enforcing it, is likely to be prohibitively difficult.

The policy we examine instead is an export tax. Set at a level t per unit of the good, this reduces the net benefit to the monopsonist from sales on the world market to $P^W–t$, as shown, and causes it to *reduce* its purchases of the country's export. Therefore it moves the market further away from the optimum at X^C. However, if the tax is not too large, then the gain to the country in tax revenue, shown as the cross hatched area between the two prices, must be greater than the loss in producer surplus to suppliers, shown as the shaded area to the left of the supply curve. This is possible because the loss of monopsonist profit is even larger. In effect, the exporting country has taxed and thus expropriated a part of those profits.

This benefit from taxing exports is analogous to the benefit that countries can sometimes derive from taxing imports. However, this is not equivalent to the most

familiar such case: the optimal tariff levied by a large country to improve its terms of

trade, as famously examined by Johnson (1954). Here we assume that the exporting

country is small, not large, so it does not have any power in the world market to exploit.

Furthermore, while it is true that the tax does allow it to extract a better price for its

product (inclusive of the tax) from the monopsonist, unlike the optimal tariff it does so in

a distinctly suboptimal way (compared to simply fixing the price). And finally, while the

optimal tariff is subject to the foreign retaliation examined by Johnson, this tax on

exports is beneficial to the exporting country even when the monopsonist responds

optimally.[2]

The analogous case of import taxation, therefore, is not to be found in traditional

models of trade under perfect competition. Rather, this is a simple example of "strategic

trade policy," a la Brander and Spencer (1981, 1984). The export tax allows the

exporting country to extract a portion of the foreign monopsonist's monopsony rent,

albeit at the cost of further worsening the economic distortion caused by monopsony

pricing.

Oligopsony

Suppose now that there are *N* identical buyers of the product engaged in Cournot

competition in the domestic market. They are price takers as sellers on the world market,

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[2] We assume that our exporting country is small precisely to abstract from the situation in which a country
might use an export tax to alter world prices in its favor. In fact, some countries with small GDPs are
nonetheless able to export a significant share of world supply of a particular product. For such countries,
an export tax may be doubly beneficial.

as above, where they get the price P^W minus an export tax t. Let the domestic supply

function be

$$P = a + bX \tag{1}$$

so that supply to the world market at price P^W, if it were direct, competitive, and tax-free,

would be

$$X^C = (P^W - a)/b \tag{2}$$

Each of the N buying firms sets a quantity of the good, x, that it buys on the

domestic market, paying the price that clears that market, $P(x) = a + bNx$. However, in

standard Cournot fashion, in selecting x each firm takes as given the purchases of all

other buyers. Thus it chooses x to maximize

$$\pi = \{(P^W - t) - [a + b(X_{-1} + x)]\}x \tag{3}$$

where X_{-1} is the combined purchases of the other $N-1$ buyers. This maximization

yields

$$x = (P^W - t - a - bX_{-1})/2b \tag{4}$$

From this, since $X_{-1} = (N-1)x$, we have the following quantities and price in the

oligopsony equilibrium:

$$x^O = (P^W - t - a)/(N+1)b \tag{5}$$

$$X^O = Nx^O = \frac{N}{N+1}\frac{(P^W - t - a)}{b} = \frac{N}{N+1}\left(X^C - \frac{t}{b}\right) \tag{6}$$

$$P^O = a + bX^O = \frac{1}{N+1}a + \frac{N}{N+1}(P^W - t) \tag{7}$$

Relative to the competitive, untaxed equilibrium, in which producers receive P^W,

the country's welfare is changed by $\Delta W = \Delta S + \Delta R$, where ΔS is the change in producer

surplus, and ΔR is the government revenue from the tax. In the Appendix we show that

$$\frac{d\Delta W}{dt} = \frac{N}{(N+1)^2}\left[X^C - (N+2)t/b\right] \tag{8}$$

From this it is clear that, if $t = 0$ then $d\Delta W/dt > 0$, so that a positive tax is necessarily

beneficial for the exporting country. The optimal level of this tax is found by setting

$d\Delta W/dt = 0$, from which

$$\hat{t} = \frac{bX^C}{N+2} = \frac{P^W - a}{N+2} \tag{9}$$

Thus the optimal tax goes to zero as the number of firms in the oligopsony goes to

infinity.

