MONOPOLY, TYING, AND RECIPROCITY: AN APPLICATION TO INTERNATIONAL TRADE

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ABSTRACT

This paper sees countertrade as a way by which the PCPEs and LDCs extract some of the monopoly profits from firms in OECD countries which are used to subsidize PCPEs/LDCs exports. Viewed in this way, countertrade is an exchange of market entry for marketing assistance in which the PCPEs and LDCs effectively shift the terms of trade in their favour. Based on a new sample of 230 countertrade contracts which have been signed between firms in OECD countries and PCPEs and LDCs in the period between 1984 and 1988 the paper estimates the likelihood of such a terms of trade change as a function of the market power of OECD firms, of whether the goods offered by the PCPEs/LDCs in the contract reflect comparative advantage, and as a function of the information available in the bargaining over the terms of the contract. The data are consistent with the view that countertrade is used by the PCPEs/LDCs as a vehicle to reduce the effective price of their imports. By being equivalent to an import-tax cum export subsidy in the presence of foreign market power, countertrade is seen to raise welfare of the PCPEs/LDCs by allowing them to recapture some of the monopoly rents the OECD firms are extracting from consumers in PCPEs/LDCs.

1. INTRODUCTION

A firm engages in countertrade when its exporting to a particular country is linked to its importing from this country. Thus, countertrade typically involves reciprocal buying of goods across countries. This tying practice which occurs most frequently in East-West and North-South trade has been opposed by international organizations because of its anticompetitive effects. Tying arrangements are considered a return to bilateralism and reciprocity and thus are seen as a threat to the multilateral world trading system (see OECD 1981, 1985). Advocates of tying instead argue that countertrade allows to correct market distortions and thus can be seen a second-best outcome when markets deviate from competitive conditions.

The competing views over the economic effects of countertrade are related to an older debate in the industrial organization literature over "business reciprocity" and the "leverage theory" of tying. The "leverage hypothesis" sees tying to provide a mechanism whereby a firm with monopoly power in one market can use the leverage provided by this power to foreclose sales in, and thereby monopolize, a second market. Similarly, reciprocity is seen to foreclose other sellers in the market thereby constituting a barrier to entry. Furthermore, reciprocity is considered to impose a constraint on the buyer, who may be forced to buy a product of inferior quality or higher price in order to sell his own goods. The anticompetitive view of tying and reciprocity has come under attack from economist in the Chicago tradition who argue that if a monopolist does employ tying his motivation cannot be leverage since a seller cannot get two monopoly profits from one monopoly (see Blair and Kaserman 1978) . Stigler (1969) goes even further by finding reciprocity procompetitive as he views it to restore price flexibility in the presence of collusion.[1]

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1 The debate over the economic effects of reciprocity is related also to the literature on vertical integration in which economists have been divided in a procompetitive and anticompetitive camp in very much the same way as on the issue of reciprocity, for a survey see Perry (1989) and Tirole (1988).

In recent two papers the Chicago view has,in turn, been challenged (Whinston (1990) and Ellingsen (1991)). Whinston shows that it is indeed possible to get two monopoly profits from one monopoly when the monopolist can influence the market structure. Tying may be an effective means for a monopolist to affect the market structure of the tied good market by making continued operation unprofitable for tied good rivals. Through the exclusion of rivals in the tied good market tying allows the monopolist to extend his monopoly to the tied good market. Similarly, Ellingsen shows that reciprocity offers itself as a way to win market shares without undercutting the price leading to profit shifting from the competitors to the reciprocating firm.

This papers explanation of countertrade follows the anticompetitive IO-tradition and applies it to international trade. The theoretical model shows that East-West countertrade can be seen as an exchange of entry for marketing assistance in which the previously centrally planned economies (PCPEs) are able to extract some of the monopoly profits from firms in developed countries (DC) which are used to subsidize the PCPEs exports. The model shows furthermore that North-South countertrade can be seen as a way of circumventing collusive agreements. The empirical evidence based on 230 countertrade contracts which were collected from trading firms involved in countertrade is consistent with the predictions of the model.

The paper comes in five sections. In section 2 the model is presented which gives two conditions under which there are gains from tying trade flows; first, when tying is used to extract a foreign monopolists rents and second, when tying is used to circumvent collusive agreements. Section 3 contains the empirical part in which testabel implications of the model are derived, which are then exposed to the data, and finally are put to an econometric investigation. A last section draws trade policy implications.

2. THE MODEL

The model consists of two agents: a developed country firm called DC-firm which produces the good q_X which is exported to a PCPE or a LDC, and a party called PCPE/LDC-party which is a firm (a foreign trade organization) in a PCPE or a member of an international cartel (an international commodity agreement) in a LDC. Assuming both DC and PCPE/LDC to be risk neutral the two agents utility function under countertrade and under a non-tied arrangement can be written as

$$(1)\quad U_M = \max \{-p_X q_X + (p_M - c_M)q_M - c_T \ , \ -p_X{}^C q_X + (p_M{}^+ - c_M)q_M\}$$

$$(2)\quad U_X = \max \{(p_x - c_X)q_X + (p_M{}^* - p_M)q_M, \ 0\}$$

$p_x{}^C$ is the "non-tied" price and p_x the countertrade price for DC's product q_X, p_M is the countertrade price, $p_M{}^*$ and $p_M{}^+$ are the world market (non-tied) prices for product q_M that PCPE/LDC receives when he sells his output with and without DC's assistance, respectively. q_X and q_M are produced with marginal cost c_x and c_M, respectively, and c_T are the transaction costs of countertrade. The compensation ratio $p_M q_M / p_x q_X = 1 + \delta$ is the value of the repurchase by the DC-firm $p_M q_M$ as a percentage of the original export value $p_x q_X$ and gives the degree of tying of the two trade flows. When $\delta = 0$ the compensation ratio is 100 per cent in which case the DC-firm makes an offsetting purchase of equal value as its original export to the PCPE/LDC. Normalizing q_X to 1 the gains from countertrade are

$$(3)\quad \frac{p_x{}^C}{c_M + \delta(c_M - p_M)} - \frac{c_x}{p_M{}^* + \delta(p_M{}^* - p_M)} > (p_M{}^+ - c_M) + c_T$$

When the compensation ratio is 100 per cent ($\delta = 0$) and $p_M{}^+ = c_M$, $p_x{}^C / c_M$ is the PCPE/LDC-party's terms of trade at

which its gross profits (exclusive of the transaction costs of countertrade) are zero under the countertrade agreement. This terms of trade has the feature that the DC-firm gets the "non-tied" price for its product q_X whereas the PCPE/LDC-party's price for q_M equals its marginal costs. Similarly, c_x/p_M^* is DC's zero profit terms of trade under the countertrade agreement when $\delta = 0$. At this terms of trade DC's price equals her marginal costs while the PCPE/LDC-party gets the world market price for q_M. Thus, when $\delta = 0$ the agreed upon countertrade terms of trade p_X/p_M has to lie in the interval $[p_x^c/c_M, c_x/p_M^*]$ which leaves a net surplus to both DC and PCPE/LDC. The net surplus is required to exceed the profit that the PCPE/LDC-party can make in an untied trading arrangement $p_M^+ - c_M$ plus the costs of countertrade in order for countertrade to take place.

The surplus that is generated by the tied trading arrangement will be the larger (smaller) depending on whether $\delta \gtrless 0$ and $p_M^* \gtrless p_M \gtrless c_M$. When $\delta > 0$, that is the DC'firm makes an offsetting purchase of greater value than its original export, the PCPE-party will agree to a higher p_x/p_M in the countertrade agreement as long as it makes a positive profit when selling q_M to DC. Thus, when $p_M > c_M$ an increase in the compensation ratio increases the PCPE's zero profit terms of trade as can be seen from (3) (note that PCPE's utility from the countertrade agreement declines with an increase in p_x/p_M). Similarly, when $\delta > 0$ the DC-firm will accept a lower p_x/p_M as long as she makes a profit when selling q_M on the world market (when $p_M^* - p_M > 0$) lowering the DC-firm's zero profit terms of trade (note that DC's utility increases with an increase in p_x/p_M). Thus, when the compensation ratio is above 100 per cent and q_M can be sold at a profitable price for either/or both parties, the range of feasible terms of trade outcomes is enlarged increasing the gains from countertrade. The opposite is the case when $\delta < 0$ or q_M cannot be sold at a profitable price for neither party.

From (3) it becomes apparent that there are gains from tying trade flows only if either the DC-firm has some monopoly power ($p_x^c > c_x$) and/or if the PCPE-party's price is above marginal costs ($p_M^* > c_M$). Thus, the model implies that countertrade

makes no economic sense in the absence of distortions on either DC's and/or PCPE's market. Three distinct cases can be distinguished under which there are gains from tied trade.

Case 1: Extracting foreign monopoly rents

$$p_x^C > c_x \ , \ p_M^* = c_M \quad \text{and} \quad p_M^+ < p_M^* \ ;$$

Case 2: Circumventing collusive agreements

$$p_x^C = c_x \ , \ p_M^* > c_M \quad \text{and} \quad p_M^+ = c_M \ ;$$

Case 3: Facing a reputational barrier to entry

$$p_x^C > c_x \ , \ p_M^* < c_M \ , \ \text{and} \quad p_M^+ < p_M^* \ ;$$

In the next two subsections I analyze the use of countertrade for case 1 in which the DC-firm has some monopoly power while PCPE's market is assumed to be perfectly competitive and for case 2 in which the PCPE-party's market is characterized by collusion while DC's market is perfectly competitive. Case 3 is discussed in (Marin 1991).

