Who Leaves Whom in Durable Trading Matches

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In this note, I investigate the determinants of "Who Leaves Whom" (WLW) in durable trading matches within the framework of the Coase Theorem, side payments, and the allocation of property rights (Coase 1960). I advance a definition of WLW which embeds the efficient matching of trading partners: trade occurs if and only if the match is optimal. In contrast with the conventional approach, this implies the rate at which trade relationships are severed is invariant to the allocation of property rights (Peters 1986). This difference makes the Coasian approach testable in contexts where differences in property rights exist at a point in time, or when changes occur over time.

While my approach embeds this efficiency property, it is essentially a treatment of WLW. My definition of WLW is summarized as follows: Whether one trader must be paid by the other to induce him to continue trading, or the one must pay the other to sever the relationship, what matters for WLW is one side's dissatisfaction with the initial distribution of the total value of the trade. As a corollary to Coase's theorem, this definition is invariant to the allocation of property rights.

Framework

Begin with an observed match of traders 1 and 2. They divide up the total value of the trade V into exhaustive parts V_1 and V_2.

$$(1) \qquad V = V_1 + V_2.$$

The traders individually decide whether or not to continue trading. (There is no marginal decision). Let two indicator variables denote their respective choices:

(2.0) $y_i = 1$ if trader i opts to sever the trade relationship,

(2.1) $y_i = 0$ otherwise; $i = 1,2$.

The resultant discrete choice (for each i) is the solution to a utility maximization problem, so the economic determinants of the y_i come from this problem. For simplicity assume the problem reduces to one of income maximization. Then with V_i^* denoting trader i's opportunity value, and S_i his surplus from this trade,

(3.0) $y_i = 1$ iff $S_i \equiv V_i - V_i^* < 0$,

(3.1) $y_i = 0$ otherwise; $i = 1,2$.

The function $y_i(V_i^*)$ (or $y(V_i^*;V_i)$) is illustrated in Figure 1. Treating V_i as a random variable, the probability of i opting to sever trade is increasing in i's opportunity value.

There is some initial, perhaps arbitrary, division of V such that $V = V_1' + V_2'$. How this division is determined is not central to the current analysis, but becomes important below. For the given pairs (V_i', V_i^*) four combinations of the pair (y_1, y_2) can result. These are depicted in Figure 2.

Whether trade occurs depends on the allocation of property rights. Separations can be by mutual consent, that is terminations obtain if and only

