CONTRACTS, INTELLECTUAL PROPERTY RIGHTS, AND MULTINATIONAL INVESTMENT IN DEVELOPING COUNTRIES

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Working Paper **6448**

NBER WORKING PAPER SERIES

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Working Paper 6448
http://www.nber.org/papers/w6448

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 1998

This work has been supported by a grant from the National Science Foundation to the National Bureau of Economic Research. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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NBER Working Paper No. 6448
March 1998
JEL Nos. F12, F23

ABSTRACT

The institution and enforcement of property rights and contracts have been an important policy issue for the developing countries, the transition economies, and the developed countries in the 1990s. This has led to the development of a literature on technology transfer and how property rights might affect such transfers and host-country welfare. Much of this literature is non-strategic, with large numbers of "northern" innovative firms and "southern" imitators, and focusses on endogenous R&D and imitation levels. This paper takes a different and complementary approach, developing a strategic model in which local managers learn the multinational's technology and can defect to start a rival firm. If contract enforcement leads the MNE to shift from exporting to producing inside the host country, both the host country and the MNE are better off. If the MNE had established a subsidiary prior to the establishment of enforcement, the host country is indifferent or worse off by enforcement. In the latter case, rents are transferred from the local manager to the MNE.

James R. Markusen
Department of Economics
University of Colorado
Boulder, CO 80309-0256
and NBER
markusen@colorado.edu

1. Introduction

Property rights, enforceable contracts and intellectual property protection (IPP) have been an important policy issue for a number of years, with the US in particular insistent that developing countries adopt higher standards. The developing countries in turn resist such pressure, seeing IPP as largely leading to a rent transfer to the high-income developed countries. The debate over IPP is just part of a wider debate about general property rights for foreign firms, contract and bankruptcy law, and other legal infrastructure for the transition economies.

This policy debate has a parallel in the economics profession, with a literature on IPP, technology transfer, and so forth. Most of this literature addresses how the institution of IPP (which affects the costs of imitation) affects equilibrium rates of innovation (level of R&D) in the north, imitation rates in the south, and southern welfare. A typical result might be that the institution of IPP, for example, lowers imitation in the south, but also lowers innovation (R&D) in the north in the long run. Theory papers include Chin and Grossman (1988), Glass and Saggi (1995), Diwan and Rodrik (1991), Helpman (1993), Grossman and Helpman (1991), Lai (1996), Segerstrom (1991), Taylor (1994), and Yang and Maskus (1997).

This paper takes a different but complementary approach, adopting a small-numbers, strategic-behavior approach to the same general problem. I build on Ethier and Markusen (1996), in which a MNE hires a local "manager" in the host country (see also Fosfuri, Motta, and Ronde, 1997). The manager learns the technology in the first period of a two-period product cycle, and can defect to start a rival firm in the second period. The MNE can similarly dismiss the manager at the beginning of the second period and hire a new manager. The ability of the MNE to defect by firing the manager is crucial to some of the interesting results in this paper, and is a consideration not found in any of the other papers referenced above. Contract enforcement and/or IPP is modelled simply as a cost imposed on the defecting party (or perhaps only on the manager).

Initially, we consider the choice between exporting and a subsidiary. Cases where a subsidiary is chosen can be divided into a case where the MNE captures all rents and one in which it shares rents with the local manager. Later, a situation is considered in which duopoly may occur as an equilibrium: the manager quits to start a new firm, competing as a duopolist with the MNE which has hired a new manager. This possibility is interesting in light of evidence for Latin America and East Asia that many managers of local firms first got their training as employees of foreign multinationals (e.g., Katz (1987), Hobday (1995), Blomstrom and Kokko, (1995)).

The welfare ranking for the host country is that both the duopoly and rent-sharing subsidiaries are preferred to the rent-capture subsidiary which is preferred to exporting (importing from the host-country's point of view). The duopoly and rent-sharing outcomes cannot in general be ranked, since the former offers a lower price (higher consumer surplus) but a zero share of duopoly rents instead of a positive share of monopoly rents. Both rankings can be produced for different parameter values.

Results show that the institution of contract enforcement may lead to a shift from exporting to a local subsidiary, a mode switch which improves the welfare of both the MNE and the host country. But if a subsidiary was chosen initially, contract enforcement leads to either no change or to a fall in host-country welfare. In the latter case, there is a rent transfer from the local manager to the MNE. One interesting result is that binding both the MNE and the manager is worse for the manager and better for the MNE than binding the manager alone (as in intellectual property protection). The reason is that a contract-enforceability constraint on the MNE allows it to credibly offer a lower licensing or royalty fee in the second period of a product cycle. But this lower second-period fee then allows it to offer a lower rent share to the manager and still satisfy the latter's incentive-compatibility constraint. Not surprisingly, the institution of contract enforcement reduces the likelihood of the duopoly outcome, but does not affect host-country welfare in the duopoly outcome if it still occurs as the equilibrium.

2. Elements of the Model

Key elements of the model are as follows.

(1) The MNE introduces a new product every second time period. Two periods are referred to as a "product cycle". A product is economically obsolete at the end of the second period (end of the product cycle).

(2) r denotes the discount rate between product cycles; to simplify notation we ignore discounting between periods within a product cycle (a short appendix reproduces key equations with discounting between periods).[1]

(3) The MNE can serve a foreign market by exporting, or by creating a subsidiary to produce in the foreign market.

(4) Because of the costs of exporting, producing in the foreign country generates the most potential rents.

(5) But any local manager learns the technology in the first period and can quit (defect) to start a rival firm in the second period. Similarly, the MNE can defect, dismissing the manager and hiring a new one in the second period.

(6) Initially, no binding contracts can be written to prevent either partner from undertaking such a defection.

(7) Initially, I will assume that the MNE either offers a self-enforcing contract or exports. The possibility that second-period duopoly occurs as an equilibrium is allowed later in the paper.

These assumptions set up a situation where the multinational prefers to produce in the foreign (host) country, but agency costs may force the MNE into rent sharing with the local manager. Thus the multinational may prefer to dissipate rents through exporting rather than to share rents with the manager. Later in the paper, we consider the case where rents may be dissipated through second-period duopoly competition as just noted.

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[1] r has an alternative interpretation. Assume that there is no discounting, but that there is uncertainly over whether or not the firm will successfully develop the next generation of product. Let the probability of successfully developing a new product in the next cycle be $1/(1+r)$ if there is a product in the current cycle, zero otherwise (i.e., once the firm fails to develop a new product, it is out of the game). The probability of having a product in the third cycle is $1/(1+r)^2$ etc. The algebra in the paper is valid under either interpretation of r.

Notation is as follows.

R- Total per period rents from producing in the foreign country.

E- Total per period exporting rents (E < R).

F- Fixed cost of transferring the technology to a foreign partner. These include physical capital costs, training of the local manager, etc.

T- Training costs of a new manager that the MNE incurs if it dismisses the first one (i.e., if the MNE defects. In general, F > T.).

G- Fixed cost that the manager must incur if he/she quits to start a rival firm (defects). This could include costs of physical capital, etc.

L_i- Licensing or royalty fee charged to the subsidiary in period i (i = 1,2).

V- Rents earned by the manager in one product cycle: $V = (R-L_1) + (R-L_2)$.

V/r- Present value of rents to the manager of maintaining the relationship (each product cycle is, in value terms, an exact replica of the one before even though the product has changed).