Note that this solution also characterizes the monopsony case, for which N=1. In

that case, (9) says that the optimal export tax is equal to one third of the gap between the

world price and the price, *a*, at which the country would just begin to supply a positive

quantity.[3] The optimal tax is smaller for an oligopsony, equal to one fourth of this gap

when there are two buyers, one fifth when there are three, and so on.

A Caveat: The Role of Exit

The argument for an export tax can be undermined if it induces exit of firms from

the oligopsony. If that happens, then the smaller number of buyers will exert greater

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[3] If that price is negative, *a*<0, so that the supply curve starts from the horizontal axis rather than the vertical, this conclusion still holds. In fact, as one might expect from the implied less elastic supply curve, the optimal export tax is then larger.

market power over sellers, reducing both their producer surplus and the tax revenue of the exporting country's government.

In the oligopsony model above, if one adds the assumption of a common fixed cost, F, per firm and then assumes that there is free entry and exit forcing profits to zero, it turns out that (with the linear supply curve assumed in (1) above), the equilibrium number of oligopoly firms is[4]

$$N^e = \left(\frac{P^W - t - a}{\sqrt{bF}} \right) - 1 \tag{10}$$

which decreases as the tax, t, increases. Indeed, in the zero-profit equilibrium, it turns out that the price paid by each oligopsonist inclusive of the tax (and therefore the price captured by the exporting country), is fixed independently of the tax itself:

$$P^O + t = P^W - \sqrt{bF} \tag{11}$$

Therefore, raising the tax, even from zero, merely lowers P^O by the same amount. Aggregate oligopsony profits are reduced, but the exporting country necessarily loses.

This free-entry-and-exit solution treats the equilibrium number of firms, N^e, as a continuous variable, which is valid as an approximation only if N is large. If the number of firms in the oligopsony is small, then profits will remain positive as long as a single additional firm would push profit below zero. In that case, a small enough tax – too small to push profit below zero – will avoid exit and be beneficial. Thus we have a caveat to our recommendation for taxing exports to an oligopsony: do not tax away all of its profits.

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[4] See Appendix for the derivation of (10) and (11).

IV. General Equilibrium

The analysis above was done in partial equilibrium, but a simple general equilibrium model would behave essentially the same. Suppose that the exporting country is able to produce two goods: a numeraire import good, Y, and the export good X. Suppose also that these are produced using labor, L, which is mobile between the industries, plus two specific factors, which are not: capital, K, in industry Y; and a natural resource, T, in X. Then with conventional neoclassical production functions in both industries, the country's supply of good X will depend positively on its price relative to the numeraire, Y. The analysis of section III can be reinterpreted as applying to this general equilibrium model without modification.

Figure 2 illustrates, under the additional assumption that the country consumes only good Y, so that it can be used to measure the country's well-being.

Production possibilities are shown by the curve Y_0X_0. Downward sloping straight lines indicate, by their slopes (in absolute value) the several relative prices of X that we have discussed: the world price, P^W, at which the country would under competition produce at C and achieve income Y^C; the lower price paid by an untaxed monopsonist, P^M, at which the country produces at M and earns the lower income Y^M; and the even lower price P^{TD} that prevails in the domestic economy when the monopsonist is taxed, and production takes place at T. Earned income then is even lower, but it is augmented by the tariff revenue, R, yielding an income Y^T, since the monopsonist actually pays to the country (not to the private sector) the higher price P^{TM} that is inclusive of the tariff.

The main contribution that the general equilibrium model provides, then, is to suggest implications beyond the export industry, implications that are familiar from the literature on the specific-factors model.[5] By depressing the domestic price of X below the world price, the monopsonist (or oligopsonist) in this specific-factors model reduces the real return to the natural resource, increases the real return to capital, and has an ambiguous effect on the real wage of (mobile) labor, pushing a larger fraction of the labor force into the numeraire manufacturing sector. This might perhaps be viewed as beneficial, by promoting industry, but given the country's assumed comparative advantage in good X, it definitely suffers a static welfare loss (from Y^C to Y^M in the figure).[6]

The optimal export tax pushes the domestic price of X even further down, and increases each of the effects just mentioned except the welfare loss. That is, the returns to the natural resource fall even more due to the tax, while the return to capital rises even more. But the revenue from the tax recaptures part of the static welfare loss, therefore raising welfare relative to the untaxed monopsonist equilibrium.