2.1 EXTRACTING FOREIGN MONOPOLY RENTS

Suppose the DC-firm wants to export its output to a PCPE and faces an entry barrier in this market. The PCPE-party makes entry contingent on the DC-firms commitment of buying and marketing the PCPE-party's product. As can be seen from the payoff function (1) PCPE's utility of choosing a tied trading arrangement relative to an untied one will be the greater the lower the countertrade price p_x relative to the "untied" price p_x^C when he is buying q_X and the higher the countertrade price p_M relative to the "untied" market price p_M^+ when he is selling q_M. Thus, the PCPE will agree to a tied trading arrangement when

$$(p_X^C - p_X)q_X + (p_M - p_M^+)q_M > c_T$$

Note that the PCPE-party has the outside option of buying an identical good q_X in an untied trading arrangement from somebody else than the DC-firm, and of selling q_M by himself without the DC-firm's assistance. When he sells his output without the help of the DC-firm's marketing ability he receives p_M^+ which is considerably lower than p_M^* assuming that DC and PCPE differ in their ability to market the product q_M.[2]

Whether or not the DC-firm will agree to a tied trading arrangement will, in turn, depend on the price-cost margin on q_X and on the possible profit that she can make when selling q_M on the world market. She will sign the contract when $U_X > 0$ (see DC's payoff function (2)). The profit from selling q_M will be the greater the higher the world market price p_M^* that she gets when selling q_M relative to the countertrade price p_M that she pays to the PCPE. It is assumed here that the DC-firm has no outside option of selling q_X in an untied trading arrangement to the PCPE-party because of the following two reasons. First, the PCPE-party makes the DC-firm's entry contingent on her accepting to market the product q_M. Second, and more importantly, the DC-firm itself is assumed to have no alternative to countertrade because she is a monopolist who wants to increase sales by discriminating between customers with different levels of willingness to pay. In order to do so effectively the DC-firm looks for an arrangement which makes her price concessions to the PCPE not visible to disfavoured customers. Countertrade is such an arrangement since it obscures the effective price from

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2 In Amann/Marin (1989) we choose an alternative characterization of PCPE's outside option by assuming him to lack the market information for q_M which the DC-firm is assumed to have. Instead of obtaining a lower price for his output when deciding for an untied arrangement as it is formulated here, the PCPE-party faces a price risk that is taken away from him in the tied trading arrangement. For countertrade as an insurance contract see also Amann/Marin (1990), for countertrade as an incentive compatible and renegotiation proof contract see Marin (1990) and Amann/Marin (1991).

outside observers allowing the DC-firm to discriminate price in a hidden way.[3]

When case 1 holds ($p_x^c > c_x$; $p_M^* = c_M$; and $p_M^+ < p_M^*$) the gains from trade (3) become

$$(3.1) \qquad (p_x^c - c_x) > c_T[c_M + \delta(c_M - p_M)]$$

From (3.1) it can be seen why DC and PCPE might prefer countertrade to an untied trading arrangement in which PCPE buys q_X and purchases DC's marketing ability for the product q_M in two separate transactions. Condition (3.1) implies that there will be gains from countertrade only if the monopoly profit of the DC-firm is sufficiently large to cover the transaction costs of countertrade and any possible loss when selling q_M on the world market.[4] When $c_M - p_M < 0$ that is DC pays more to the PCPE than she receives on the world market for q_M, the DC's profit margin is used to subsidize PCPE's export of product q_M. In this case countertrade is used to force the DC-firm to sell its product at a more competitive price thus constraining DC in exploiting her monopoly power in PCPE's market thereby lowering the relative price of its imports. Note that under the circumstances described by case 1 countertrade becomes attractive to PCPE, since his outside option to countertrade becomes negative when $p_M^* = c_M$. In spite of the fact that PCPE's output is competitive on the world market it can be sold with a loss only since PCPE lacks the marketing ability that DC is assumed to have which makes him obtain p_M^+ only instead of p_M^*

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3 Without loss of generality we abstract from DC's potential outside option to sell q_X in an other than PCPE's market by assuming that DC is already selling q_X to those markets. For the price discrimination hypothesis see also Caves/Marin (1991).

4 When DC's profit margin is sufficiently large there are gains from countertrade even when $p_M^* = 0$. In this case the DC-firm can afford to throw PCPE's output away with a net profit. In 0.9 per cent of the 230 countertrade contracts of the sample used here this indeed happened. The PCPE-party's product had to be marked down by 100 per cent in order to make it sellable on the world market or - as countertrade specialists call it - had a discount ratio of 100 per cent implying $p_M^* = 0$.

for q_M. Thus, PCPE has the alternative of selling q_M to a trading house with marketing knowledge over q_M in an untied trading arrangement with a net loss (since he would need to pay a fee for the service) or to export his product via countertrade with a net surplus.[5] The PCPE's motivation for countertrade is strenghten when $p_M^* < c_M$ holds, that is when q_M is not competitive on the world market, since in this case countertrade provides the PCPE with the financial resources (via the extraction of DC's monopoly rents) to subsidize a not competitive product.[6] The DC-firm will agree to such a contract since countertrade provides her with entry into PCPE's market and leaves her a net surplus. Countertrade is in this way a means by which market entry is exchanged for marketing assistance and by which the PCPE-party effectively shifts the terms of trade in its favour.

2.2 CIRCUMVENTING COLLUSIVE AGREEMENTS

Under the circumstances described by case 1 there are gains from countertrade because the PCPE can use tying to extract some of the DC-firms profit who as a price discriminating monopolist

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5 The PCPE could achieve the same reduction in the relative price of its imports by charging DC an entry fee and by selling its output in an untied trading arrangement. However, the DC-firm is not indifferent between the two arrangements because of its motivation to discriminate price in a secret way. In Marin (1990) and Amann/Marin (1991) we show, furthermore, that tying the trade flows reduces the incentives for moral hazard and ex-post 'hold up' in situations of bilateral monopoly when parties have made specific investment.

6 That countertrade is used by the PCPEs/LDCs to subsidize goods without an underlying comparative advantage is of deep concern to international organizations see OECD (19). Although there is indeed a theoretical case for this worry, the empirical evidence does not seem to support it see Marin (1991). One could argue that when $p_M^* < c_M$, the PCPE/LDC-party will not produce q_M, since the gains from trade are increased when q_M is not produced. However, here it is assumed that the PCPE-party has already made the decision to produce q_M and chooses only whether to sell q_M in a tied or an untied trading arrangement. c_M reflects in this case the average rather than the marginal costs of producing q_M and $p_M^* < c_M$ indicates that PCPE has no comparative advantage in q_M.

charges a price above marginal costs. The situation given by case 2 to which I turn in this section is reversed to that of case 1. It is now the LDC-party who has monopoly power while DC's market is perfectly competitive. Let the LDC-party be a member of a cartel and/or a member of an international commodity agreement and let it be faced with surplus capacity for whatever reason. In this situation the LDC-party wants to untercut the cartel price (that is now denoted by p_M^*) and can do so without openly violating the cartel regulations by using countertrade. The lack of transparency of countertrade makes it a vehicle for secret price reductions. The LDC sells its output at the cartel price p_M^* and pays a higher price p_x for DC's product. The two payoff functions given in (1) and (2) remain the same except that $p_M^*=p_M$ represents now the cartel price, and p_M^+ is now the price that prevails when it comes to a breakdown of the cartel. When the LDC-party violates the cartel agreement openly by lowering its price this starts a price war among the cartel members leading to a breakdown of the cartel. The LDC-party will end up with $p_M^+ = c_M$ reducing its outside option to $-c_x q_X$. From the so modified payoff function (1) it becomes apparent that LDC will want to sign a countertrade agreement if

$$(p_M^* - c_M)q_M \;>\; (c_x - p_x)q_X + c_T$$

the profit increase due to the increase in sales of q_M will at least cover the loss due to the higher price that he pays for q_X plus the higher costs associated with signing the countertrade agreement.

Under the setting ($p_x^C = c_x$; $p_M^* > c_M$; and $p_M^+ = c_M$) the condition (3) for gains from trade becomes when $\delta = 0$

$$(3.2) \qquad \frac{p_M^* - c_M}{c_M} \;>\; c_T \frac{p_M^*}{c_X}$$

which says that there are gains from countertrade if the market distortion that is generated by the formation of the cartel is

sufficiently large. When the rents that are generated by the formation of the cartel are large the LDC's secret price reduction will still leave a sufficiently large profit margin which together with the increase in output more than compensates for the higher costs that are created by countertrade.

2.3 CHANGING THE TERMS OF TRADE

So far we have seen how DCs and PCPE/LDCs market power, the competitiveness of PCPEs output, and the degree of tying (as measured by δ) will affect the gains from countertrade. The preceding analysis showed also that by changing the terms of trade countertrade can be understood as an import-taxed export subsidy or as a secret price cut in the presence of collusion. In order to determine the size of the export subsidy (the size of the hidden price reduction) we have to look where the actual terms of trade outcome will be located and thus which of the two parties will be favoured in the countertrade agreement. The outcome will depend on the details of the bargaining. In Amann/Marin (1989) we modelled the bargaining as a one shot game under asymmetric information in which the PCPE/LDC-party makes an offer of some p_X/p_M which the DC-firm can accept or reject. Recall that PCPE's payoff is a declining and DC's an increasing function of p_X/p_M. If DC rejects the offer the outside option of no countertrade is adopted. In a bargaining under complete information the party that makes the offer of p_X/p_M (usually the more powerful one) will always offer the others party zero profit terms of trade at which the other party will just be indifferent between signing and not signing the contract. Thus, under symmetric information the PCPE/LDC-party will make a terms of trade offer in which it gets the maximum share of the surplus and in which the DC-firms payoff will just equal its outside option.