There are two "individual rationality" constraints (IR): the MNE and the manager (agent) must earn non-negative rents. There are two "incentive compatibility" constraints (IC): the MNE and the manager must not want to defect in the second period. Subscripts 'a' and 'm' refer to the manager (agent) and the MNE respectively. The manager's IR constraint is that he/she must earn his/her opportunity cost over the product cycle from some other outside opportunity (normalized at zero).

$$(1) \qquad (R - L_1) + (R - L_2) \geq 0 \qquad IR_a$$

The manager's IC constraint is that second-period earnings $(R-L_2)$, plus the present value of continuing the relationship with the firm (V/r) exceed the returns from defecting to start a rival firm.[2]

[2] I am modelling this as a contracting problem, not explicitly as a game. Nevertheless, we do need to define "defecting" and its payoff in order to derive the incentive-compatibility constraints. Basically, I have in mind that both the manager and the MNE must plan and undertake the costs for a defection during the first period, with

(2) $$(R - L_2) + V/r \geq (R - G) \quad where \quad V = (R - L_1) + (R - L_2)$$ IC_a

The MNE's IR constraint is that the subsidiary yields earnings greater than or equal to exporting.

(3) $$L_1 + L_2 - F \geq 2E$$ IR_m

The MNE's IC constraint is that the second-period license fee is greater than or equal to the returns from firing the first manager and hiring a second one.

(4) $$L_2 \geq R - T$$ IC_m

Consider a contract in which both (1) and (2) hold with equality. But if (1) holds with equality, then V = 0, there is no rent sharing. From (2), we then have

(5) $$L_2 = G, \quad implies\ from\ (1)\ that \quad L_1 = 2R - G$$

This in turn implies that $L_1 + L_2 = 2R$, or that the MNE captures all available rents in equilibrium. The contract in (5) ($L_2 = G$) also satisfies (3) if

(6) $$R - T \leq G \quad or \quad R \leq T + G$$

Result 1:

If $R \leq T + G$, the MNE captures all rents in a product cycle, henceforth referred to as a rent-capture (RC) contract. This situation occurs when

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their "rival's" move only revealed at the beginning of the second period. Thus if one party defects and the other does not, the latter is out of the game and the defecting party collects all rents.

(1) The market is relatively small.
(2) Defection costs for the MNE (T) are high.
(3) Defection costs for the manager (G) are high.

If R > T + G, there is no single-product fee schedule that will not cause one party to defect.

Now consider the case where the manager's IR constraint (1) does not hold; that is, the MNE shares rents with the manager. Combine (2) and (4).

(7) $$R - T \leq L_2 \leq G + V/r$$

It is clear that the multinational should minimize V, since that is the same as maximizing $L_1 + L_2$ V is therefore chosen such that (7) holds with equalities, $L_2 = R - T$. Write (7) as an equality and substitute for V.

(8) $$R - T - G = V/r = (2R - L_1 - L_2)/r = (2R - L_1 - (R - T))/r$$

(9) $$r(R - T - G) = 2R - R + T - L_1$$

(10) $$L_1 = R + T - r(R - T - G)$$

Adding together L_1 and $L_2 = R - T$ and subtracting F, we get the earnings of the MNE

(11) $$L_1 + L_2 - F = 2R - F - r(R - T - G) > 0$$

The MNE has to share some rents with the subsidiary. The subsidiary earns

(12) $$2R - L_1 - L_2 = r(R - T - G)$$

The subsidiary earns positive rents, and no potential rents are dissipated.

Result 2:

If $R > T + G$, the MNE can credibly offer a long-term commitment, but must share rents with the subsidiary. This is henceforth referred to as a rent-sharing (RS) contract. The one-period rents earned by the subsidiary are smaller as

(1) r is smaller (future rents are more valuable)
(2) G is larger (the incentive to defect is smaller)
(3) T is larger (the MNEs incentive to defect is smaller).
(4) R is smaller (the subsidiary's share increase faster than R).

The one-period rents earned by the MNE are larger when (1), (2), (3) and (4) hold. Increases in F reduce profits (but do not dissipate the rents 2R) and make the MNE worse off and leave the subsidiary unaffected. Increases in G shift rents toward the MNE (G is never incurred in equilibrium).

The boundary between the area in which a rent-capture contract is possible and the area in which a rent-sharing contract is needed is given by SC in Figure 1. RC occurs to the right, RS to the left of SC.

Now consider exporting versus a subsidiary. MNE chooses exporting over the RC contract if $2R - F < 2E$. Indifference between exporting and the RC subsidiary is given by the horizontal line in Figure 1, $F = 2R - 2E$. We label this line EC.

At point A in Figure 1, exporting and a RS subsidiary also yield the same profits (by transitivity). Beginning at this point, differentiate the right-hand side of (11) holding it equal to zero, in order to derive the locus of indifference between exporting and a subsidiary.

(13) $$dF - r dG = 0 \qquad dF/dG = r$$

The locus of points giving the same profits from a subsidiary as point A in Figure 1 is given by SE in Figure 1. This line intersects the vertical axis ($G=0$) at $F = 2R - 2E - r(R-T)$.

Result 3

(1) Above SE and EC in Figure 1, the MNE chooses exporting.
(2) Below EC and right of SC, the MNE chooses a subsidiary and captures all rents.
(3) Left of SC and below SE, the MNE chooses a subsidiary and shares rents.

The exporting region of Figure 1 below EC and above (left of) SE is a region in which the MNE prefers to dissipate some rents in exporting rather than share rents with a subsidiary.

3. Contract Enforcement, Property Rights

Now assume that a defecting party incurs a penalty P, which can be thought of as a partial or complete property right. We assume that this penalty is paid to the state, not to the other party (alternatively, it could be paid to the other party but exactly consumed in litigation costs). This does not play a role in analyzing the incentive-compatible contract, but could if defection is explicitly permitted as an equilibrium.

Equations (1), (2) and (4) become

(14) $$(R - L_1) + (R - L_2) \geq 0 \qquad IR_a$$

(15) $$(R - L_2) + V/r \geq (R - G - P) \qquad IC_a$$

(16) $$L_2 \geq R - T - P \qquad IC_m$$

Combining (14) and (15) equations, we see that the MNE can offer the contract $L_1 = 2R - G - P$, $L_2 = G + P$ and capture all rents: $L_1 + L_2 = 2R$. This will satisfy (16) if

(17) $$R - T \leq G + 2P$$

The SC locus in Figure 1 shifts left (17 holds with equality) as shown in Figure 2. Nothing happens to the EC locus in Figure 2 (it is horizontal at the same value of $F = 2R - 2E$).

Now consider the case where $R - T > G + 2P$ (i.e., left of the shifted SC locus). Combine (15) and (16).

(18) $$R - T - P \le L_2 \le G + V/r + P$$

It is clear that the multinational should minimize V (maximize $L_1 + L_2$). V is therefore chosen such that (18) holds with equalities, $L_2 = R - T - P$. Write (18) as an equality and use the definition of V to substitute for V.

(19) $$R - T - G - 2P = (2R - L_1 - L_2)/r = (2R - L_1 - R + T + P)/r$$

(20) $$r(R - T - G - 2P) = 2R - R + T + P - L_1$$

(21) $$L_1 = R + T - r(R - T - G) + (1 + 2r)P$$

Adding together L_1 and $L_2 = R - T - P$ and subtracting F, we get the earnings of the MNE

(22) $$L_1 + L_2 - F = 2R - F - r(R - T - G - 2P) \ge 0.$$

The multinational unambiguously benefits from the property right if it choses a subsidiary initially. The MNE has to share some rents with the manager. The manager earns

(23) $$2R - L_1 - L_2 = r(R - T - G - 2P)$$

The manager earns positive rents, but they are reduced by the property right if there was a rent-sharing contract chosen initially.

Finally, note from (22) that the SE locus in Figure 1 has the same slope as before (set (22) equal to 2E and differentiate holding the value of the equation constant). Figure 2 shows the shifts due to the property right corresponding to Figure 1. In Figure 1, the area corresponding to RS contracts on its right-hand boundary. And, at any point inside the original rent-sharing region shown in Figure 1, equations (22) and (23) tell us that the profits of the MNE increase and the profits of the subsidiary decrease.