The effect on the real wage of labor is, as usual in the specific factors model, ambiguous, since the wage rises relative to the fallen price of the export good, but falls relative to the price of the other good. If, as may be plausible for a primary product

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[5] See just about any text on international trade, such as Krugman and Obstfeld (2003, ch. 3).
[6] One could embed this model in a dynamic framework with learning by doing in the import-competing sector, in which case the export tax would yield the added benefit of providing (second best) infant-industry protection.

export, workers consume little of it themselves, the latter effect alone implies a fall in the real wage. That is, the monopsonist has depressed the real wage, and the export tax depresses it further. Presumably the revenue from the export tax could be allocated as desired by the country's government, perhaps to compensate either workers or the owners of the natural resource.

The general equilibrium model also reminds us of another important implication of the pure theory of international trade, that a tax on exports has the same effect as a tax on imports, as shown by Lerner (1936). Thus, in the two-good model, the same effects that we have been ascribing to an export tax could be achieved as well by an import tax. Of course in the real world of many goods, this equivalence is only relevant if the exports facing the monopsonist are the country's only exports, and even then the export tax is equivalent only to a tax on all imports.

V. Conclusion

Developing countries facing a single- or few-buyer market for primary commodity exports suffer a loss of producer surplus due to a reduction of price and quantity exported relative to the free market outcome. Any countervailing power they may once have exercised through state-run marketing boards has gone with the abolition of those boards, a standard condition attached to structural adjustment programmes of the IMF and the World Bank. This has atomised producers, at a time when buyer concentration was increasing, with technological developments favouring larger scales of operation.

An export tax levied by the producing country is one possible partial corrective. This reduces the quantity exported even further, but it offers a way by which the exporting country can extract a part of the profits of the monopsonist/oligopsonist.

The paper demonstrates that, in a simple model, the optimal tax is equal to one-third of the gap between the world price and the price at which the country would just begin to supply a positive quantity. The optimal tax is smaller for an oligopsony, equal to one fourth of this gap when there are two buyers, one fifth when there are three, and so on.

The general equilibrium results of an export tax show reduced returns to the specific factor in the commodity export sector, and a reduction also in the real wage of labor if wages are spent solely on the non-export good. However, the revenue from the tax, if set appropriately, recaptures more than the static welfare loss and is sufficient to reallocate incomes so that owners of all factors gain.

An export tax is clearly far from the optimal way of dealing with monopsony power, but small developing countries, acting alone, may have no practical alternatives. Futures markets and/or enforceable forward contracts, as correctives to buyer opportunism, typically do not have a time horizon long enough to match the gestation period to crop maturity for perennials. Other possible alternatives to an export tax are restoration of international commodity agreements or commodity marketing boards. Perhaps the best hope of dealing with this problem globally would be to introduce

competition policy into the World Trade Organization and use it to limit the market

power of firms. Until that happens, however, an optimal tax by the exporting country

may be the (second) best policy available to let it share in the profits of the buying

monopsony/oligopsony.

Appendix:
Welfare Effects of Oligopsony and Tax
Relative to the competitive, untaxed equilibrium, producer surplus, *S*, is changed by

$$\Delta S = -\int_{P^O}^{P^W} S_X(P)dP = -\int_{P^O}^{P^W} [(P-a)/b]dP = -\left[P^2/2b - aP/b\right]_{P^O}^{P^W}$$

$$= -(1/2b)[P^{W2} - 2aP^W - P^{O2} + 2aP^O]$$

$$= -(1/2b)[-2a(P^W - P^O) + (P^{W2} - P^{O2})] \tag{A1}$$

$$= -(1/2b)[-2a(P^W - P^O) + (P^W - P^O)(P^W + P^O)]$$

$$= -(P^W - P^O)[(P^W + P^O)/2 - a]/b$$

which is, of course, negative. Relative to the same benchmark, government revenue is

$$\Delta R = tX^O \tag{A2}$$

Of interest is the effect on welfare, $\Delta W = \Delta S + \Delta R$, of changing the size of the
tax, *t*, which affects ΔS through P^O (see the second line of (A1)) and affects ΔR through
both *t* itself and through X^O:

$$\frac{d\Delta W}{dt} = \frac{d\Delta S}{dt} + \frac{d\Delta R}{dt} = \left[\left((P^O - a)/b\right)\frac{dP^O}{dt}\right] + \left[X^O + t\frac{dX^O}{dt}\right] \tag{A3}$$

