International Joint Venture and Host-Country Policies

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1st Version: August 1998; Current Version: April 2000

Abstract

In the presence of international joint ventures, the implications of policies such as trade protection, foreign equity cap, discriminatory foreign income tax and domestic resource requirement restriction towards equity sharing and welfare are analyzed. Foreign equity cap policy is shown to reduce welfare. Trade protection implies a higher equity share for the local firm. Besides the standard deadweight loss, there is a first-order source of gain from protection through an improvement in the internal efficiency of the firm as well as a first-order loss due to leakage as a part of the surplus goes to a foreign firm. A tax on foreign income may or may not increase the equity share by the local firm and may not be welfare improving. 'Paradoxically', a marginal domestic resource requirement restriction enhances the joint net payoff of the venture as well as social welfare.

Journal of Economic Literature Classifications: F21, F23

Key Words: Multinational firm, Joint venture, moral hazard, Foreign equity cap

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1 Introduction

As restrictions on foreign business continue to fall in many developing economies, there is a steady increase in foreign direct investment (FDI) into these countries. Most of formal international trade and investment theory simply assumes that FDI occurs through fully-owned subsidiaries. However, joint venturing is another important mode through which FDI takes place. This is especially relevant when an already established multinational firm (MNF) from a developed country is unfamiliar with the economic, policy and political environment in developing countries. For example, in India, the growing automobile sector is dominated by international joint ventures (JVs). The same is true in the computer hardware industry. Table 1 records the "incidence" of joint venturing in the FDI activity in China.

Table 1: Joint Venturing Relative to
Fully-Owned Subsidiary Activity In the Context of FDI in China

Year	$\frac{\text{JV}}{\text{Fully-Owned Subsidiary}}$ In terms of # of agreements	$\frac{\text{JV}}{\text{Fully-Owned Subsidiary}}$ In terms of amount	Total FDI in billions of US dollars
1979-83	00.16	02.09	02.92
1984	02.20	17.05	02.70
1985	28.20	44.78	04.46
1986	37.16	49.35	07.26
1987	27.86	06.05	08.54
1988	09.42	08.73	10.22
1989	03.89	05.48	10.05
1990	02.19	02.76	10.28
1991	02.99	02.03	11.55
1992	03.95	02.43	19.20
1993	02.84	02.36	38.95
1994	02.14	02.23	43.21
1995	01.74	01.95	48.13
1996	–	01.65	54.80
1997	–	01.20	64.40

Note: The figures for 1979-83 are the annual averages.

Source: *Almanac of China's Foreign Economic Relations & Trade*

It is seen that, from 1984, FDI through JVs dominates over FDI through fully-owned subsidiaries, both in terms of the number of agreements as well as the amount involved. Moreover, this dominance grew in the initial years of Chinese liberalization and recently it has come down. This

confirms the notion that as familiarity with the host country as well as the host partner increases over time, there is less "need" for a business partner. Such "transitional stage" is likely to be the norm for many developing countries for years to come. It is therefore important to understand the implications of host country's FDI policies in the context of international JVs, rather than in the context of fully owned subsidiaries only – which is the usual practice. This is the aim of this paper.

There are some earlier studies on this issue. For example, Katrak (1981) analyzes how export and profit taxes affect the welfare of a host country when the manufacturing unit is a multinational firm with our without shares held by domestic (host country) residents; the case with shares belonging to the host country is referred to an international JV. More recent work on international JVs appeal to the agency theory. Instead of equity share specified exogenously – as in the earlier literature or determined in some bargaining framework ruling out transfers (Zhao (1997)), it comes out endogenously *along with* lump-sum transfers as a contract between two parties. More specifically, Chan and Hoy (1991) examine how a double moral hazard problem with risk-neutral agents leads to equity sharing and they have applied it to study 'East-West' international JVs. Furthermore, the MNF may opt for a joint venture rather than a fully owned subsidiary as an insurance against nationalization (Marjit (1990)). Also, international JVs may arise due to 'policy moral hazard' (or lack of commitment) facing the host country (Das (1997, 1998)).