Figure 1

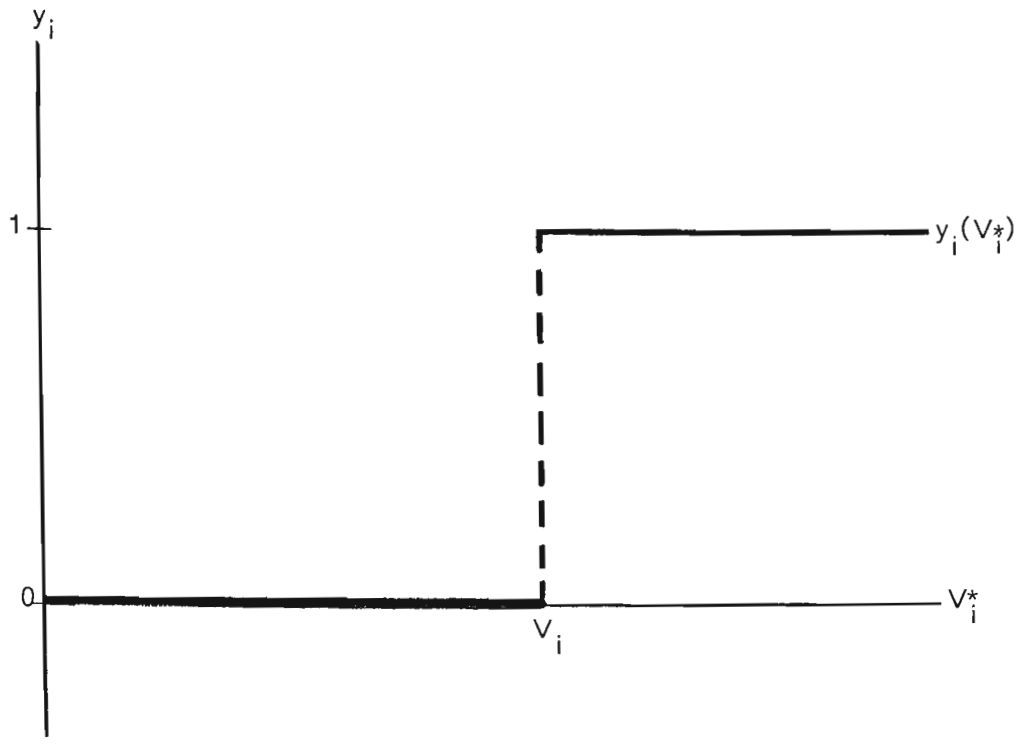

Figure 2

y_2 / y_1	1	0
1	Mutual Move	Differences
0	Differences	Mutual Stay

if both y_1 and y_2 equal 1; or separation can be unilateral or forced by one of the traders, so if either y_1 or y_2 equals 1 trade obtains.[1] There are two intermediate cases as well; in the first of these cases, trade occurs if and only if $y_1 = 0$; in the second case, $y_2 = 0$ is required for trade.[2] Note that the allocation of property rights determines whether or not "differences in opinion" (i.e., (0,1) and (1,0) combinations) result in trade.

The usual approach to WLW focuses on the differences of opinion or off-diagonal cells. Trader 1 leaves trader 2 under the (1,0) combination, and vice versa for (0,1). Clearly this depends on the allocation of property rights: under separations by mutual consent with differences of opinion, no one leaves; i.e., trade can be forced. Moreover, there is little economic content to the approach: neither prices nor side payments are used to clear the market by resolving the differences. The determinants of the y_i are not important for equilibrium analysis.

Side Payments and the Coase Theorem

I advance an alternative approach in which differences in choice are resolved by a redistribution of the trade value through side payments. In this context, the surplus equations are modified to include a side payment P.

$$(4.0) \qquad S_1(P) = (V_1' + P) - V_1^* = V_1' - (V_1^* - P)$$

$$(4.1) \qquad S_2(P) = (V_2' - P) - V_2^* = V_2' - (V_2^* + P)$$

$$(4.2) \qquad S \equiv S_1(P) + S_2(P) = V_1' + V_2' - V_1^* - V_2^* = V - V_1^* - V_2^*.$$

Consider four cases: Under unilateral separations, P>0 is a side payment from trader 2 to trader 1 to induce the latter to continue trading, and P<0 reverses the direction of payment. Under separations by mutual consent, P>0 is a side payment from trader 1 to trader 2 to get the latter to agree to dissolve the trading match; and vice versa for P<0. In (4.0) and (4.1), the middle expression groups the terms for interpretation under unilateral separations; the third expression for interprelation under mutual consent. The algebraic equivalence of a "prize for staying" and a "penalty for leaving" is thus highlighted in (4.0) and (4.1). All that matters is relative remuneration.

Replacing V_i with $V_i' \pm P$ as the argument in the y_i functions, the indicator functions are now denoted $y_i(P)$ with the variables V_i' and V_i^* suppressed. By the change of variables, the probability that $y_i = 1$ is decreasing (increasing) in P for i=1 (i=2).

The Coase Theorem states: Under unilateral separations, there exists some side payment $\bar{P}$ (not necessarily unique) such that $S_i(\bar{P})>0$, i=1,2, if and only if S>0 (independent of the sign configuration of the $S_i(0)$). Under separations by mutual consent, there exists some side payment $\tilde{P}$ such that $S_i(\tilde{P})<0$, i=1,2, if and only if S<0. Therefore, in terms of the y_i functions:

$$(5.0) \qquad y_1(\bar{P}) = y_2(\bar{P}) = 0 \text{ iff } S > 0 \quad \text{(unilateral separations)}$$

$$(5.1) \qquad y_1(\tilde{P}) = y_2(\tilde{P}) = 1 \text{ iff } S < 0 \quad \text{(separations by mutual consent)}$$

That is, the (0,1) and (1,0) combinations are precluded. Endogeneity of the y_i via side payments makes all trade and dissolutions mutual, and this is independent of the property right allocation.

An important implication is immediate: separations are more frequent under unilateral separations if and only if side payments are precluded. In the absence of side payments, "differences in opinion" result in separations only under the unilateral separations rule. With side payments, the rate at which trade relationships are severed is invariant to the allocation of property rights. Therefore, one can in principle test the implication of side payments and the Coase Theorem if differences in property rights are observed at a point in time, or property rights change over time.[3] Peters (1986) conducts such a test in the context of the marriage market and rejects the exclusion of side payments.