The area corresponding to the RS contract expands on its north-west margin. Within the original RS area, the MNE is better of and the subsidiary is worse off. But in the area which was exporting and now becomes a rent-sharing subsidiary, the subsidiary now earns rents versus nothing before. The MNE is also better off at any point strictly interior to the set of points which were E and are now RS.

<u>Result 4</u> Introduction of Contract Enforcement (Defection Penalty)

(1) Contract enforcement in terms of a penalty for defection shifts the SC and SE loci left.

(2) At any point at which a RS subsidiary was initially chosen, the MNE is made better off by enforcement and the manager worse off.

(3) In the area in which exporting occurred but in which a RS subsidiary is now chosen, both the MNE and the subsidiary are better off. In the area in which exporting is replaced by a RC subsidiary, the MNE is better off, and the manager is indifferent.

Finally, suppose that only the agent has to pay the defection penalty. With reference to equations (15) and (16), P only appears in (15). Adding P is now identical to just increasing G. The new equivalents of (22) and (23) become:

(24) $$L_1 + L_2 - F = 2R - F - r(R - T - G - P) \geq 0.$$

(25) $$2R - L_1 - L_2 = r(R - T - G - P)$$

The MNE is now worse off than if the penalty was binding on both parties, and the manager is better off! The intuition is as follows. A binding penalty on the MNE means that the MNE can credibly commit to a lower L_2 (higher second-period earnings for the manager). But this in turn relaxes the managers incentive-compatibility constraint, which in turn allows the MNE to offer lower rent sharing (lower V), as seen in (23) versus (25). By credibly committing not to fire the manager, the MNE lowers rent sharing.

Consider one small tangent before proceeding, the comparative-statics of the mode choice with respect to the size of the host country. Figure 3 shows the effect of a growth in the host country, represented by an increase in R and 2R - 2E. The effect of this is to encourage investment via a subsidiary versus exporting (outward shift of SE and EC in Figure 3). This is perhaps rather obvious given the fixed costs of entering via a subsidiary. Somewhat more subtle is the rightward shift of SC in Figure 4, indicating that the MNE must share rents to prevent defection over a broader range of parameter values. The host-country benefits (corrected for its size) in all the shaded regions of Figure 3 if the subsidiary price is less than the export price, but an explicit welfare analysis is postponed until section 5.

4. Duopoly as a Second-Period Equilibrium

In our discussion of the rent-sharing subsidiary contract, we simply assumed that the MNE would not offer a contract leading to defection in the second period. In this section, we consider a situation in which the MNE offers simply a one-period contract, with the MNE and the manager knowing that they will compete as duopolists in the second period.[3] This seems to be an empirically relevant case insofar as a number of studies have documented the fact that managers of locally-owned firms in Latin American and in East Asia often originally receive their training in multinational firms This does not necessarily imply that they become competitors, they may become suppliers to the MNEs for example (Katz 1987, Hobday 1995, Blomstrom and Kokko 1995). A richer treatment of duopoly outcomes including the possibility that the MNE and its former manager might have a complementary (or at least less competitive relationship than implicitly assumed here) is found in Fosfuri, Motta, and Ronde (1997).

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[3]Consistent with this formulation, we assume that the penalty P (when it exists) is not actually incurred: there is no "defection". But P still matters. In so far as a higher P improves the attractiveness of RS to the MNE, a higher D may shift the equilibrium from duopoly to RS as we shall see.

Suppose that both the MNE and the original manager engage in duopoly (Cournot) competition at the end of the one-period arrangement. Let $0 < D < R$ denote total duopoly rents (before fixed costs) earned by the MNE and the (former) manager when the MNE runs the original plant in competition with its original manager running a new second plant. If we assume equal marginal costs, then the MNE earns D/2 and the manager D/2 when they both defect. The MNE need not incur an additional fixed cost other than T (it is the "residual owner" of any physical capital). The former manager incurs the fixed cost G in the new facility.

Knowing duopoly will occur in the second period, the best that the MNE can do in the first period is offer a one-period license at $L_1 = R + (D/2-G)$, and receive two-period earnings of

(26) $$L_1 + D/2 - T - F = R + D - T - F - G$$ (MNE earnings in duopoly)

The manager has zero earnings: $R - L_1 + D/2 - G = 0$.

The MNE will not want the duopoly outcome if the earnings of the MNE exporting are greater than the earnings from the contract/duopoly. This condition is given by:

(27) $$R + D - T - F - G < 2E$$ (MNE prefers exporting to duopoly)

This condition may not hold if T, F, G are very small. The locus of points satisfying this condition with equality may be a line of slope -1 in the E region of Figure 1 if indeed it lies in the positive orthant at all.

As shown earlier, the MNEs earning from an RS contract in the RS region of Figure 1 are

(28) $$2R - F - r(R - T - G)$$ (MNE earnings in a RS equilibrium)

A sufficient condition for all points in the RS region to be better than the duopoly outcome is thus:

(29) $$2R - r(R - T - G) - F > R + D - T - F - G$$ or

(30) $$(1 - r)R + (1 + r)(T + G) > D$$ (MNE prefers RS to duopoly)

A sufficient condition for this to hold, even at T = G = 0 is that r is small.

Refer back to the condition (27) for equality between duopoly and exporting (27 holds with equality). This locus lies entirely within the RS and RC regions if the intercept of (27) with the F axis in Figure 1 is less than the intersection of the SE locus with the F axis (G=0). This condition is that:

(31) $$R + D - 2E - T < 2R - 2E - r(R - T)$$

(32) $$(1 - r)R + (1 + r)T > D$$ (locus (27) lies inside the RS and RC regions)

But note that (32) satisfies (30), the condition for RS to be preferred to a duopoly equilibrium. Thus (32) is a sufficient condition for the MNE not to want the duopoly outcome.

(33) $$(1 - r)R + (1 + r)T > D$$ (MNE does not want duopoly)

This is likely to be satisfied if r is relatively small and T is non-trivial. Of course, restricting T to some minimal value also restricts F presumably, since the original investment cost F includes an initial training cost like T (i.e., F > T). So if r is not small, then (33) requires us to restrict T and F to some minimal values to rule out duopoly as the desired equilibrium (e.g., the original of Figure 1 is at a positive value of F = T).

With linear demand and constant marginal cost, R and D have the relationship R = (8/9)D or approximately D = .89R (shown in the following section). (33) is then satisfied by r ≤.11 even at T = 0. Recalling footnote 1, this can also be interpreted as a 90% probability of success (equal to 1/(1+r)) in the next product cycle. Recall also from (30) that a positive G weakens this restriction.

Finally, we might note what happens if these restrictions do not hold such that the MNE wants duopoly in preference to E or RS. Suppose that the value of F that solves (27) with equality lies above the intersection of SE with the F axis in Figure 1 (reverse the inequality in (30) and (33)). Then there will exist a region DD shown in Figure 4, where the MNE would want the duopoly outcome. The boundary of DD initially has a slope of -1 (equation (27)) until it hits the SE locus. Then it runs vertically down to the G axis ((30) as an equality). With fixed costs F and G very low and r "relatively" high, the dissipation of rents through duopoly competition is preferable to the dissipation of rents through exporting and the sharing of rents in an RS contract.

5. Welfare

In this section, we will develop an underlying model that generates values of R, E, and D as functions of more primitive parameters, which in turn permits a welfare analysis. I will use the well-known "linear" model (linear demand and constant marginal cost) that has, for better or worse, been popular in the strategic trade-policy literature.