The objective of this paper is not to seek out whether or when an MNF will opt for a JV, but to analyze the effects of various policies when a JV is presumed to be the most preferred option of FDI. The important difference with the earlier literature is that the contractual arrangement within the firm – or, more specifically, the equity sharing – may endogenously evolve responding to a policy shock or a change in some basic parameter. The subject matter of this paper is therefore related to the issue of trade policy and internal organization of firms (Vousden and Campbell (1994) and Das (1996)). More specifically, we examine the effects of foreign equity cap, trade protection

(or liberalization), a discriminatory tax on foreign income and a domestic resource requirement regulation. Policies other than the first indirectly induce changes in the equity distribution; our model predicts these as well as how welfare of the host country may be affected.

2 The Model

Elements

A foreign multinational firm (MNF) negotiates with a domestic or local firm (LF) to form a joint venture (JV). The MNF offers the new or better technology that is used by the venture. Production requires three types of variable inputs: (a) some combination of country-specific, production, managerial or marketing skills (with 'production' interpreted as sales) provided by both firms, (b) other inputs from abroad and (c) some other inputs obtained locally.

We will call (a) as the 'effort' input, denoted by e and e_f respectively for the LF and the MNF. From the viewpoint of agency problems giving rise to an equity arrangement, the critical feature of this input is that it is not directly observable: it is something internal to a party and cannot be contracted directly at arm's length. In other words, there is moral hazard. A profit incentive elicits this input, where profits – more appropriately, accounting profits – do not include the (private) cost of this input.

Output is a linear function of e and e_f: $x = A(e + e_f)$, where A represents technology. We normalize A to one. There are increasing marginal costs of supplying this input by either party – indicated by the respective cost functions, $e^2/2$ and $e_f^2/(2b)$, with $b < 1$. The last inequality signifies that the LF is more efficient in supplying this input.

Note that the additive feature of the production function implies that if b is sufficiently close to one, forming a fully owned subsidiary will be preferred by the MNF to forming a JV. It is implicit

therefore that b is bounded from one.[1] However, as long as $b > 0$, increasing (marginal) costs imply that the MNF will provide a positive amount of the variable input e_f.

Each of the inputs (b) and (c) is used in fixed proportion with the output.[2] Without loss of generality, let each coefficient be normalized to one and let w be the sum of these input prices.

Apart from variable costs, there are fixed costs of maintaining the technology. It has a deterministic component and a random one. Randomness can arise from machine breakdown for example. Let the former be normalized to zero and let the latter be denoted by θ. For tractability, suppose that $\theta \sim N(0, \sigma^2)$.

As regards risk behavior, similar to Das (1998), it is assumed that there is a difference in risk attitude between the MNF and the LF – that is, the former is risk-neutral and the latter risk-averse. This captures, in the extreme fashion, the notion that the LF is more risk-averse than the MNF. Unlike an established MNF in the world market, because of lack of ready access to the world capital and insurance markets, firm owners in developing countries may not be able to diversify their portfolios sufficiently and hence are more risk-averse. For tractability we will further assume that the preference of the LF satisfies constant absolute risk-aversion, so that together with normality of the distribution of θ it is represented by a mean-variance utility function (Varian, 1992, Ch. 25).

As we shall see, the risk-aversion assumption implies that the optimal equity share division is not entirely determined by the relative contribution of the two firms towards the joint surplus of venture, i.e., by the parameter b; more generally, it is partly sensitive to external parameters such as product price (or market demand if the firm has market power) which affects the net payoffs of firms differently. Consequently, the model is able to predict an effect of policy changes on the equity share distribution which is empirically testable.

[1] See Das (1998) for an analysis of choice between different modes of direct foreign investment as well as technology licensing.

[2] Output as a function of primary factors with intermediate inputs being used in fixed proportion with output is used by Findlay and Rodriguez (1977) for example. This assumption is relaxed later.