Who Leaves Whom

The challenge now surfaces of how to generate WLW if ex post all is mutual. For the analysis of WLW, the discussion can be limited to the case of $S<0$ with initial differences of opinion. Under mutual consent, the side payment takes the form of a "bribe to let me go"; examples are a slave buying back his freedom, alimony, severance pay, and nonvested pensions (i.e., forfeited bonds) (Mortensen 1978, Kennan 1979). So trader 1 is allowed to leave trader 2 by making a positive side payment $\tilde{P}$. Consider the case of $S_1(0)<0$, $S_2(0)>0$, and $S<0$; only trader 1 is initially dissatisfied with the suboptimal match. By the Coase Theorem, there exists a $\tilde{P}>0$ which satisfies the inequalities $S_1(\tilde{P})<0$ and $S_2(\tilde{P})<0$. Therefore, $y_1(\tilde{P})=1$ and $y_2(\tilde{P})=1$, so dissolution of the trading pair is ex post mutual; but the ex ante dissatisfaction of trader 1 clearly results in his buying his way out. There is no doubt that such a severing of the trade relationship would be

summarized: trader 1 leaves trader 2. Hence I adopt the following definition of WLW under separations by mutual consent: trader 1 leaves trader 2 if $\tilde{P}>0$, and vice versa for $\tilde{P}<0$.

The definition of WLW is slightly different if trade is voluntary; that is, under unilateral separations. With this allocation of property rights, the side payment would be to the potential leaver to induce him to stay. To be explicit, assume again $S_1(0)<0$, $S_2(0)>0$, and $S<0$. Then there does not exist a side payment $\bar{P}$ such that $S_1(\bar{P})>0$ and $S_2(\bar{P})>0$. Therefore, trade does not occur. Unlike the mutual consent result, here the definition of WLW is not obvious. However, I conclude: trader 1 leaves trader 2 if $S_1(0)<0$ and there does not exist a side payment $\bar{P}$ from trader 2 big enough to keep trader 1.

The definition of WLW under a unilateral separation rule is motivated in several ways. First, one might simply associate leaving with an initial dissatisfaction (i.e., $S_1(0)<0$) which is not resolved. Second, if the initial dissatisfaction leads to a demand for a redivision of the trade value, and if the demand is rejected then the "leaver" is associated with the initiator of the change. This equates initiating unsuccessful demands for a redivision with initiating a separation, which in some contexts is equivalent to leaving (see McLaughlin 1986a).

Invariance Property

The next step is to show that the definition of WLW is invariant to the allocation of property rights. For given conditions of trade (V, V_i', V_i^*, $i=1,2$), the conclusion "1 leaves 2" is equivalent to $S_1(0)<0$, $S_2(0)>0$, $S<0$, independent of the property right allocation.

This is established as a corollary to the Coase Theorem. Under separations by mutual consent, the existence of a side payment $\tilde{P}>0$ -- meaning trader 1 leaves trader 2 -- is equivalent to: $S_1(0)<0$, $S_2(0)>0$, and $S<0$. Under unilateral separations, the non-existence of $\bar{P}$ combined with $S_1(0)<0$ -- meaning trader 1 leaves trader 2--is also equivalent to: $S_1(0)<0$, $S_2(0)>0$, and $S<0$. Hence, my definition of WLW reduces to a pattern of surplus inequalities which are independent of the allocation of property rights.

Testing WLW

One might find in the context of some particular application that the implication of side payments and the Coase Theorem are borne out empirically. Therefore, the traditional view of WLW is inapplicable, and a test of my alternative is appropriate.

Testing the hypothesis requires predictions of WLW in order to compare the subjective responses of the traders with the predicted responses as implied by the definition. The data must include the subjective response as to WLW and one of three additional sets of variables: (i) side payments if separations are by mutual consent; (ii) determinants of i's trade value V_i and opportunity value V_i^* and an indication of property right regimes which varies across observations; (iii) determinants of V_i and V_i^* and the initial division of the trade value V_i' or its determinants.

The method for empirically generating the WLW label depends on the available data. The task is simple under separations by mutual consent if side payments are observed. The definition of WLW in this case is: He who makes the side payment leaves the recipient of the side payment. Hence, the prediction is given directly by the value of side payment variable.