In order to get a richer and more realistic picture of the bargaining over the contract we assumed that the DC-firm knows the price p_M^* at which the PCPE-party's product can be sold on

the world market, while PCPE's knowledge over p_M^* is incomplete (he has a probability distribution of these prices only). Under this setting the PCPE-party will set its optimal offer of p_x/p_M in such a way as to maximize its payoff and the probability of the DC-firms acceptance of the offer. Thus, the PCPE-party will equate the marginal utility he obtains from an increment to his share of the surplus to the decline in the probability that the DC-firm will agree to it. Because the PCPE-party wants to make sure that the DC-firm will agree to his offer - any bargaining outcome is more preferable to him than no agreement - his uncertainty over p_M^* and thus over whether the DC-firm will accept his offer puts a constraint on his ability to fully exploit his power in the bargaining. Compared to the bargaining outcome under complete information the PCPE-party will be less able to shift the terms of trade in its favour when its knowledge of the world market conditions for its output is incomplete.

In Amann/Marin (1989) we have looked also at how the bargaining outcome will change when DC's market power on the one hand and PCPE's competitiveness on the other changes. Figure 1 in Appendix B summarizes the results of this exersize. It shows how variations of the factors explaining the occurence of countertrade will affect how the surplus is split between DC and PCPE. It turns out that the higher DC's price-cost margin the larger are the gains from trade and the more will the PCPE-party be able to push the terms of trade in its favour. The reason for this is that when DC has a very large profit margin (which is visible to PCPE), PCPE will know that he will not increase the probability of DC's acceptance by offering a higher more favourable terms of trade to DC which, in turn, weakens DC's relative bargaining position. In other words, a very large profit margin will tell the PCPE that he can make a more unfavourable offer which DC will accept with the same

probability as a more favourable one no matter how low the world market price p_M^* might be.[7]

An improvement in PCPE's competitiveness (a decrease in his marginal costs) works in a similar way. The lower PCPE's marginal costs c_M, the more likely will it be that DC will accept a lower and less favourable offer. In contrast to the DC-firm whoms bargaining power is weakend when she has a strong market position, the PCPE's bargaining power becomes stronger the stronger its market position. By improving its bargaining position, countertrade creates an incentive for PCPE to improve its competitiveness and thus makes it more unlikely that PCPE will use countertrade to sell a product without an underlying comparative advantage. Although PCPE might use countertrade to subsidize the exporting of goods without an underlying comparative advantage, his position in the bargaining will be weak in this case. His ability to extract monopoly rents from the DC-firm will be limited thereby constraining the size of the subsidy that he can obtain via countertrade.[8]

3. SPECIFICATION AND ESTIMATION

In this section I proceed first, by deriving testable implications from the model outlined in the previous section; second, by looking for proxies for the variables that play a role in the theoretical model; and third, by estimating whether the derived implications are consistent with the data. I start with the first.

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7 When DC's profit margin is very large the DC-firm can afford to throw PCPE's output away with a net profit, see also footnote 3. In other words, when DC's profit margin becomes very large PCPE does not need to care at which price the DC-firm will be able to sell his output (or what type the DC-firm is) since p_M^* does no longer influence the probability at which the DC-firm will be signing the contract, see the flat region of curve C in Figure 1 in Appendix B.

8 see the discussion of the gains from trade under case 1 when $p_M^* < c_M$.

3.1 TESTABLE IMPLICATIONS

There are three implications that follow from the theoretical model.

Proposition 1: The compensation ratio will depend on the market power and competitive conditions of both parties. The sign of the relationship will, in turn, depend on whether or not PCPE/LDCs output can be sold profitably and on whether or not PCPE/LDC has shifted the terms of trade in its favour. When q_M can (cannot) be sold profitably and the bargaining takes place under perfect information, the size of the compensation ratio is positively(negatively) related to the market power of the DC-firm and negatively(positively) to the market power of the PCPE/LDC-party. Thus, for given prices for q_X and q_M, the less profitable PCPE/LDCs output the less of q_M DC will want to repurchase and the more of q_M PCPE will want to sell in the countertrade agreement.

Proposition 2: The terms of trade outcome will depend on the market power of the DC-firm and on whether or not PCPE/LDC has a comparative advantage in producing q_M. The larger DCs monopoly power and the lower c_M the larger is the probability that the DC-firm signs a contract in which her profits are squeezed. Moreover, when $\delta > 0$ and q_M is without an underlying comparative advantage, it is more likely that PCPE will not change the terms of trade in its favour.

Proposition 3: The less knowledge the PCPE-party has over the world market conditions for its output the less able will it be in reducing the relative price of its imports.

3.2 THE DATA

The data base includes information on 230 countertrade contracts signed between firms from OECD countries and PCPEs and LDCs in the period between 1984 and 1988. The sample has been generated

by a survey in which the respondent (typically a countertrade specialist) has been asked to provide information on 43 aspects on one specific countertrade transaction. The data are discussed in more detail in the Appendix.

Table 1 provides the mean, minimum and maximum values, and a brief description of all of the variables used in this paper. Here I comment only on four variables. These are COMPR, TOT1, DISC and BARTER/CPURCH of which COMPR and TOT1 are used as the dependend variables. COMPR=(1+δ) measures the degree to which the two trade flows are tied together and thus captures the degree of "countertradeness". In the 230 contracts of the sample the compensation ratio COMPR is in the range of 2 and 400 percent with a mean of 71 per cent. Thus, on average the DC-firm repurchases 70 percent of its export value in the countertrade contract. TOT1 is supposed to indicate in which of the two parties favour the terms of trade p_X/p_M has been shifting in the contract. TOT1 is a dummy variable that takes on the value of 1 when the DC-firm has (at least partially) absorbed the DISC in her profit margin and zero otherwise. Thus, when TOT1=1 the PCPE-party has been able to shift the terms of trade in its favour. This, in fact, has been the case in 52.2 percent of the contracts. DISC=$-(p_M^*-p_M)/p_M$ measures the DC-firms expectation (not realization) of the percentage loss or gain from selling PCPE's output. It runs from -2 percent (gain when selling q_M) to 100 percent (total loss, q_M not sellable) with a mean of 11 percent. The variables BARTER, CPURCH, and BUYB describe the types of contract in which countertrade occures. The three forms are all linked export-import transactions, but they differ from each other in terms of whether they involve foreign exchange in the transaction, whether the two trade flows are temporally separated, and on whether the trade flows stand in a technical relation to each other.[9]

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9 For the importance of the form of contract for the degree of tying of trade flows see Marin (1990).

Table 2 is the correlation matrix which gives a first glance on the relationship of the central variables used in the paper. There are several points which are noteworthy. First, some of the variables measuring the market structure characteristics and competitive conditions of the two parties markets like XPOS1, XPOS3, MPOS1, MPOS3 are significantly associated with the compensation ratio (COMPR). Moreover, XPOS1 (DC-firm is leading producer) is negatively related to the degree of tying, while XPOS3 (DC-firm is insignificant producer) and MPOS3 (PCPE-party is insignificant producer) positively. This seems to suggest that the DC-firm is able to lower its repurchase requirement in the contract when she has market power and the PCPE-party cannot object to it when it has a weak position on the market (see Proposition 1).

Second, the view that tying is an exchange of entry for marketing assistance seems to be consistent with the data, since there is a good chance that both parties are newcomers in each others market (the correlation between XNEW and MNEW is .3) and XNEW and MNEW are significantly associated with COMPR and TOT. When the DC-firm is a newcomer (occasional or first time exporter) in PCPE/LDCs market she tends to accept a higher repurchase commitment in the contract (corr(COMPR,XNEW)=.26) but not a change in the terms of trade in its disfavour (corr(TOT1,XNEW)=.08). This might be associated with the fact that the DC-firm tends not to be a significant producer in terms of market share (which is used here as a proxy for the DC-firms profit margin) when she is a new entrant in PCPE/LDCs market (corr(XNEW,XPOS3)=.20). The situation is reversed for the PCPE/LDC-party. When the PCPE-party is a newcomer in the OECD market it does not try to commit the DC-firm to a high repurchase in the contract (corr(COMPR,MNEW)=.02) but rather to make the DC-firm accept a shift in the terms of trade in its favour (corr(TOT,MNEW)=.24).