Let the product price be denoted by P. To abstract from inefficiencies from market imperfections, we assume that the product is sold in a competitive market. Denoting $p \equiv P - w$, the accounting profit of the venture is expressed as $p(e + e_f) - \theta$. Let s denote the share of the LF. Then its surplus is given by $s[p(e + e_f) - \theta] - e^2/2 - T$, where T ($\gtrless 0$) is the lump-sum transfer from the LF to the MNF. Let r denote the index of absolute risk-aversion. Recalling that the fixed cost is normally distributed, in terms of expected utility, the LF's surplus translates to

$$\Omega = sp(e + e_f) - \frac{Rs^2}{2} - \frac{e^2}{2} - T, \text{ where } R \equiv r\sigma^2.$$

This will be called the net payoff (economic profit) of the LF, which includes the risk-cost. That of the MNF is: $\Omega_f = (1 - s)p(e + e_f) - e_f^2/(2b) + T$. Without any loss of generality, the outside option values of both firms are normalized to zero.

The joint surplus of the two firms are the sum of individual net payoffs, equal to

$$\Pi = p(e + e_f) - \frac{Rs^2 + e^2}{2} - \frac{e_f^2}{2b}.$$

Determination of Equity Shares and Net Payoffs

Consistent with contract theory in the presence of moral hazard, equity

shares are determined so as to maximize joint surplus, and lump-sum transfers are a means to distribute the surplus in proportion to the bargaining strengths. It is assumed that both firms possess positive bargaining power. The source of bargaining power by the MNF lies in its diversified and bigger (global) portfolio. That by the LF may stem from its own portfolio together with its

political clout and connections in the host country.

Given the share distribution $(s,\ 1-s)$, the LF and the MNF attempt to maximize their respective net payoffs with respect to the variable input they supply. The respective first-order conditions are:[3]

$$sp = e; \quad (1-s)p = \frac{e_f}{b}. \tag{1}$$

These are the incentive compatibility constraints arising from the moral hazard problem facing the LF and the MNF respectively and they highlight the resulting inefficiency within the firm. Substituting these expressions into output and the joint-surplus expressions:

$$x(s) = p[s + b(1-s)] \tag{2}$$

$$\Pi(s) = p^2[s + b(1-s)] - \frac{Rs^2 + p^2 s^2}{2} - \frac{p^2 b(1-s)^2}{2}. \tag{3}$$

The joint-surplus function is strictly concave in s, yielding optimal s equal to

$$s_o = \frac{p^2}{R + (1+b)p^2}, \tag{4}$$

as illustrated in Figure 1. This is the expression for equilibrium share of the LF when the MNF is an **active partner**. When $b = 0$,

$$s_1 = \frac{p^2}{R + p^2} \tag{5}$$

is the share of the host firm when the MNF is **passive**.

[3]Given the additive production function, there is no strategic interaction between e and e_f. With more general specifications, there will be strategic interdependence and here the practice is to assume a noncooperative solution such as Nash.

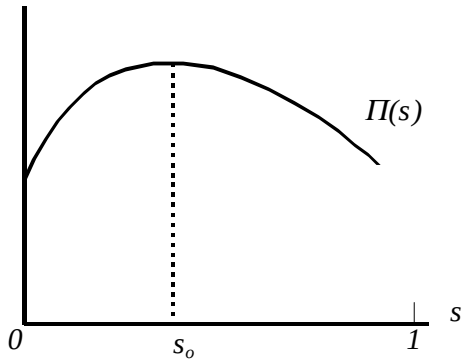

Figure 1: Equity Share Distribution

In reduced-form, let $\bar{\Pi}(p) = \underset{s}{\text{argmax}}\ \Pi$ denote the joint surplus. Applying the envolop property to (3), we obtain the following comparative statics

$$\frac{d\bar{\Pi}}{dp} = x + p(1+b)s(1-s). \tag{6}$$

Note that the first term is the standard envelope term – the slope of the indirect profit function is the supply function. The second positive term is the new element and it arises because an increase in the product price 'eases' the compatibility constraint facing both parties and improves the internal efficiency of the firm. This will aid us in understanding the effect of protection on welfare.