Differentiating (7) and using (2), (6) and (7), this becomes

$$\frac{d\Delta W}{dt} = \left[\left((P^O - a)/b\right)\frac{d}{dt}\left(\frac{1}{N+1}a + \frac{N}{N+1}(P^W - t)\right)\right]$$

$$+ \left[X^O + t\frac{d}{dt}\left(\frac{N}{N+1}\frac{(P^W - t - a)}{b}\right)\right]$$

$$= \left[X^O\left(\frac{-N}{N+1}\right)\right] + \left[X^O - \frac{N}{N+1}\left(\frac{t}{b}\right)\right] \tag{A4}$$

$$= \frac{1}{N+1}X^O - \frac{N}{N+1}\left(\frac{t}{b}\right)$$

$$= \frac{1}{N+1}\frac{N}{N+1}\left(X^C - \frac{t}{b}\right) - \frac{N}{N+1}\left(\frac{t}{b}\right)$$

$$= \frac{N}{(N+1)^2}\left[X^C - (N+2)t/b\right]$$

Oligopsony with Free Entry and Exit
Let each firm in the oligopsony incur a fixed cost, F, that it must cover in order to make a profit. Profit per firm, as a function of the number of firms N, can then be expressed using (5) and (7):

$$\pi(N) = [P^W - t - P^O(N)]x^O(N) - F$$

$$= \left\{ P^W - t - \left[\frac{1}{N+1}a + \frac{N}{N+1}(P^W - t) \right] \right\} \frac{(P^W - t - a)}{(N+1)b} - F \qquad \text{(A5)}$$

Setting $\pi(N) = 0$, multiplying through by $(N+1)^2 b$, and rearranging,

$$(N+1)(P^W - t)(P^W - t - a) - (N+1)^2 bF = \left[a + N(P^W - t) \right](P^W - t - a)$$

$$(P^W - t)(P^W - t - a) - (N+1)^2 bF = a(P^W - t - a)$$

$$(P^W - t - a)^2 = (N+1)^2 bF$$

$$\frac{P^W - t - a}{\sqrt{bF}} = N + 1$$

from which (10) follows.

Now, using (7) and (10),

$$P^O + t = \frac{1}{N+1}a + \frac{N}{N+1}(P^W - t) + t$$

$$= \frac{a + t + NP^W}{N+1}$$

$$= \frac{a + t + \left(\dfrac{P^W - t - a}{\sqrt{bF}} - 1 \right)P^W}{\dfrac{P^W - t - a}{\sqrt{bF}}} \qquad \text{(A6)}$$

$$= \frac{\sqrt{bF}(a + t - P^W) + (P^W - t - a)P^W}{P^W - t - a} = P^W - \sqrt{bF}$$