Third, the simple correlations between TOT1 and XPOS,MPOS do not seem to suggest that the competitive conditions on either DCs and/or PCPEs market are significantly related to the terms of

Table 1: Variable Definition and Selected Statistics for 230 Countertrade Contracts

Variables	Observations	Description	Mean	Minimum	Maximum
COMPR=(1+δ)	230	value of repurchase in percent of export value	71.38	2	400
DISC= $-(p^{*}_{M}-p_{M})/p_{M}$	225	percentage mark down of PCPEs output	11.05	-2.	100
MQALIT1	219	quality of PCPEs output relative to world average: excellent to average dummy		(D=1; 195 Observations)	
XPOS1	227	DCs market power: worldwide leading producer dummy		(D=1; 152 Observations)	
MPOS1	221	PCPEs market power: worldwide leading producer dummy		(D=1; 32 Observations)	
XCOMPET1	227	DCs market structure: oligopolistic competition dummy		(D=1; 105 Observations)	
MCOMPET1	220	PCPEs market structure: oligopolistic competition dummy		(D=1; 38 Observations)	
XCOLUS1	229	DC member of a collusive agreement cartel dummy		(D=1; 12 Observations)	
MCOLUS1	229	PCPEs member of a collusive agreement or regulated prices, dummy cartel or commodity agreement		(D=1; 183 Observations)	
TOT1= P_x/P_M	195	PCPE shifts terms of trade in its favour dummy		(D=1; 120 Observations)	
MINF1	85	PCPEs output traded at a Stock Exchange dummy		(D=1; 30 Observations)	
XINF1	61	DCs output traded at a stock exchange dummy		(D=1; 6 Observations)	
TYEQAL $p^{*}_{M}=p_{M}$	188	PCPEs output has same price in tied as in untied export dummy		(D=1; 91 Observations)	
MUSE1	230	DCs usage of PCPEs output own usage dummy		(D=1; 55 Observations)	
XDIF4	228	DCs output is differentiated in design and quality dummy		(D=1; 95 Observations)	
MDIF4	224	PCPEs output is differentiated in design and quality dummy		(D=1; 39 Observations)	
XNEW	227	DCs frequency of exporting to PCPE/LDC new entry dummy		(D=1; 78 Observations)	
MNEW	214	PCPEs frequency of exporting to OECD new entry dummy		(D=1; 86 Observations)	
MNIC	230	regional Dummy; PCPE is LDC or NIC		(D=1; 31 Observations)	
BARTER	230	contract type: barter dummy		(D=1; 26 Observations)	
CPURCH	230	contract type: counterpurchase dummy		(D=1; 176 Observations)	
BUYB	230	contract type: buy-back dummy		(D=1; 28 Observations)	

Data Sources and variable definitions can be found in the Appendix.

trade outcome as is implied by the preceding theoretical analysis, although the correlations are of the expected sign (see Proposition 2). The availability of information on the market conditions for PCPE/LDCs output (MINF), however, is significantly associated with whether the DC-firm has accepted a profit squeeze in the agreement. The positive correlation between TOT1 and MINF1 of .23 indicates that when q_M is traded on a stock exchange and thus PCPE has perfect knowledge over p_M^*, it is more likely that the PCPE will be able to shift the terms of trade in its favour which is in accordance with the theoretical prediction (see Proposition 3).

Fourth, the quality of PCPEs output MQALIT1 (excellent to average quality compared to western standards) as a proxy for whether or not q_M reflects comparative advantage is neither associated with TOT1 nor with COMPR as implied by the theory. When q_M is of very good quality it tends to increase COMPR on the one hand and makes it less likely that DC faces a profit squeeze on the other. The latter contradicts the prediction of the model (see Proposition 2).

Fifth, XNEW is significantly associated with MCOMPET3, MPOS1 and MPOS3 which might be some indication that the tied induced entry of the DC-firm allows her to affect the competitive conditions on the tied good market as has been suggested by Whinston (1991) in a somewhat different context. DC's entry tends to make the PCPE-party more powerful on its market (corr(XNEW,MPOS1=.23) and competition on PCPEs market less intense by reducing the number of firms (corr(XNEW,MCOMPET3)=-.26).

Table 2

CORRELATION MATRIX

	COMPR	TOT1	XPOS1	XPOS3	XCOMPET1	XCOMPET3	MPOS1	MPOS3	MCOMPET1	MCOMPET3	MCOLUS1	MINF1	MQALIT1	XNEW	MNEW
COMPR	1.00	-.05	-.24**	.24**	-.12	.14	.20*	-.27**	.15	-.15	.10	.10	.13	.26**	.02
TOT1		1.00	.11	-.01	.10	-.13	-.02	.02	-.08	-.03	.08	.23*	-.10	.08	.24*
XPOS1			1.00	-.80**	.40**	-.27**	.04	-.06	.06	.01	-.00	.03	.03	-.24**	.04
XPOS3				1.00	-.44**	.40**	-.02	.11	-.11	-.01	-.03	-.05	.00	.20*	-.08
XCOMPET1					1.00	-.42**	.00	-.06	.15	-.01	.01	.16	.09	-.01	.17
XCOMPET3						1.00	-.00	.02	-.05	.11	-.07	-.04	.06	.13	-.08
MPOS1							1.00	-.64**	.37**	-.30**	.25**	.18*	.19*	.23**	-.14
MPOS3								1.00	-.53**	.54**	-.14	-.27**	-.16	-.23**	-.06
MCOMPET1									1.00	-.48**	.29**	.24**	.19*	.07	-.03
MCOMPET3										1.00	-.12	-.13	-.11	-.26**	-.18*
MCOLUS1											1.00	.34**	.18*	.06	-.14
MINF1												1.00	.14	.05	-.08
MQALIT1													1.00	-.04	-.14
XNEW														1.00	.31**
MNEW															1.00

N = 181 1-tailled signif.: *-.01 **-.001

for data sources and variable definitions see Appendix

3.3 ECONOMETRIC IMPLEMENTATION

In order to see whether the data are consistent with the theoretical predictions (which follow from equation 3) I have to assume that gains from countertrade exist and then estimate whether the predictions of the model of how the gains are divided between DC and PCPE/LDC are supported by the data. As dependent variables I use COMPR on the one hand and TOT1 on the other. I will work with variants of the following equations.[10]

$$(1)\ \ln(COMPR_i) = a_o + b_1 XPOS_i + b_2 MPOS_i + b_3 XCOMPET_i + b_4 MCOMPET_i + b_5 XCOLUS_i + b_6 MCOLUS_i + b_7 TOT1*DISC_i + b_8 XNEW_i + b_9 MNEW_i + b_{10} MUSE_i + b_{11} CPURCH_i + b_{12} BARTER_i + \ln(u_i)$$

$$(2)\ \ln(COMPR_i) = a_o + b_1 XPOS*TOT1*DISC_i + b_2 MPOS*TOT1*DISC_i + b_3 MCOLUS_i + b_4 XNEW_i + b_5 MNEW_i + b_6 MUSE_i + b_7 BARTER_i + b_8 CPURCH_i + \ln(u_i)$$

$$(3)\ TOT1_i = a_o + b_1 XPOS_i + b_2 MPOS_i + b_3 XCOMPET_i + b_4 MCOMPET_i + b_5 MCOLUS_i + b_6 COMPR*DISC_i + b_7 MINF_i + b_8 XDIF_i + b_9 MDIF_i + u_i$$

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10 The data set does not allow to test the adequacy of the theoretical model for the occurence of countertrade, since it would require data on tied as well as untied trading contracts. We have, therefore, to assume that the conditions for gains from countertrade are met and estimate whether the factors determining the split of the gains as set out by the theory are supported by the data. The assumption of gains from trade is consistent with the data since 66 percent of the DC-firms and 14 percent of the PCPE/LDCs involved in the contract are worldwide leading producers (in terms of market share) operating on a market with only a few number of firms worldwide (XCOMPET1) or locally (XCOMPET2) (in 82 percent of the cases for the q_X good and in 45 percent of the cases for the q_M good). For an alternative procedure of estimating the adequacy of the theoretical model of countertrade see Appendix C.

$$(4)\ TOT1_i = a_o + b_1 XPOS*COMPR_i + b_2 MPOS*COMPR_i + b_3 DISC_i + \\ + b_5 MCOLUS_i + b_6 MINF_i + b_7 XNEW_i + b_8 MNEW_i + u_i$$

where i indexes contracts and u_i is an error term. There are four groups of variables that enter equations (1) to (4). Variables measuring market distortions on each of the parties market, respectively. These include for the DC-firms market $XPOS_i$, $XCOMPET_i$, and $XCOLUS_i$; for the PCPE/LDC-party's market $MPOS_i$, $MCOMPET_i$, and $MCOLUS_i$. Variables that capture the profitability with which PCPE's output can be sold on the world market: $MQALIT_i$ and $DISC_i$. $TOT1*DISC_i$ is the effective discount which takes on the value zero when DC has not absorbed the costs of discounting PCPEs output in her profit margin and takes on any value between -2 and 400 when she does absorb it. This variable takes into account that the party that bears the costs of discounting q_M will want to minimize these costs. Accordingly, the estimated coefficient on TOT1*DISC in COMPR equation (2) is expected to have a negative sign reflecting that when the DC-firm absorbs the DISC in its profit margin (TOT1*DISC > 0) it will want a lower COMPR. Similarly, in the TOT equation (3), the variable COMPR*DISC captures whether the repurchase value is above or below 100 percent (COMPR takes value 1 when below 100%, 2 when equal to 100% ,and 3 when above 100%) and whether PCPE/LDCs output is easily sellable (1:DISC < 5%), (2: 5% < DISC < 15%), or hard to sell on world markets (3:DISC > 16%). The latter is taken as a proxy for the profitability with which q_M can be sold on the world market. The PCPE/LDC-party is more likely to agree to a contract in which the effective price of its imports will not be reduced when COMPR > 100 and DISC > 16, and likewise the DC-firm is more likely to agree to a contract if it need not absorb the DISC in its profit margin when the compensation ratio exceeds 100 percent and q_M can be sold only with a considerable mark down. Thus, we expect the DC-firm not to absorb the discount in its profit margin and, therefore, a negative sign on the coefficient on COMPR*DISC when it takes on high values (DISC > 16 and

COMPR > 100) and a positive sign when it takes on low values (COMPR*DISC runs from 1 to 9).

The third group are informational variables that indicate the degree of knowledge available to both parties in the bargaining. $XDIF_i$ and $MDIF_i$ is supposed to give the degree of differentiation of DC's and PCPE's output, respectively. The more differentiated DC's output the more difficult it will be for the PCPE-party to infer DC's profit margin from its market position (XPOS) and market concentration (XCOMPET). Likewise, the more differentiated PCPE's output the harder will it be for PCPE to guess the price p_M^* at which DC will be able to sell his output. Both variables, XDIF and MDIF increase PCPE's uncertainty in the bargaining constraining it in its ability to extract DC's monopoly rents. Finally, XINF and MINF indicate whether DC's and PCPE's output, respectively is traded on a stock exchange in which case the market conditions for each of their output is common knowledge favouring PCPE's position in the bargaining. The fourth group are ad hoc variables that are not derived from the model. Among these are MUSE1, BARTER and CPURCH.