We assume that the firms engage in a one-shot Nash bargaining in dividing the surplus. Let α denote the relative bargaining power of the LF. Then, effectively, $\alpha \ln \Omega + (1-\alpha) \ln \Omega_f$ is maximized with respect to T. The resulting net payoffs are $\alpha\bar{\Pi}(\cdot)$ and $(1-\alpha)\bar{\Pi}(\cdot)$ respectively for the LF and the MNF.

3 Policy Implications

We are now ready to examine the effects of host country's policies.

Foreign Equity Cap

This restriction is of the form, $s \geq \underline{s} > 0$ and easiest to analyze. Turn to Figure 1. If $\underline{s} \leq s_o$, it is obviously not binding. If $\underline{s} > s_o$, it is binding. The joint surplus falls. However, in view of (2), the output increases since the LF is more efficient in providing the input. The net payoff of each firm – proportional to the joint surplus – declines however.

Particularly interesting, this restriction entitles a higher share of profits to the LF but *lowers* its net payoff. The key to understanding this result is that the share distribution in a JV is *not* a distributive instrument; it is an incentive mechanism toward internal efficiency.

As usual, let social welfare be defined as the sum of (a) consumer surplus, (b) LF's net pay off, (c) profits of other domestic firms and (d) net revenues. Clearly, (d) is zero here and there is no change in (a) or (c). However, as the LF's net payoff falls, social welfare declines. We then have our first proposition.

Proposition 1: A foreign equity share cap that is restrictive results in more output by the international JV, but implies less net payoffs to both firms and less welfare for the host country.

We should however remark that our model treats equity sharing as an efficiency variable only. In reality however, the 'control' of a JV is tied to equity sharing, and control may entail some profit-shifting. If so, equity sharing may be both an efficiency and a distributive variable, possibly implying some rationale for a policy of foreign equity share cap.

Note that so far we assume that the MNF is an active partner. If it were a passive partner

($b = 0$), output expansion by the international JV would be higher, but Proposition 1 would continue to hold.

3.1 Protection

Consider a protective policy through an industry-wide production subsidy for example. Assume that it is committed in the sense that it does not react, ex post, to the equity allocation. In other words, firms decide on equity allocation, taking the protective policy as exogenous. Define $p = 1 + \mu$, where μ is the specific subsidy and foreign price is normalized to one. From (4), it follows immediately that such a policy implies a higher share of the LF. The LF being more risk-averse, an increase in the producer price eases the incentive compatibility constraint arising from its moral hazard problem more than from the moral hazard problem facing the MNF. Joint surplus maximization therefore implies a higher share be allocated to the LF. Turning to (2), we see that the output of the venture increases on two accounts. First, at given s, both firms tend to supply more of the variable input. Second, at given producer price, a higher s increases output since the LF is more efficient in providing the variable input.

We now examine the effect on welfare. Recall that in the standard competitive-industry situation, a production subsidy entails no first-order welfare loss or gain and a second-order production loss. The same second-order deadweight loss is present here too. However, there are two sources of first-order effects. First, because a part of the joint surplus goes to a foreign firm, a subsidy to the venture, ceteris paribus, is not just an internal transfer. There is a leakage – a source of welfare loss. Second, a protection through a higher producer price enhances the internal efficiency of the firm; insofar as it increases the net payoff of the LF, there is a welfare gain. We now formalize these concepts.