The problem is more difficult under unilateral separations or if side payments are not observed. In either case side payments can not guide the inference. However, differences in property right regimes -- either cross-sectionally or through time -- can be exploited to yield the predictions of WLW under my hypothesis. The key is in exploiting the following implication: If trader 1 leaves trader 2, then trader 1 is worse off in doing so under mutual consent. This follows because, under separations by mutual consent, trader 1 makes a side payment to trader 2. One can in principle estimate structurally the determinants of the trade and opportunity values (V_i, V_i^*) by selection bias correction techniques and determine the impact of the allocation of property rights on the income of traders in severed matches. Thus for each trader one can estimate the impact of a change in property rights. Those traders who are estimated to fare better under unilateral separations are labeled leavers.

If one observes neither side payments nor the property right regime, then the initial division of the trade value must be modeled to test my hypothesis. With the V_i' specified, one compares the observed V_i^* with the modeled V_i' to determine whether $S_i(0) \gtrless 0$. If the trade relationship severs and $S_1(0)<0$, then trader 1 is predicted to leave trader 2.

In all three cases the implication of the model is tested by comparing the predictions with the subjective responses of the traders. Of course, in the third case such a procedure tests the joint hypothesis of my definition of WLW and the underlying specification of the V_i'.

What are the V_i'?

Consider several alternatives for the initial division of the trade value, V_1' and V_2'. First, trader 2 may be the residual income recipient, in which case

$$(6.0) \qquad V_1' = V_1^\circ$$

$$(6.1) \qquad V_2' = V - V_1^\circ$$

where V_1°, satisfying $V^\circ = V_1^\circ + V_2^\circ$, is trader 1's prior period trade value. This is a special case of a more general sharing rule which conditions the V_i' on V. Another alternative is an expectations scheme. Forecastable variations in V and the V_i^* (and perhaps relative bargaining strength) can be included in the determination of the initial distribution; then simply, $V_i' = EV_i$. These alternatives can be combined as well. For instance, V_i' may be determined from the expectations scheme, but trader 2 acts as the residual income recipient.

$$(7.0) \qquad V_1' = EV_1$$

$$(7.1) \qquad V_2' = V - EV_1.$$

Which set of relations applies is likely to be application specific. Some matching markets are characterized by a residual income recipient (e.g., the labor market), but others are not (e.g., the marriage market). In general, the V_i' are chosen to be consistent with the known empirical regularities. In my work on quits and layoffs, or WLW in the labor market, I conclude the V_i' described by (6.0) and (6.1) can account for several well-known empirical regularities of labor turnover, and that an alternative like (7.0) and (7.1) cannot (McLaughlin 1986b).

Conclusion

I have advanced in this paper a general framework for the analysis of who leaves whom (WLW). It can be applied to quits and layoffs in the labor market, to divorce in the marriage market, to dissolution of buyer-seller attachments in consumer and industrial markets, or perhaps to embargos in international trade; in fact, to any case in which there is a durable attachment of traders which is sometimes severed. Furthermore, the model is not limited to applications where side payments are observed since the essential feature is flexibility in the trade values, not side payments *per se*.[4]

My hypothesis is refutable on two margins. First, in contrast with the conventional approach, the rate at which trade relationships are severed is predicted to be invariant to the allocation of property rights. Second, observed behavior can be used to construct the theoretically implied predictions of WLW which can be compared with the subjective responses of the traders.

My definition of WLW under the two varieties of property rights produces a Coase-like result: conclusions as to WLW are invariant to the allocation of property rights. This contrasts with the usual view which does not admit side payments into the analysis. The importance of such a result is that with trade-specific capital or informational asymmetries traders may adopt seemingly forced trade mechanisms like severance pay to preserve optimal sorting (Kennan 1979, Kahn 1985). If sorting and hence observed dissolutions are optimal, then who leaves whom is not affected by this complication. However, if costly renegotiation dominates, an important role for the usual view may remain.

NOTES

*I thank Gary Becker for his stimulating comments on the first draft.

1. Separation by mutual consent is equivalent to a unilateral trading rule; i.e., one trader can "force" the other to trade. Unilateral separation is equivalent to trade by mutual consent; i.e., trade if and only if neither trader wants to dissolve the relationship.

2. The two intermediate allocations of property rights are not considered in the rest of the paper, although they may be important in some contexts. (For instance, in the context of the labor market, long term contracts guarantee a job to the worker and indenture contracts guarantee a worker to the firm.) Rather, the analysis carries over to these two cases with only trivial modification.

3. This first result is entirely invariant to the initial allocations. In this way, one is not testing the joint hypothesis of efficient dissolutions of trading relationships and the rule for initial allocations V_i'.

4. The trade values V_i need not be perfectly flexible: if outside offers are verifiable, a counter-offer-matching scheme is sufficient to support the theoretical results (Mortensen 1978).

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