In the following empirical section I will proceed by first, estimating the COMPR equations (1) and (2) by OLS and the TOT1 equations (3) and (4) by LOGIT. The latter estimates the likelihood that the PCPE/LDC shifts the terms of trade in its favour and thus estimates whether PCPE/LDC achieves an import-taxed export subsidy in the countertrade agreement. Next, in Appendix C the likelihood of the occurence of a tying contract is estimated by LOGIT. Finally, I present LOGIT and OLS estimates for equations (1) to (4) for the East-West and North-South region separately.

3.4 RESULTS AND INTERPRETATION

A: OLS Estimates

The OLS results are presented in Table 3. The first two columns give estimates of the contribution of market power and the competitive conditions of both parties to the size of the compensation ratio, columns (3) and (4) contain estimates of equation (1), and column (5) estimates of equation (2). A DC-firm with strong market power (xpos1) is predicted to have a contract with a compensation ratio that is about 6.5 percent lower than those of OECD firms with a weak market position; and a strong market position of the PCPE/LDC-party (MPOS1) increases - as expected - the compensation ratio by roughly the same percentage. Similarly, lower (higher) repurchase requirements are associated with DC-firms (PCPE/LDC-parties) that operate on concentrated rather than competitive markets (XCOMPET,MCOMPET). The relationship is, however, not significant at conventional levels and will be dropped in the subsequent regressions. The results seem to suggest that the market power of the DC-firm helps her to keep the repurchase obligation low to which the PCPE/LDC-party can object only if she herself has market power.

When the PCPE/LDC-party is a member of a cartel or a member of an other form of collusive agreement (MCOLUS1) it tends to sign countertrade agreements in which the compensation ratio lies above the usual agreed size. This finding seems to account for the cheating on a cartel motive for the barter form of countertrade that occures more frequently in LDCs than PCPEs. The high repurchase value in percent of the export value means unfavourable terms of exchange for the LDC-party that uses countertrade to change the terms of exchange in its disfavour (for secret price cuts).

Table 3

TYING TRADE FLOWS
Dependent Variable: ln COMPR

Independent Variable	(1)	(2)	(3)	(4)	(5)
XPOS1	-.62 (3.37)	-.62 (3.40)	-.77 (4.66)	-.64 (4.19)	
XPOS2	-.32 (1.16)	-.30 (1.10)	-.64 (2.59)	-.74 (3.17)	
XCOMPET1	-.24 (1.11)	-.29 (1.32)			
XCOMPET2	-.27 (1.29)	-.28 (1.40)			
MPOS1	.64 (2.78)	.57 (2.45)	.43 (2.11)	.34 (1.81)	
MPOS2	.53 (2.33)	.54 (2.40)	.39 (1.97)	.20 (1.14)	
MCOMPET1	.11 (.47)	.03 (.11)			
MCOMPET2	-.09 (.51)	-.08 (.50)			
XPOS1*TOT1*DISC					-.02 (3.3)
XPOS2*TOT1*DISC					-.03 (.94)
MPOS1*TOT1*DISC					.02 (1.76)
MPOS2*TOT1*DISC					.003 (.20)
MCOLUS1		.60 (1.40)	.51 (1.40)	.44 (1.27)	.13 (.92)
XCOLUS1		.48 (1.50)	.47 (1.53)	.17 (.58)	
TOT1*DISC			-.001 (1.81)	-.01 (2.1)	
XENTRY3			.02 (.07)	.08 (.37)	.31 (1.78)
XENTRY2			.31 (1.67)	.30 (1.82)	.41 (2.42)
MENTRY3			.19 (.73)		
MENTRY2			-.05 (.30)		
BARTER				.21 (.84)	.28 (1.04)
CPURCH				-.49 (2.55)	-.34 (1.76)
MUSE2				-.13 (.97)	-.11 (.82)
MUSE1				-.43 (2.76)	-.57 (3.4)
INTERCEPT	4.28 (20.89)	4.38 (23.97)	4.4 (28.76)	4.86 (20.0)	4.05 (10.50)
R^2 N	.15 212	.17 212	.24 170	.32 178	.28 178
ANOVA F p-value	4.6 (0.000)	4.1 (0.000)	4.49 (0.000)	6.01 (0.000)	5.32 (.000)

Note: OLS regressions. t-values in parentheses. The p-value indicates the probability of obtaining an F-ratio at least as large as the test statistic under the null. XENTRY3 + XENTRY2 = XNEW; MENTRY3 + MENTRY2 = MNEW. All variables have been transformed to dummies. The coefficient of the omitted variable is therefore zero.

The estimated coefficients on TOT1*DISC capturing the profitability with which PCPE/LDCs output can be sold on the world market in columns (3) and (4) all have the predicted negative sign and are significant at conventional levels. The impact of a hard to sell product on the size of the compensation ratio is, however, negligible.

When the DC-firm is a newcomer (XENTRY2) rather than an established exporter in PCPE/LDCs market it seems to make her weaker in the bargaining by letting her agree to a contract with a higher repurchase commitment. The relationship is again significant at conventional levels. Market entry of the PCPE/LDC-party into the OECD market (MENTRY), in contrast, has not a significant effect on the size of COMPR. The coefficient on MUSE1 is negative and significant suggesting that when the DC-firm uses q_M within the firm rather than selling it, the PCPE/LDC accepts a lower tying commitment possibly in the expectation of establishing a new customer.

Finally, the coefficient on CPURCH is negative and significant indicating that counterpurchase contracts have significantly lower offsetting purchase requirements than barter and buy-back contracts. When no money is used in the transaction (as in the barter contract) a low repurchase value as a percentage of the DC-firms export value means unfavourable terms of exchange for the DC-firm and favourable ones for the PCPE/LDC-party. The DC-firm gets paid in kind for q_X and the more of q_M she receives the more favourable her terms of trade. This will no longer be the case when foreign exchange is involved in the transaction (as in the counterpurchase and buy-back contract). q_M is no longer used as payment for q_X, but gives the obligation of the DC-firm to market PCPE/LDCs output. Therefore, when money is used in the transaction a low compensation ratio means favourable terms of exchange for the DC-firm and unfavourable ones for the PCPE/LDC-party. The negative coefficient on CPURCH reflects this difference in countertrade contracts when foreign exchange is used in the transaction.[11]

11 The form of contracts differ also with respect to the way they govern the incentive structure, see Marin (1990).

The last column in Table 3 captures the interactive effect on the compensation ratio of the market power of the two parties, the profitability of PCPE/LDCs output, and whether or not PCPE/LDC has shifted the terms of trade in its favour as is set out in Proposition 1. The negative and significant coefficient on XPOS*TOT1*DISC suggests that when q_M cannot be sold profitably and the DC-firm has absorbed the discount in its profit margin the size of the compensation ratio is smaller the stronger the DC-firms market position. Similarly, the positive and significant coefficient on MPOS*TOT1*DISC indicates that when the PCPE/LDC-party has a strong market position it can increase the size of the compensation ratio under the same circumstances. The signs of the estimated coefficients are, therefore, as predicted by Proposition 1. However, both influences on COMPR seem to be negligible confirming the results obtained on TOT1*DISC in columns (3) and (4).

B: Logit Estimates

The Logit estimates for TOT1 examining Propositions 2 and 3 are shown in Table 4. Column (1) looks at the impact of market power and of the competitive conditions of both parties on the terms of trade outcome. Columns (2) and (3) examine additionally the influence of competitiveness of q_M and of the information available in the bargaining on the likelihood that the PCPE/LDC shifts the terms of trade in its favour. Column (4) includes interacting effects. All equations correcly predict about 70 % of the terms of trade outcomes.

All coefficients of the market structure variables except MCOLUS have the predicted sign in all the equations. As the p-values indicate the null hypothesis that DCs market power and the degree of concentration do not contribute to the log likelihood of shifts in the terms of trade in PCPE/LDCs favour has to be rejected at the 2 percent significance level. This stands in contrast to the first findings obtained by the correlation matrix in Table 2. With p-values of .81 and .37 for MPOS and

MCOMPET the same null hypothesis cannot be rejected at conventional levels for the PCPE/LDC-party. Especially noteworthy is the positive and significant contribution of DCs market power and competitive conditions, respectively on the log likelihood of shifts in the terms of trade in PCPE/LDCs favour. When the DC-firm is a worldwide leading producer (XPOS1) compared to a firm with no market power (XPOS3) and when it operates on an oligopolistic (XCOMPET1) rather than a competitive (XCOMPET3) market it is more likely that the DC-firm will supply its output at a more competitive price. The extra explanatory contribution of the XCOMPET variable might capture also the extend to which the PCPE/LDC-party has knowledge over the size of DCs profit margin when he uses DCs market concentration as a basis for infering the size of her profit margin. However, the findings are partially only consistent with the models predicition, since it is equally likely that the PCPE/LDC shifts the bargaining outcome in its favour when the DC-firm has negligible market power (XPOS3). Only a DC-firm with a market share of medium size (XPOS2) is significantly more likely to avoid a profit squeeze in the contract.[12]

The coefficient of MCOLUS is significant, but has the wrong sign; apparently when the PCPE/LDC-party has market power by being a member of a cartel or a member of a collusive agreement or when its price is administered as in planned economies it is more likely that the PCPE/LDC shifts the terms of trade in its favour. The model, however, predicts that under these circumstances the PCPE/LDC might want to use countertrade in order to change the terms of trade in its disfavour. These findings and those of the COMPR regressions seem to suggest that the PCPE/LDC-party uses the compensation ratio rather than prices to change the terms of exchange when it wants to

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12 With XPOS3 as the omitted variable the estimated coefficients compare the effect of each category to the average effect of all categories. The coefficient of XPOS3 is, therefore, the negative of the sum of XPOS1 and XPOS2 which is .68.