X is the good produced by the MNE and Y is the outside, constant-returns, perfectly-competitive sector. There is one factor, labor, and the economy is endowed with L units of labor to be divided between the X and Y sectors. Utility is given by the usual quadratic function:

$$(34) \qquad U = \alpha X - (\beta/2)X^2 + Y$$

Let Π denote rents (if any) accruing to the local manager. Income of the host country is then given by L + Π Units are chosen so that one unit of labor produces one unit of Y: $Y = L_y$ p_x denotes the price of X in terms of Y, the numeraire. The budget constraint is then given by:

(35) $$L + \Pi - p_x X - Y = 0$$

Maximizing (34) subject to (35) gives the inverse demand function for X:

(36) $$p_x = \alpha - \beta X$$

If we substitute the budget constraint into (34) for Y, and then use (36) to substitute for p_x, welfare can be written as:

(37) $$U = (\beta/2)X^2 + \Pi + L$$

The first term in (37) is consumer surplus and the second term is of course local rents. Since L is constant, we will ignore this term in what follows to save a bit on notation.

Consider first the exporting equilibrium. The MNE produces with marginal cost m and incurs transport cost t to serve the host country. The MNEs profits E and its first-order optimization condition are given by:

(38) $$E = Max\ (\alpha - \beta X)X - (m + t) \qquad \frac{\partial E}{\partial X} = \alpha - 2\beta X - (m + t) = 0$$

This allows us to solve for the exporting-equilibrium supply (X_e), which in turn gives us welfare (U_e) from (36) (the local manager earns no rents). With output and price known, we can also solve for profits E ($E = \beta X^2$).

(39) $$X_e = \left[\frac{\alpha - m - t}{2\beta}\right] \qquad U_e = \frac{\beta}{2}\left[\frac{\alpha - m - t}{2\beta}\right]^2 \qquad E = \beta\left[\frac{\alpha - m - t}{2\beta}\right]^2$$

Following the same procedure, we can solve for the subsidiary's output, and then U and R (profits). Note that R is the same in the RC and RS equilibria, the only difference being the share of rents R going to the host country in the RS equilibrium. The equations are the same as (38) and (39) except with t = 0.

$$(40) \qquad X = \left[\frac{\alpha - m}{2\beta}\right] \qquad R = \beta\left[\frac{\alpha - m}{2\beta}\right]^2$$

These give us host-country welfare in the two subsidiary equilibria RC (U_c) and RS (U_s).

$$(41) \qquad U_c = \frac{\beta}{2}\left[\frac{\alpha - m}{2\beta}\right]^2$$

$$(42) \qquad U_s = \frac{\beta}{2}\left[\frac{\alpha - m}{2\beta}\right]^2 + r(R - T - G) = (\beta/2 + r\beta)\left[\frac{\alpha - m}{2\beta}\right]^2 - r(T + G)$$

The welfare ranking of the three outcomes is immediately clear from these results:

$$(43) \qquad U_s \geq U_c \geq U_e$$

The subsidiary is preferred by the host country to exporting, because the price is lower with the subsidiary, generating a larger consumer surplus. RS is preferred to RC because of the rent capture by the local manager.

These results are shown schematically in Figure 5 (ignoring duopoly for now). Welfare effects can be decomposed into a product price (consumer surplus) term and a domestic rent-sharing term. Figure 6 then shows what happens with the institution of property rights, generating the shifts shown in Figure 2. At all points at which exporting was chosen initially but a subsidiary is chosen after property rights are instituted, the host country is better off (cross hatched area). Consumer surplus rises, and rents are captured in the area where RS replaces E. At all points at which a RS subsidiary was chosen initially, the host country is worse off (diagonal slashes). There is no change in welfare for points at which RC was chosen initially, or at which E is chosen before and after property rights.

The duopoly outcome is only slightly more complicated, but straightforward if we assume that both firms have the same marginal cost, m. We can then exploit symmetry to easily solve for the firm and industry outputs. Let X be the output of one firm and X^* the output of the other. Firms are assumed to be Cournot competitors.

(44) $$D/2 = Max\ (\alpha - \beta(X + X^*))X - mX \qquad \frac{\partial D/2}{\partial X} = \alpha - \beta X^* - 2\beta X - m = 0$$

Given symmetry, the equilibrium firm and industry (consumption) outputs are:

(45) $$X = X^* = \frac{\alpha - m}{3\beta} \qquad X + X^* = \frac{2(\alpha - m)}{3\beta}$$

Total duopoly rents D, are given by $\beta(X^2 + X^{*2})$.

(46) $$D = 2\beta\left[\frac{\alpha - m}{3\beta}\right]^2$$

Recall that all rents are captured by the MNE (the MNE extracts the former manager's second-period rent D/2 in the first-period license fee). Welfare is then given by consumer surplus.

(47) $$U_d = \frac{\beta}{2}(X + X^*)^2 = \frac{\beta}{2}\left[\frac{2(\alpha - m)}{3\beta}\right]^2$$

It is clear that $U_d > U_c > U_e$. Competition drives down the price of X and the duopoly outcome has the largest consumer surplus. However, the duopoly outcome cannot in general be welfare ranked compared to the RS outcome. The duopoly outcome has a higher consumer surplus, but the local manager earns zero rents as opposed to a share of monopoly rents in the RS equilibrium.

The statement that the DD and RS equilibria cannot be welfare ranked is a much weaker statement that to say that parameter values exist such the DD is preferred and other values such that RS is preferred. We can indeed show that the latter is true. Consider the boundary between the RS and DD regions given by equation (30).

(48) $$r(R - T - G) = R - D + T + G$$

Use the right-hand side of this equation to replace the left-hand side in equation (42). Welfare in the RS equilibrium at the RS-DD boundary becomes:

(49) $$U_s = \frac{\beta}{2}\left[\frac{\alpha - m}{2\beta}\right]^2 + R - D + T + G = \frac{\beta}{2}\left[\frac{\alpha - m}{2\beta}\right]^2 + \beta\left[\frac{\alpha - m}{2\beta}\right]^2 - 2\beta\left[\frac{\alpha - m}{3\beta}\right]^2 + T + G$$

This reduces to:

(50) $$U_s = \frac{3}{8\beta}(\alpha - m)^2 - \frac{2}{9\beta}(\alpha - m)^2 + T + G$$

Comparing (50) and (47), we have:

(51) $$U_s - U_d = -\frac{5}{72\beta}(\alpha - m)^2 + T + G$$

The first term in (51) reflects the fact that consumer surplus is higher in the DD equilibrium. The second term T+G seems odd, since an increase in T or G reduce host-country welfare under RS. But remember r must increase with an increase in G to remain on the DD-RS boundary (48), and the increase in r increases host-country welfare. For a given dr > 0, the increase in dG necessary to maintain the MNEs indifference (48) is less than the dG > 0, needed to keep host-country welfare constant (42). Thus welfare under RS at the DD-RS boundary increases as the boundary shifts right (dG > 0) due to an increase in r (dr > 0).

To show that both welfare ranking are possible, we can find parameters such that (51) is zero, and then show how a larger or smaller value of that parameter generates opposite welfare rankings. Chose parameters such that (51) is zero. Then we pick the implied value of r such that we are on the DD-RS boundary. Substitute for T+G in the boundary equation (30) using (51), to obtain:

(52) $$(1 - r)\frac{1}{4\beta}(\alpha - m)^2 + (1 - r)\frac{5}{72\beta}(\alpha - m)^2 = \frac{2}{9\beta}(\alpha - m)^2$$

Cancel and solve for r.

(53) $$r = 7/13 \approx .538$$

With parameters chosen such that (51) is zero and r is given by (53), welfare in DD and RS are equal at the DD-RS boundary. If we lower r, the DD-RS boundary must shift left to a lower value of G. But (51) is then negative, and welfare is higher under DD at the boundary. Correspondingly, a higher value of r shift the boundary to the right to a higher value of G, and welfare is higher under RS at the boundary.