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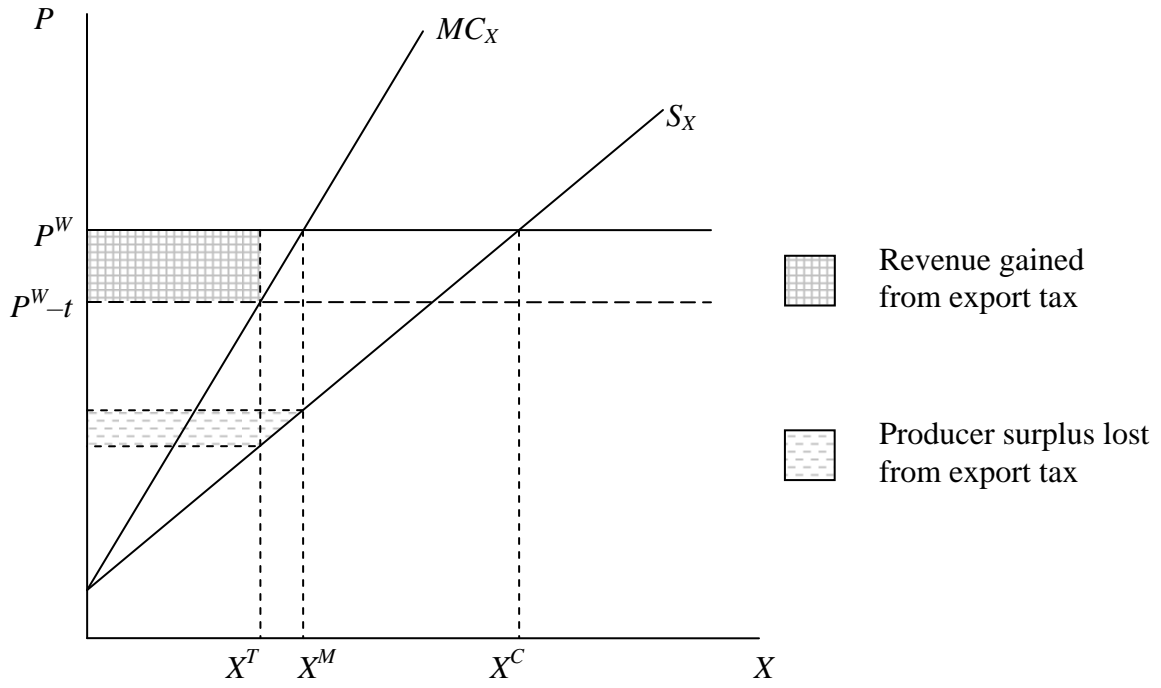
Figure 1
Exports under Competition (C), Monopsony (M), and
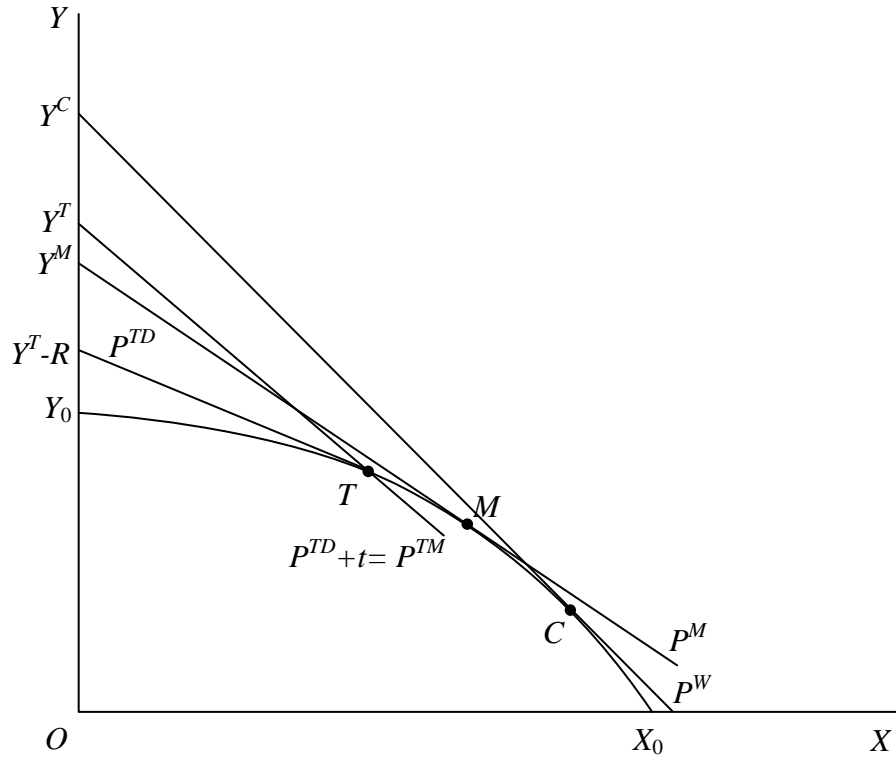Monopsony with Export Tax (T)

Figure 2
Exporting to, and Taxing, a Monopsony
in General Equilibrium