Table 4 DETERMINANTS OF A CHANGE IN THE TERMS OF TRADE
Dependent Variable: TOT1

Independent Variable	(1)	(2)	(3)	(4)
XPOS	[8.00] (.02)	[14.1] (.001)	[13.3] (.001)	
XPOS1	.43 (.09)	.67 (.03)	.61 (.03)	
XPOS2	-1.11 (.01)	-1.7 (.000)	-1.5 (.000)	
MPOS	[.40] (.81)			
MPOS1	.13 (.72)			
MPOS2	.07 (.83)			
XCOMPET	[8.12] (.02)	[7.7] (.02)	[5.05] (.08)	
XCOMPET1	.71 (.01)	.62 (.04)	.45 (.12)	
XCOMPET2	.20 (.40)	.36 (.14)	.34 (.16)	
MCOMPET	[1.95] (.37)			
MCOMPET1	-.48 (.19)			
MCOMPET2	.32 (.22)			
XCOLUS	[.89] (.63)			
XCOLUS1	-.42 (.54)			
XCOLUS2	.83 (.36)			
MCOLUS	[9.08] (.01)	[7.8] (.02)	[5.76] (.05)	[3.69] (.16)
MCOLUS1	1.36 (.10)	-.12 (.86)	-.08 (.92)	.55 (.56)
MCOLUS2	-.07 (.87)	.58 (.27)	.59 (.24)	.24 (.64)
MINF1		1.4 (.002)	1.2 (.005)	1.1 (.01)
COMPR		[5.6] (.06)		
COMPR1 < 100 %		.23 (.37)		
COMPR2 = 100 %		.53 (.05)		
COMPR*DISC			[18.9] (.002)	
(1) COMPR < 100 %, DISC < 5 %			-1.2 (.02)	
(2)			1.1 (.003)	
(3)			-.11 (.76)	
(4)			1.07 (.01)	
(5)			-.30 (.51)	
XENTRY				[2.54] (.28)
XENTRY1				-.41 (.23)
XENTRY2				.58 (.15)
MENTRY				[6.04] (.05)
MENTRY1				-.51 (.14)
MENTRY2				.70 (.05)
XPOS*COMPR				[16.3] (.01)
(1) DC leading producer, COMPR < 100 %				1.72 (.01)
(2)				.33 (.47)
(3)				.86 (.15)
(4)				-2.25 (.01)
(5)				1.14 (.08)
MPOS*COMPR				[5.54] (.35)
(1) PCPE/LDC leading producer, COMPR < 100 %				-.05 (.96)
(2)				-.44 (.50)
(3)				-1.13 (.03)
(4)				.62 (.51)
(5)				.23 (.69)
DISC		[12.04] (.002)		[11.8] (.003)
DISC1 < 5 %		-.64 (.02)		-.72 (.01)
5 % < DISC2 < 15 %		.79 (.001)		.94 (.001)
INTERCEPT	.57 (.38)	.18 (.75)	.06 (.91)	
N	180	187	187	171
-2 LL	218.2	188.5	197.9	168.3
significance	.005	.12	.10	.18
% correct	70 %	74.3 %	73.8 %	73.1 %

Note: Logit Regressions, numbers in [ ] are Wald statistics and in ( ) p-values. The p-value indicates the probability of obtaining a Chi-Square ratio at least as large as the test statistic under the null. A p-value smaller than .05 indicates rejection of the null at the 5 % level. The estimated coefficients compare the effect of each category to the average effect of all of the categories. The coefficient for the omitted reference category is therefore, the negative of the sum of the included categories.

circumvent collusive agreements. Indeed, when COMPR or COMPR*DISC capturing the agreed upon size of the repurchase requirement are included in the logit regressions the coefficient on MCOLUS1 drops substantially or turns sign and becomes insignificant (see column (2) and (3) of Table 4).

Column (4) looks at the interactive influences on the bargaining outcome of the market power of the two parties on the one hand and whether or not DC made an offsetting purchase that exceeded her original export on the other as captured by XPOS*COMPR and MPOS*COMPR. A terms of trade outcome in PCPE/LDCs favour is more likely when the DC-firm is a leading producer who has agreed to make a repurchase of lower value than its original export than when DC has a negligible market share and signs a contract with a tying committment exceeding 100 percent. The contribution of XPOS*COMPR to the log likelihood of a terms of trade change is significant at the 1 percent level, while the same variable for the PCPE/LDC-party does not change the probability of a shift in the terms of trade at a significant level confirming the results obtained in the preceding regressions.

The variable MINF1 indicating the extent to which information is available to PCPE/LDC on p_M^* is positive and significant at the 1 percent level: a PCPE/LDC having perfect knowledge over the world market conditions of its output when it is traded on a stock exchange is more likely to change the terms of trade in its favour than when its knowledge is incomplete which is what is stated in Proposition 3. The two other variables indicating the information available in the bargaining XDIF and MDIF made no significant contribution to the log likelihood of a reduction in the effective price of PCPE/LDCs imports and are, therefore, dropped from the analysis (not shown in the Table).

In contrast to the results obtained for the COMPR regression the fact whether or not the DC-firm is a newcomer in PCPE/LDCs market does not affect the terms of trade achieved in the transaction, while PCPE/LDCs status as a newcomer does. This

confirms the findings reported in the correlation matrix in Table 2.

C: East-West Countertrade

In order to see whether there are regional differences in the ability to change the terms of trade between Eastern Europe on the one hand and developing countries on the other, I report estimates of equations (1) to (4) for East-West countertrade and North-South countertrade separately. I expect the DC-firms market power to play a much less and PCPE/LDCs collusion a much more important role for the likelihood of a terms of trade change in the North-South region compared to the East-West region, since in the former the cheating on a cartel motive for tying is more predominant. The results are given in Table 5 and Table 6.

Columns (1) to (3) of Table 5 give the logit estimates for TOT1 and columns (4) and (5) the OLS estimates for COMPR. Turning to the evidence on TOT1 it becomes apparent that the coefficient on MCOLUS has now the expected sign and its contribution to the likelihood of a shift in the terms of trade is marginally less strong compared to the full sample (see Table 4 and 5). The results for the COMPR equation do not differ from those obtained for the total sample.

Table 5: EAST-WEST COUNTERTRADE

Independent Variables	TOT1 (1)	(2)	(3)	Independent Variables	ln COMPR (4)	(5)
XPOS	[2.99] (.22)	[8.1] (.02)				
XPOS1	.43 (.13)	.86 (.01)		XPOS1	-.74 (.000)	
XPOS2	-.65 (.14)	-1.2 (.02)		XPOS2	-.81 (.003)	
MPOS	[.63] (.72)					
MPOS1	-.14 (.73)			MPOS1	.56 (.02)	
MPOS2	.29 (.44)			MPOS2	.17 (.43)	
XCOMPET	[3.5] (.17)					
XCOMPET1	.48 (.09)					
XCOMPET2	.10 (.69)					
MCOMPET	[3.99] (.14)					
MCOMPET1	-.78 (.06)			BARTER	.37 (.23)	.35 (.27)
MCOMPET2	.49 (.08)			CPURCH	-.46 (.03)	-.40 (.06)
MCOLUS		[5.5] (.06)	[3.5] (.06)	MUSE1	-.43 (.02)	-.57 (.001)
MCOLUS1		-3.4 (.81)	-2.9 (.84)	MUSE2	-.13 (.36)	-.54 (.37)
MCOLUS2		2.4 (.74)	2.1 (.77)	COLLUD	.73 (.38)	
DISC			[7.8] (.02)			
DISC1 < 5 %			-.43 (.21)			
5 % < DISC2 < 15 %			.89 (.01)			
COMPR*DISC		[13.6] (.02)		TOT1*DISC	-.01 (.02)	
(1)		-.89 (.13)				
(2)		1.01 (.01)				
(3)		-.21 (.61)				
(4)		1.31 (.01)				
(5)		-.27 (.61)				
XPOS*COMPR			[13.8] (.02)	XPOS1*TOT1*DISC		-.02 (.000)
(1)			1.9 (.01)	XPOS2*TOT1*DISC		-.03 (.34)
(2)			.34 (.54)			
(3)			.71 (.30)			
(4)			-1.35 (.21)			
(5)			1.18 (.12)			
MPOS*COMPR			[7.6] (.17)	MPOS1*TOT1*DISC		.03 (.08)
(1)			-.73 (.59)	MPOS2*TOT1*DISC		.002 (.86)
(2)			-.18 (.82)			
(3)			-1.3 (.02)			
(4)			.87 (.45)			
(5)			-.18 (.78)			
XENTRY		[1.97] (.37)	[2.11] (.34)	XENTRY3	.04 (.84)	.33 (.10)
XENTRY1		-.36 (.31)	-.62 (.16)	XENTRY2	.35 (.10)	.54 (.01)
XENTRY2		.57 (.20)	.52 (.32)			
MENTRY		[8.72] (.03)	[7.2] (.02)	MENTRY3	.08 (.77)	
MENTRY1		-.81 (.04)	-.77 (.05)	MENTRY2	.13 (.45)	
MENTRY2		.51 (.21)	.85 (.05)			
MINF1		.98 (.03)	.69 (.12)			
INTERCEPT	-.68 (.78)	-1.2 (.86)	-.55 (.94)	INTERCEPT	4.87 (.000)	4.35 (.000)
N	153	147	144	N	143	151
-2 LL	193.2 (.004)	148.7 (.15)	137.3 (.15)	R^2	.36	.28
significance	.004	.15	.15	ANOVA F	5.1 (.000)	5.3 (.000)
% correct	63.4 %	72.8 %	76.4 %			

Note: COLLUD = MCOLUS*TYEQAL. Numbers in [ ] are Wald statistics and in ( ) p-values. The p-value indicates the probability of obtaining a Chi-Square ratio (for the logit regressions (1), (2), and (3)) or a t-ratio (for the OLS regressions (4), (5)) at least as large as the test statistic under the null. A p-value smaller than .05 indicates rejections of the null at the 5 % level.