Welfare effects are shown schematically in Figure 7. Welfare rankings are clear, except for DD versus RS as we have just been discussing. Now the institution of property rights shift the curves as before in Figure 2. SE shifts up, and the intersection of the DD-E boundary with the F axis remains fixed (under the assumption that P is not actually incurred in the duopoly outcome). The DD-RS boundary shifts left. Welfare is not affected at points inside the DD region both before and after the institution of property rights, but the boundary between DD and RS shift left reflecting increased returns to the MNE in the RS region. If contract enforcement shifts the equilibrium from DD to RS, the welfare effect on the host country is uncertain.

Finally, we can use these results to infer welfare results about Figure 3 (growth in the host country). All of the areas of "regime shifts", the shaded areas in Figure 3, are areas of welfare improvement for the host country (more than in proportion to the increase in R or E). The regime shifts lower the domestic price (E to RS or RC) or increase the local rent share (RC to RS). The region which is initially RS is also an area of welfare improvement, in the sense that the host country manager captures a larger share of total rents than prior to growth. This share is $S = r(R - T - G)/R$, with $dS/dR = r(T+G)/R^2 > 0$. Growth leads to a more than proportional increase in income (i.e., more than in proportion to R) if the regime shifts or if RS was chosen initially.

Figure 8 presents a numerical example, in which region DD exists (but also notes alternative values in which DD would not exist). In this example welfare is higher in DD than in RS.

6. Summary and Conclusions

This paper presents a simple model, following Ethier and Markusen (1996), in order to improve our understanding of how contract enforcement, IPP etc. influence foreign direct investment into host economies, and host-country welfare. In the model, the local manager learns the necessary technology in order to produce the good in the first period of a two-period product cycle, and can quit (defect) to start a rival firm in the second period. The MNE can similarly defect, firing the manager and hiring a new one. We solve for the optimal mode of serving the foreign market as a function of various parameter values.

The principal result is both MNE profits and host-country welfare are improved by the institution of contract enforcement if it leads to a mode shift from exporting to production within the host economy. Exporting dissipates rents and results in a higher product price in the host country, so domestic production results in a consumer-surplus gain and may result in rent capture by the local manager. Contract enforcement leaves host-country welfare unchanged or reduces welfare, however, if a subsidiary was chosen prior to the policy change. In the latter case, rents are transferred from the local manager to the MNE, precisely the scenario feared by many developing countries.

Other results include the fact that the MNE is better off and the manager worse off if the MNE is bound by a contract than if it is not. A binding contract allows the MNE to credibly commit to a lower second-period licensing fee, which lowers the amount of rents it must share with the manager in order to ensure incentive-compatibility for the manager. Not surprisingly, contract enforcement reduces the likelihood of duopoly competition in the second period, with uncertain welfare consequences for the host country if duopoly was chosen initially.[4]

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[4]Again, Fosfuri, Motta and Ronde (1997) present a richer treatment of duopoly outcomes and in particular allow for a range of possibly relationships between the MNEs good and that produced by its former workers (in my model they must be perfect substitutes). This is surely important for some developing countries in which the former workers may become suppliers to the MNE. Fosfuri, Motta, and Ronde do not allow the MNE to defect and they do not treat contract enforcement and property rights issues.

Appendix

The purpose of this short appendix is to try to show that the assumption of no discounting within a product cycle (between periods of a cycle), is a harmless assumption that makes the algebra cleaner without altering results in any important way. Let ρ denote the discount rate between periods of a product cycle. r continues to denote the discount rate between product cycles (obviously, the time between the beginning of two cycles is more than the time between to periods of a cycle). Equations (1)-(4) of paper can be rewritten as:

(A1) $$(R - L_1) + (1+\rho)^{-1}(R - L_2) \geq 0 \qquad IR_a$$

(A2) $$(R - L_2) + V/r \geq (R - G), \quad V = (R - L_1) + (1+\rho)^{-1}(R - L_2) \qquad IC_a$$

(A3) $$L_1 + (1+\rho)^{-1}L_2 - F \geq E + (1+\rho)^{-1}E \qquad IR_m$$

(A4) $$L_2 \geq R - T \qquad IC_m$$

Combining (A2) and (A4) as before, the new version of (7) is unchanged:

(A7) $$R - T \leq L_2 \leq G + V/r$$

Once again, it is clear that the multinational should minimize V, since that is the same as maximizing $L_1 + (1+\rho)L_2$. V is therefore chosen such that (A7) holds with equalities, $L_2 = R - T$. Write (A7) as an equality and substitute for V.

(A8) $$\begin{aligned} R - T - G &= V/r = ((R - L_1) + (1+\rho)^{-1}(R - L_2))/r \\ &= (R - L_1) + (1+\rho)^{-1}(R - (R - T))/r \end{aligned}$$

(A9) $$r(R - T - G) = (R - L_1) - (1+\rho)^{-1}T$$

(A10) $$L_1 = R + (1+\rho)^{-1}T - r(R - T - G)$$

Adding together L_1 and $(1+\rho)L_2 = (1+\rho)(R\text{-}T)$ and subtracting F, we get the earnings of the MNE

(A11)
$$\begin{aligned} L_1 + (1+\rho)^{-1}L_2 - F &= R + (1+\rho)^{-1}R + (1+\rho)^{-1}T - (1+\rho)^{-1}T - r(R-G-T) \\ &= \left[\frac{2+\rho}{1+\rho}\right]R - F - r(R - T - G) > 0 \end{aligned}$$

The MNE has to share some rents with the manager. The manager earns

(A12) $$R + (1+\rho)^{-1}R - L_1 - (1+\rho)^{-1}L_2 = r(R - T - G)$$

which is the same rent-sharing (value of V) as before.

Let $\delta = (2+\rho)/(1+\rho)$. The only modification this extra algebra makes to Figure 1, is that the intercepts of the EC and SE loci with the F axis become, respectively:

(A13) $$\delta(R - E) \quad \textit{and} \quad \delta(R - E) - r(R - T)$$

The slope of SE is the same, and other features of the model are unchanged except to this discount factor $\delta < 2$ replacing 2. I should be apparent that this carries over to the case of duopoly, so I will not derive that here.

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Figure 1: Values of F and G supporting alternative Modes