D: North-South Countertrade

The results for the North-South region have to be interpreted with caution, since low degrees of freedom lead to poor statistical properties of the regressions (the sample includes 31 transactions with LDCs only, see Table 1). A comparison of Table 5 and 6 reveals a striking difference between the two regions. Distortions on either partys market cannot account for the likelihood of the occurence of a change in the terms of trade. In the TOT1 equations only DISC and CPURCH make a significant contribution (see column 1 and 2). The cheating on a cartel motive for countertrade in LDCs can, however, be seen in the COMPR regression in column 3. The negative coefficient of the COLLUD variable indicates that when the LDC is member of a cartel and sells its output via countertrade at the same price as in an untied transaction it tends to sign agreements in which DCs repurchase obligation is low. However, as most of the deals with the developing countries in which the latter is member of a cartel take place in the barter form of countertrade in which foreign exchange is not used in the transaction, the low offsetting purchase is not - as expected - favouring DC. Note that collusion (as measured by COLLUD) has the strongest impact on the compensation ratio in the North-Sorth region supporting the importance of the collusion motive for countertrade in developing countries (the p-value for COLLUD declines from .38 in Table 5 to .19 in Table 6). The negative sign of the COLLUD coefficient remains, however, a puzzle.

Table 6: NORTH–SOUTH COUNTERTRADE

Independent Variable	TOT1 (1)		(2)		Independent Variable	ln COMPR (3)	
XPOS	[2.8]	(.25)					
XPOS1	2.4	(.89)			XPOS1	2.57	(.25)
XPOS2	-6.8	(.85)			XPOS2	2.16	(.35)
MCOLUS	[.06]	(.96)			MINF1	4.12	(.17)
MCOLUS1	11.4	(.83)			COLLUD	-4.67	(.19)
MCOLUS2	-5.8	(.82)			XENTRY2	1.53	(.26)
					XENTRY3	2.62	(.09)
DISC			.25	(.08)	TOT1*DISC	.33	(.20)
					BARTER	-1.40	(.50)
					MUSE1	2.16	(.34)
CPURCH			1.7	(.01)			
INTERCEPT	3.5	(.86)	-1.2	(.28)	INTERCEPT	-.18	(.93)
N	29		27		N	30	
-2 LL	21.64		21.16				
significance	.60		.62		R^2	.85	
% correct	79.3 %		74.1 %		ANOVA F	1.26 (.51)	

Note: COLLUD = MCOLUS*TYEQAL. Numbers in [ ] are Wald statistics and in ( ) p-values. The p-value indicates the probability of obtaining a Chi-Square ratio (for the logit regressions (1), (2)) or a t-ratio (for the OLS regression (3)) at least as large as the test statistic under the null. A p-value smaller than .05 indicates rejections of the null at the 5 % level.

3.4 CONCLUSIONS AND IMPLICATION FOR TRADE POLICY

This paper sees countertrade as a way by which the PCPEs and LDCs extract some of the monopoly profits from firms in OECD countries which are used to subsidize PCPEs/LDCs exports. Viewed in this way, countertrade is an exchange of market entry for marketing assistance in which the PCPEs and LDCs effectively shift the terms of trade in their favour. Based on a new sample of 230 countertrade contracts which have been signed between firms in OECD countries and PCPEs and LDCs in the period between 1984 and 1988 the paper estimates the likelihood of such a terms of trade change as a function of the market power of OECD firms, of whether the goods offered by the PCPEs/LDCs in the contract reflect comparative advantage, and as a function of the information available in the bargaining over the terms of the contract. The data are consistent with the view that countertrade is used by the PCPEs/LDCs as a vehicle to reduce the effective price of their imports.

By being equivalent to an import-tax cum export subsidy in the presence of foreign market power the welfare implications of countertrade seem to be clear cut. Given the market power of OECD firms, countertrade raises welfare of the PCPEs/LDCs by allowing them to recapture some of the monopoly rents the OECD firms are extracting from consumers in PCPEs/LDCs. With respect to the welfare ranking countertrade is superior to an import tax since it works similar to a price ceiling on imports. As is well known an import tariff is not the first-best policy for rent extraction because the OECD firms will not absorb the tariff fully in their markup and will pass on part of the tax to consumers in PCPEs/LDCs. The extent to which domestic prices will increase in response to the tariff and thus the extent to which consumers will loose will depend on details of the demand curve (see Brander and Spencer (1984). In the countertrade contract, in contrast, the OECD firm can be seen as paying a fee for the right to sell on PCPE/LDCs market, since the PCPEs/LDCs bargain with the OECD firm over the price at which it will supply its output on the PCPEs/LDCs market. Compared to the

import tariff, countertrade therefore avoids the loss to consumers as the bargaining over the terms of the contract will lead to lower rather than higher domestic prices as is the case for an import tariff.[13]

So far to the import side. Countertrade, however, is also a subsidy on exports. Whether, in fact, such a subsidy is desirable is discussed in Marin (1991). When the PCPEs/LDCs face an informational barrier to entry on export markets due to consumers being incompletely informed about the quality of goods they offer a subsidy might benefit the PCPEs/LDCs.

As most of the results of this paper apply to PCPEs it is reasonable to ask what can be learned from the findings for the transformation in Eastern Europe. Trade liberalization and decentralization has removed (and will remove) the power of the Foreign Trade Organization (FTO) to control foreign trade. As has been shown in the paper the market structure of the PCPEs in East-West trade can be best described as foreign (OECD) market power in the form of oligopoly with a domestic industry either not existent or operating mostly under perfect competition. Given the market power of the OECD firms an import policy that constraints this power will benefit the PCPEs. As price ceilings on imports are no longer feasable when the powerful and knowledgable FTOs disappear, second-best policies in the form of a trade tax might be justified.

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13 An import tariff is not always welfare improving under these circumstances. Whether it is depends on the relative steepness of the demand curve and the marginal revenue curve. When the marginal revenue curve is flatter than the demand curve a small import subsidy, in fact, will be desirable see Brander and Spencer (1984) and Helpman and Krugman (1989).

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Appendix A: The Data Sample

Here the data sources and the construction of the variables are discussed in more detail. The data base has been generated by a survey that has been sent out to 83 multinational firms, trading houses and producing firms with location in Austria. The survey has asked for 43 items on one specific countertrade transaction and contains detailed information on both sides of the transaction and on both parties involved in the negotiation over the contract. In total 424 questionnaires have been sent out of which 230 contracts proved useful for the analysis. In each transaction the sample distinguishes between the DC-firm (which is either a producing firm with location in Austria or a firm from an OECD country that has used a trading house with location in Austria to fulfill its repurchase obligation) and the PCPE/LDC-party. The latter is a private or state owned firm or a state agency (Foreign Trade Organisation) in a PCPE (86.5 percent of the contracts) or in a LDC (13.5 percent of the contracts). The respondent to the survey has been either an inhouse countertrade specialist of the DC-firm or a countertrade specialist in a trading firm.

The construction of the data base began with the choice of contracts to use in the analysis. Contracts were chosen if they involved a repurchase commitment by the DC-firm and if they have been succesfully signed. Failed negotiations over a tying contract and/or untied contracts have been excluded. The resulting sample consists of 230 completed countertrade contracts that have been signed between 1984 and 1988.

The variable definition and construction are as follows:

COMPR: Compensation ratio: Value of repurchase by the DC firm $p_M q_M$ in percent of the DC firms value of export $p_X q_X$. A COMPR of 100 percent means that $p_M q_M = p_X q_X$. COMPR is a continious variable running from 2 to 400. It has also been transformed to a categorial variable with 1: COMPR < 100, 2: COMPR = 100, and 3: COMPR > 100 and to a dichotomous variable COMPR1 (used in Appendix C) with 0: COMPR < 20, and 1: COMPR > 20.

DISC: Discount ratio: Percentage by which PCPE/LDCs output is required to be marked down to make it sellable on world markets. It can be expressed as the difference between the price at which q_M is purchased from the PCPE/LDC and the price at which it can be sold on world markets $-(pM^* - pM)/pM$ whereby it is assumed that $p_M^* < p_M$. The DISC is the countertrade specialists expectation of the required mark down for PCPE/LDC output not

the realization. He might end up realizing a p_M^* which lies considerably above p_M.

MQALIT: Countertrade specialists judgement of the quality of PCPE/LDCs output relative to international standards: categorical variable 1: excellent quality, 2: good, 3: average, 4: bad, 5: very bad.

XPOS, MPOS: Market power of DC-firm and PCPE/PDC-party, respectively. categorical variable 1: worldwide leading producer (with respect to market share), 2: firm of medium significance, 3: one firm among many.

XCOMPET, MCOMPET: Competitive conditions on DCs and PCPE/LDCs market, respectively. Categorical variable 1: worldwide a few firms (worldwide oligopolistic), 2: locally a few firms (segmented oligopolistic), 3: many firms (perfect competition).

XCOLUS, MCOLUS: DC and PCPE/LDC member of a collusive agreement: Categorical variable 1: member of cartel or commodity agreement, 2: administered price (regulated prices in agriculture and of planned economies), 3: none of both.

TOT1: Terms of trade dummy variable that is equal to one if the DC-firm has (at least partially) absorbed the costs of discounting PCPE/LDCs output and zero otherwise. When TOT1 equals one the PCPE/LDC has shifted the terms of trade in its favour by reducing the relative price of its imports.

XINF, MINF: DCs and PCPE/LDCs output, respectively traded on the stock exchange. Dummy variable that equals one if the respective partys output is traded on the stock exchange and zero otherwise.

TYEQAL: PCPE/LDC output has same price in tied as in untied export $p_M^* = p_M$. Dummy variable that equals one if $p_M^* = p_M$ and zero otherwise.

MUSE: DCs usage of PCP/LDCs output. Categorical variable that takes on three values 1: inhouse usage, 2: sold on local market, 3: sold on third market. MUSE has been transformed to a dummy variable that takes on the value one when the DC-firm used q_M inhouse and zero otherwise.

XDIF, MDIF: Degree of differentiation of DCs and PCPE/LDCs output, respectively. Categorical variable with four values 1: homogenous product, 2: differentiated in design but not

quality, 3: differentiated in quality but not design, 4: differentiated product in design and quality.

XENTRY, MENTRY: DC's and PCPE/LDC's frequency of exporting to the other parties market. Categorical variable with values 1: regular exporter, 2: occasional exporter, 3: first time exporter. The two variables have been transformed to the dummies XNEW and MNEW which equal one when DC and PCPE/LDC, respectively have been first time or occasional exporter to each others market and zero otherwise.

MNIC: A regional dummy variable that equals one if PCPE/LDC is LDC or NIC and zero if member of former CMEA.

BARTER: A contract type dummy variable that equals one if the countertrade agreement is a barter contract and zero otherwise. Barter is a spot transaction in which the two trade flows occur at more or less the same time with no involvement of foreign exchange.

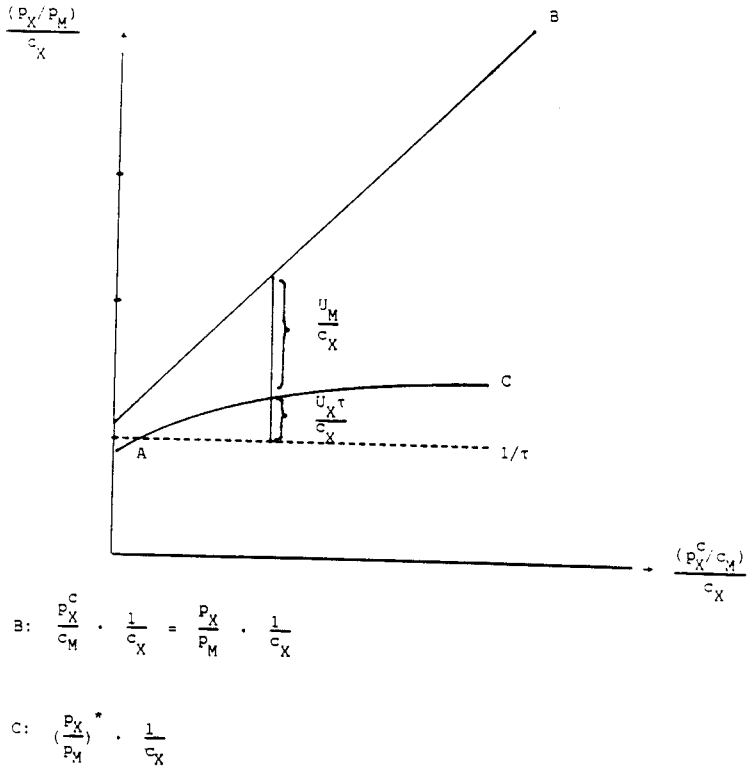
CPURCH: A contract type dummy variable that equals one if the countertrade agreement is a counterpurchase contract and zero otherwise. Counterpurchase is a long-term contract in which the two trade flows take place at different points in time and in which foreign exchange is used in the transaction.

BUYB: A contract type dummy variable that equals one if the countertrade agreement is a buy-back contract and zero otherwise. Buy-back is equal to counterpurchase except for the technical association between the original export and the offsetting purchase.

Appendix B: Determining the Size of the Import-Taxed Export Subsidy

The comparative statics of a change in DCs monopoly power (measured by $p_X{}^C/c_X$) on the one hand and of a change in PCPE/LDCs competitiveness (measured by a decline in c_M) on the other on the terms of trade outcome p_X/p_M is summarized in the following Figure.

Figure 1



The vertical axis gives the terms of trade divided by DCs marginal costs $(p_X/p_M)/c_X$ and the horizontal axis measures $(p_X{}^C/c_M)/c_X$ which increases with DCs profit margin $p_x{}^C/c_x$ and declines with PCPE/LDCs marginal costs c_M. When $p_M{}^+ = c_M$ holds, the B-line represents PCPEs zero profit terms of trade (exclusive of the transaction costs of countertrade). For a given DC-firm of type X^τ (as drawn by the horizontal line $1/\tau$), the gains from countertrade can be seen by the distance between the $1/\tau$-line and the B-line. The C-curve shows how the gains are divided between DC and PCPE as a function of DCs monopoly power. The larger DCs profit margin becomes the greater are the gains from trade and the more favourable becomes the terms of trade outcome for PCPE. In other words, the larger DCs monopoly power the greater the import-taxed export subsidy that PCPE can achieve by using countertrade. At point A the DC-firm of type τ is indifferent between accepting and rejecting PCPEs countertrade offer and PCPE receives the total gains from trade. As DCs market power increases, both DC and PCPE gain from the increase in the gains from trade up to the point where PCPE only can improve his terms of trade. A similar argument applies for a decrease in c_M. The lower c_M the greater the gains from trade and the more favourable the terms of trade outcome for PCPE.

The prediction of the model is broadly supported by the data given in the following Table. The Table indicates a strong association between DCs market position and the terms of trade outcome. In 52.2 percent of the countertrade contracts the terms of trade shifted in PCPEs favour (the cases do not add to 100 % because of missing cases). When the DC-firm has a very strong position on its market (but also when it has a very weak position) the terms of trade shifts in PCPEs favour in 65.4% of the cases, while this happens only in 35.3% of the cases when the DC-firm has a market share of medium size.

MARKET POWER AND TERMS OF TRADE OUTCOME

		TOT shifts in favour of PCPE/LDC	TOT shifts not in favour of PCPE/LDC
		52.2	32.6
1. DC's market position			
leading producer	66.1	65.4	34.6
follower	8.9	35.3	64.7
insignificant producer	25.0	60.4	39.6
Chi Square Value	5.74		
marginal significance	.05		
2. PCPE/LDC's market position			
leading producer	13.9	57.7	42.3
follower	15.0	60.7	39.3
insignificant producer	71.1	60.9	39.1
Chi Square Value	.09		
marginal significance	.95		
3. Status of PCPE/LDC-party			
member of cartel	3.1	83.3	16.7
administered price	77.8	63.6	36.4
none of both	19.1	48.6	51.4
Chi Square Value	4.05		
marginal significance	.12		

Note: numbers are row percentages

Appendix C: Determining the Likelihood of Tying

Here I use an alternative procedure to estimate the adequacy of the theoretical model of countertrade. Instead of assuming gains from countertrade as is done in section 3.3 I will estimate the gains by artificially creating a sample of tied as well as untied trading contracts. For that purpose, I transform COMPR to a dichotomous variable such that

if COMPR < C_o, then COMPR1 = 0 (untied contract)
if COMPR > C_o, then COMPR1 = 1 (tied contract).

The threshold C_o is set equal to 20.

The probability that a tying contract is chosen is estimated as a function of DCs and PCPEs market power on the one hand and as DC and PCPE using countertrade as an entry strategy in each others market. The result of this exercise is shown in Table 7. In column (1) the estimates for the total sample are given and in column (2) those for East-West countertrade only. It turns out that the two are almost identical except for the contribution of the MCOLUS variable which is - as expected - less important for East-West countertrade. However, the results do not support the theoretical model since a tying contract is more likely to be chosen when the DC-firm has a market share of medium size rather than when she has strong market power as is suggested by the gains from trade (3) of the model. Again, the results seem to reflect more how the gains are divided and not what determines the decision to ty.

Table 7: DETERMINANTS OF TYING DECISION:
Dependent Variable: COMPR1

Independent Variable	(1) TOTAL	(2) EAST
XPOS	[7.14] (.03)	[5.2] (.07)
(1)	-.74 (.01)	-.64 (.03)
(2)	.32 (.48)	.27 (.54)
XNEW	-.48 (.03)	-.44 (.05)
MNEW	.13 (.49)	.09 (.60)
MCOLUS	[8.02] (.02)	[5.2] (.07)
(1)	3.6 (.70)	3.4 (.80)
(2)	-2.8 (.57)	-2.4 (.74)
INTERCEPT	4.1 (.38)	3.7 (.81)
N	210	179
-2 LL	202.6	192.18
signif.level	.50	.14
% correct	81 %	58 %

Note: Numbers in [ ] are Wald statistics and in ( ) p-values. The p-value indicates the probability of obtaining a Chi-square ratio at least as large as the test statistic under the null. A p-value smaller than .05 indicates rejection of the null at the 5 % level.