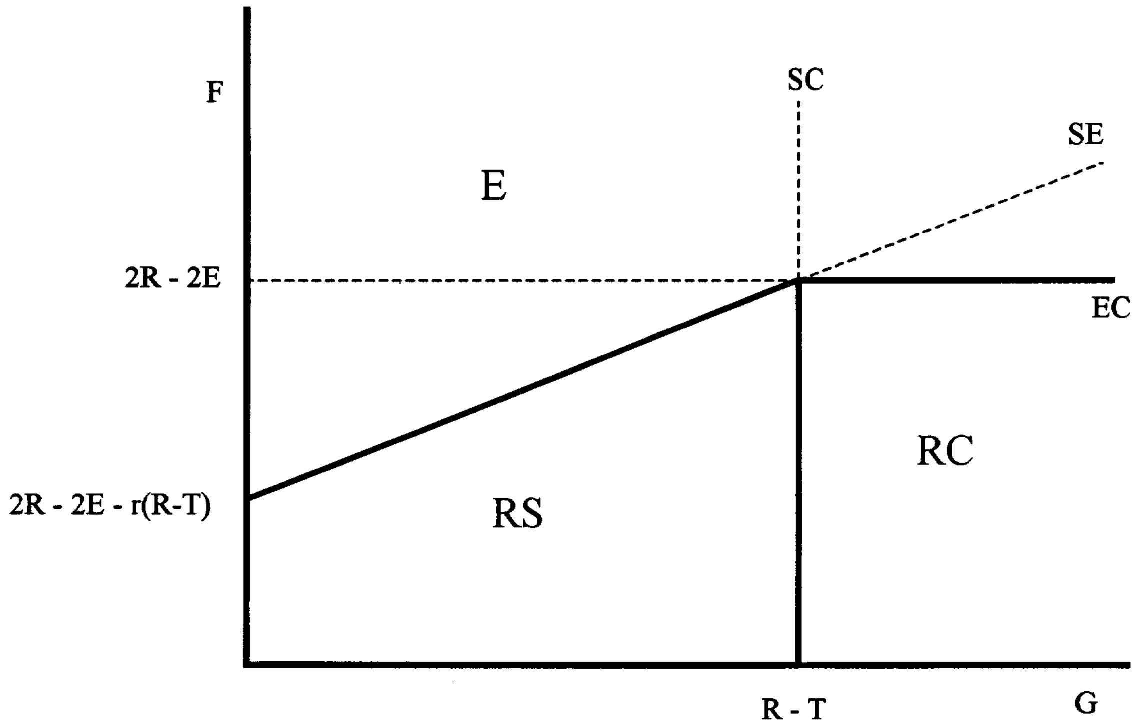


Figure 2: Introduction of Contract Enforcement

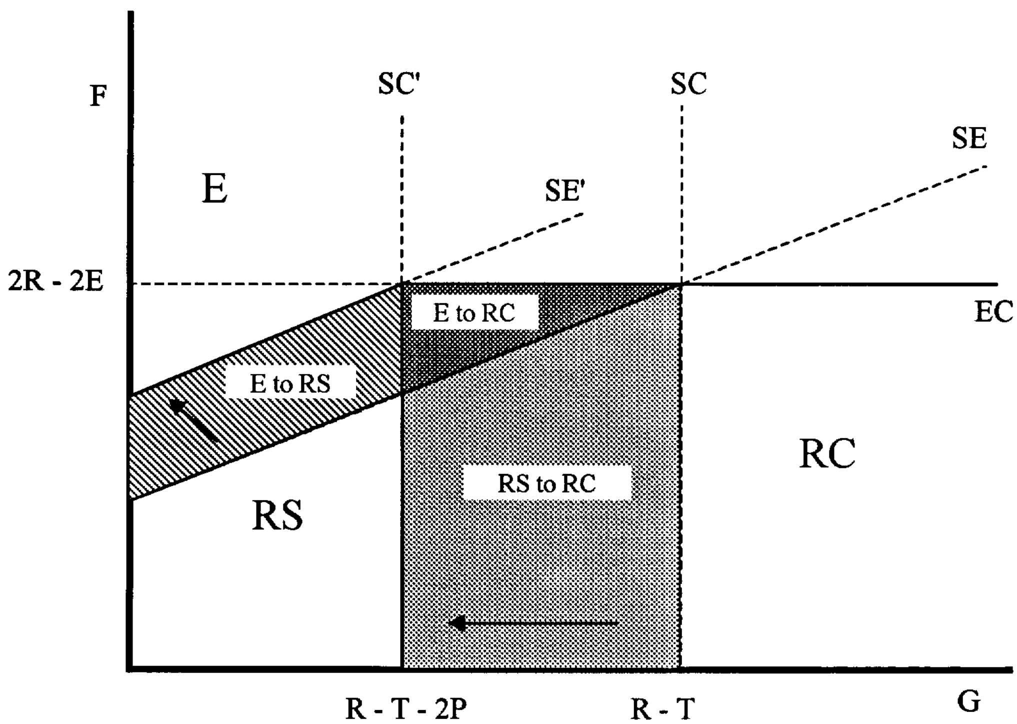


Figure 3: Growth in host-country market size

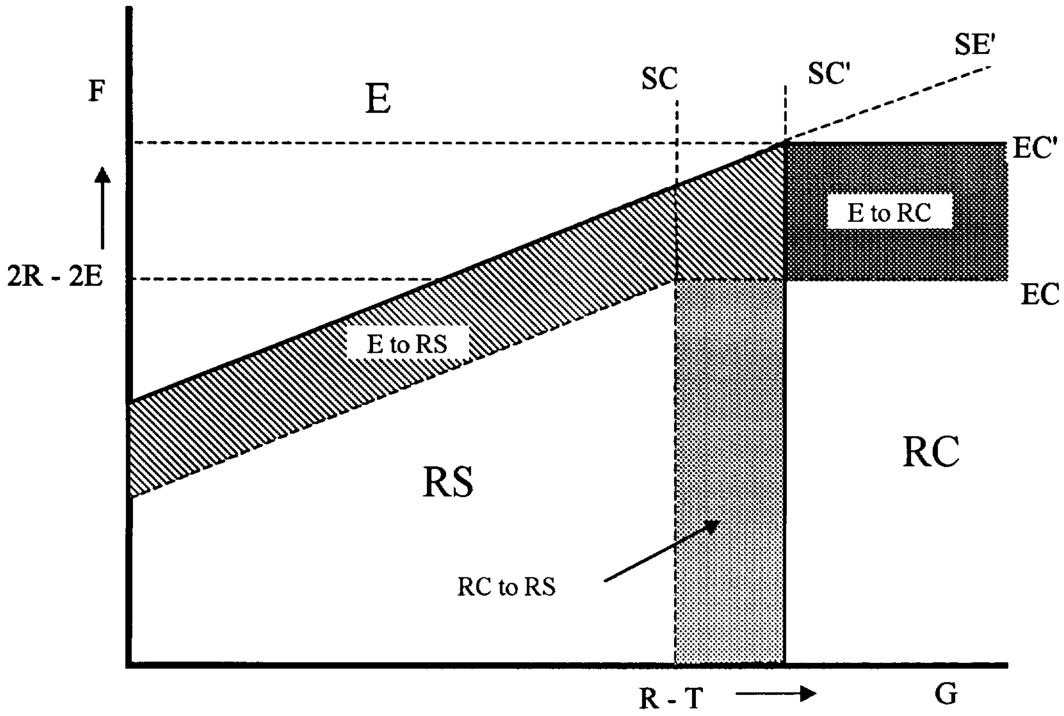


Figure 4: Defection Occurs in Equilibrium

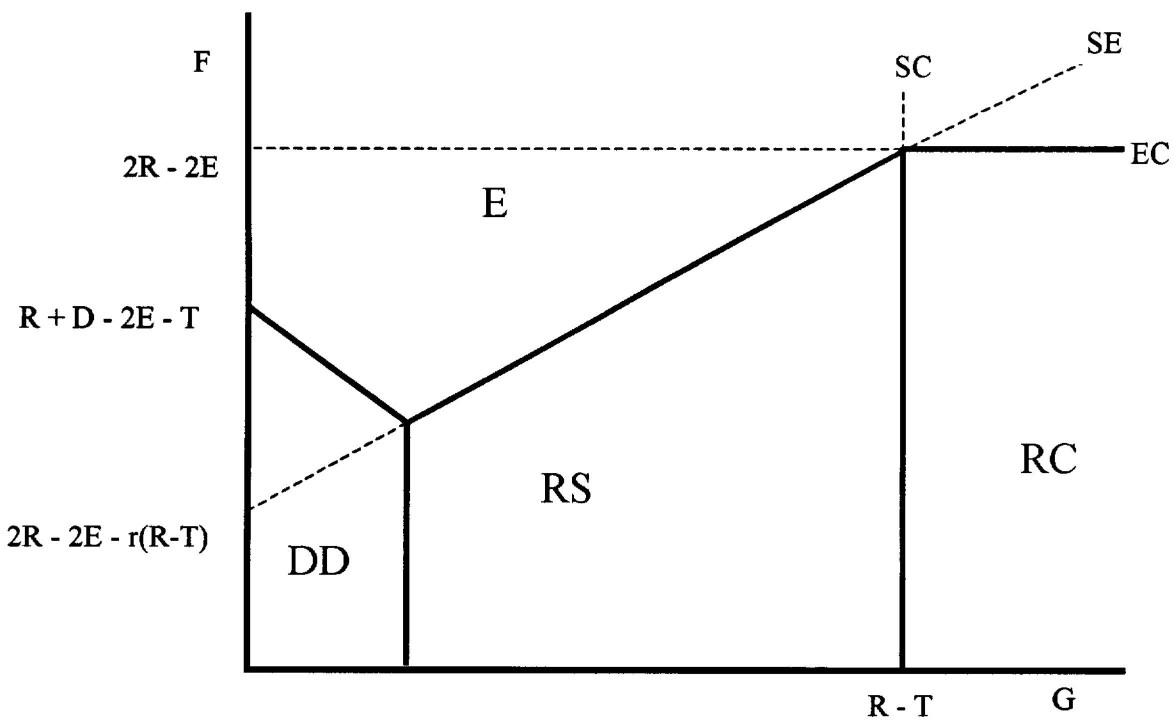


Figure 5: Regimes and Welfare

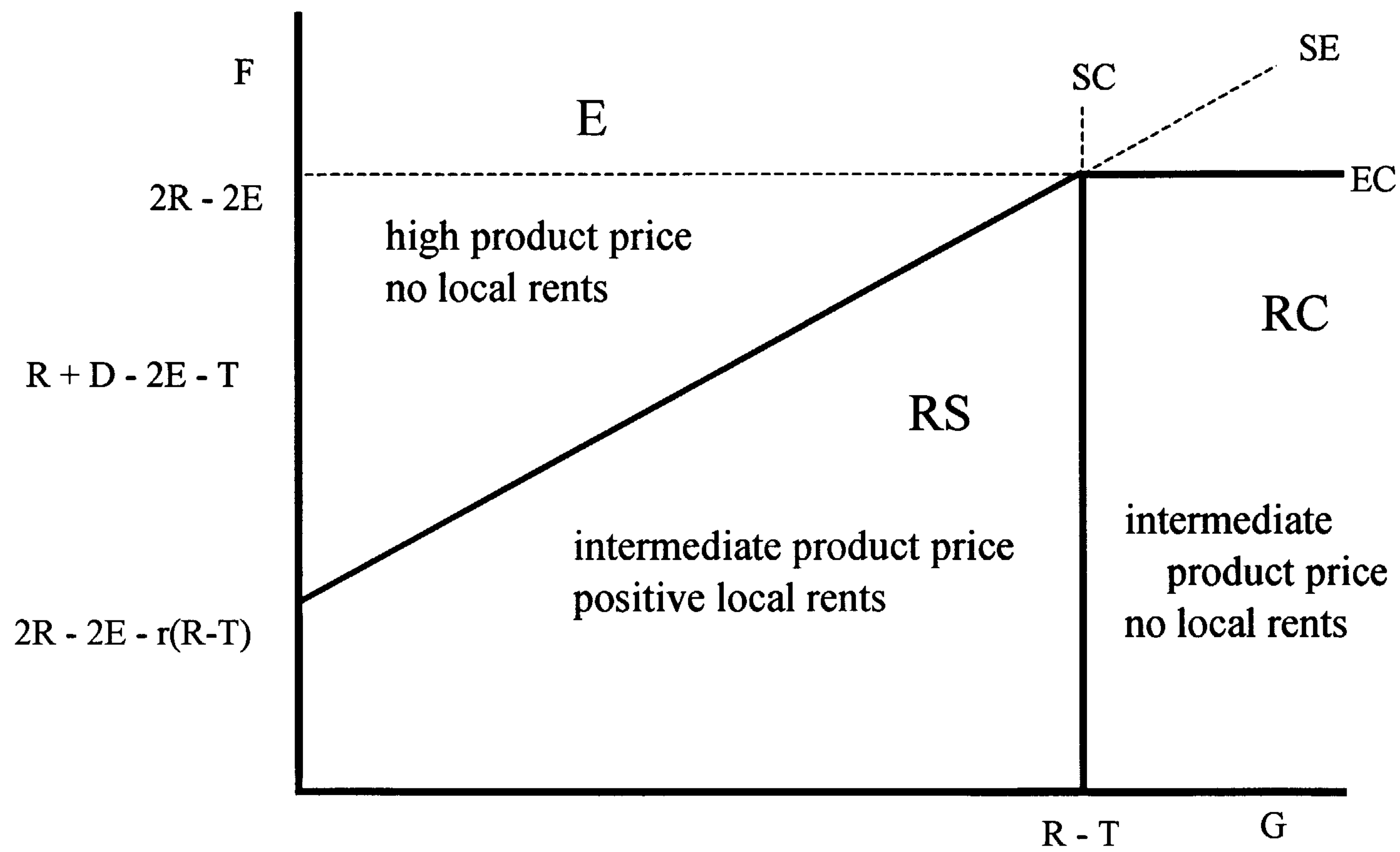


Figure 6: Contract Enforcement and Welfare

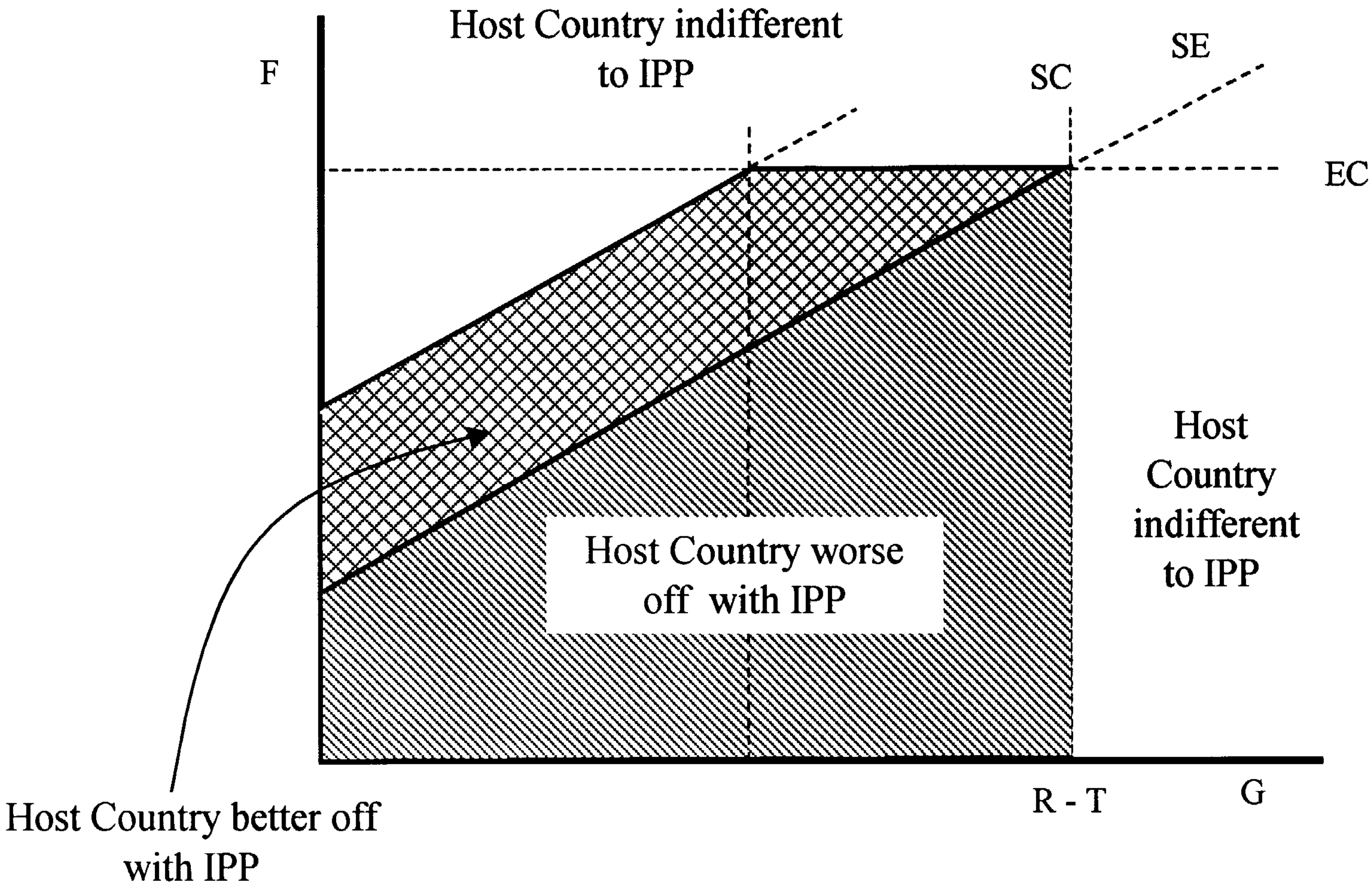


Figure 7: Regimes and Welfare

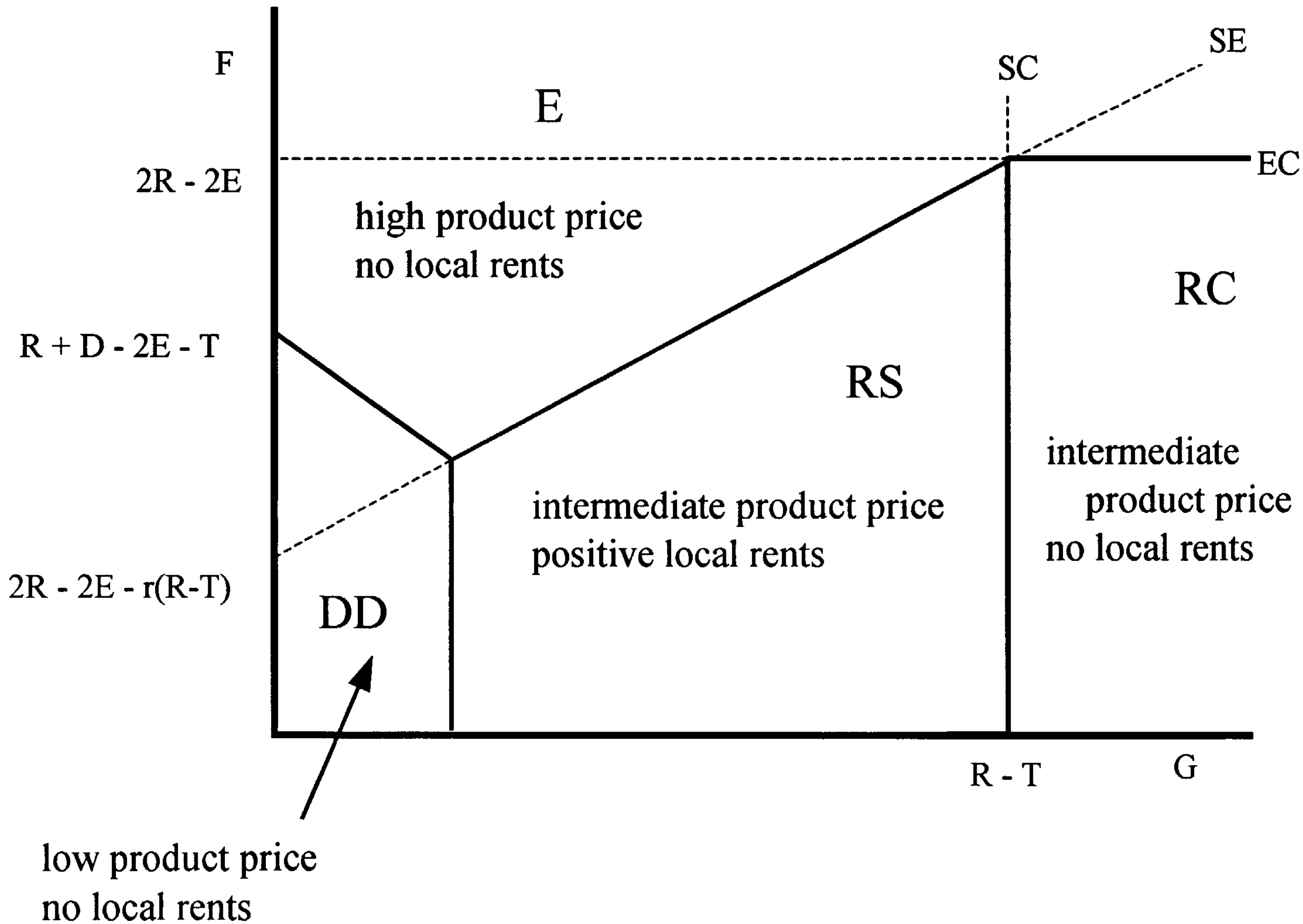
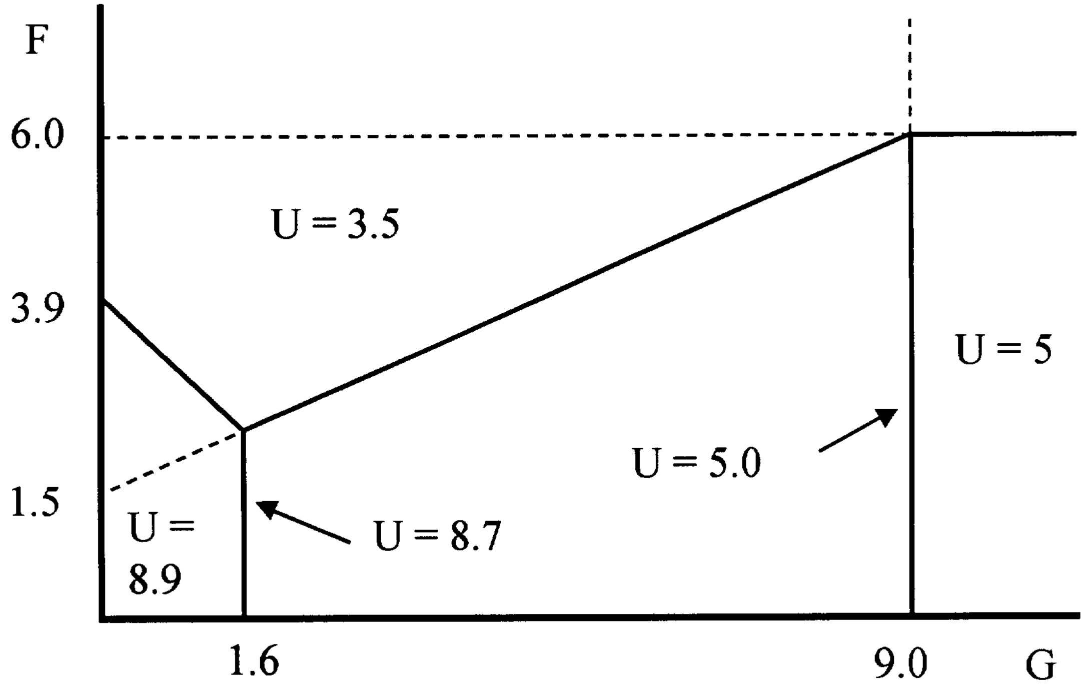


Figure 8: Numerical Example



Parameter values:

R = 10
D = 8.9 (implied by model)
E = 7
r = 0.5
T = 1

these are in turn implied by the more primitive values:
$\alpha = 2$
$\beta = 0.1$
m = 0
t = 0.33

DD region can be eliminated by raising T to T = 3.33 or lowering r to r = .111