Write social welfare as:

$$W = B + \alpha\bar{\Pi}(1+\mu) + \Pi_r(1+\mu) - \mu(x + x_r). \tag{7}$$

Recall that α is the relative bargaining power of the LF. B is the consumer surplus (which remains unchanged) and Π_r and x_r denote profits and output by other domestic firms in the market. By the standard envelope property, $\partial\Pi_r/\partial\mu = x_r$. Using this as well as (6), the effect of a marginal production subsidy is given by

$$\left.\frac{dW}{d\mu}\right|_{\mu=o} = \alpha x + \alpha p(1+b)s(1-s) - x \tag{8}$$

$$= -(1-\alpha)x + \alpha p(1+b)s(1-s) \tag{9}$$

$$= -(1-\alpha)[s + b(1-s)] + \alpha(1+b)s(1-s). \tag{10}$$

The first term and the second term of (9) respectively represent the leakage loss and the internal-efficiency gain.

Quite intuitively, we see that if $\alpha \simeq 0$, the efficiency gain to the JV does not translate into a significant increase in the net payoff to the LF. Hence the leakage effect dominates. If $\alpha \simeq 1$, the leakage effect is close to zero and hence there is a net gain in welfare. In general, we see in (10) that $s + b(1-s) > (1+b)s(1-s)$. Thus, in the neutral case of equal bargaining power, there is a first-order welfare loss due to a production subsidy. Hence

Proposition 2: An increase in protection leads to a higher equity share to the host firm. There are two first-order welfare effects of protection: a leakage loss and an internal-efficiency gain. As long as the MNF has no less bargaining power than does the LF, the leakage loss outweighs the

internal-efficiency gain and hence there is a first-order net welfare loss from protection. If the bargaining power of the LF is sufficiently higher than the MNF's, there is first-order net welfare gain from protection.

Discriminatory Tax on Foreign Income

Let τ denote such a tax and for notational simplicity, let the product price be normalized to unity. The expression for the net payoff of the LF, at any given s, remains the same as before. That of the MNF changes to $\Omega_f = (1-\tau)(1-s)(e+e_f) - e_f^2/(2b) + T$. The resulting 'effort supply functions' and output functions are:

$$e = s; \quad e_f = b(1-\tau)(1-s); \quad x(s,\tau) = s + b(1-\tau)(1-s). \tag{11}$$

Thus an increase in τ motivates the MNF to supply less of the variable input, and, consequently, the equilibrium output of venture is less at any given s. The joint surplus as function of s and τ is expressed as:

$$\pi(s,\tau) \equiv [s + (1-s)(1-\tau)][s + b(1-\tau)(1-s)] - \frac{(1+R)s^2}{2} - \frac{b}{2}(1-s)^2(1-\tau)^2. \tag{12}$$

Unlike when $\tau = 0$, this is not however a strictly concave function in s in (0,1). Thus, in general, the case of full share to the LF cannot be ruled out. However, we will be concerned with the effects of a marginal tax, in which case there is an interior solution of s given by

$$s_o = \frac{(1+\tau b)(1-\tau)}{1+R+b(1-\tau)^2+2b\tau(1-\tau)-2\tau}. \tag{13}$$

We begin by observing that

$$\left.\frac{\partial s_o}{\partial \tau}\right|_{\tau=0} = \frac{2-(1-b)(1+R+b)}{(1+R+b)^2} \gtrless 0.$$

An increase in foreign income tax would motivate the venture to reduce the tax incidence and hence protect the joint surplus by allocating more equity share to the LF. This is the tax-incidence effect. There is also an output effect: an increase in τ would induce the MNF to provide less of the variable input, hence less output and joint surplus. This effect also implies a higher share to the LF. The magnitude of this effect is positively related to the efficiency of the MNF. Third, there is the risk-cost effect: the LF being risk-averse, allocating a higher share to this firm would increase its risk-cost and hence tend to lower the joint surplus. In summary, there are these three effects; the first two tend to push equity allocation toward the LF and the last one away from it. Hence it follows that if the degree of risk-aversion by the LF is low enough ($R \leq 1$), then an increase in τ would increase the share of the LF. If $R > 1$ and sufficiently high in magnitude and the efficiency of the MNF (b) is low enough, then the risk-cost effect is large and the output effect is small, with the implication that the risk-cost effect outweighs the sum of the tax-incidence effect and the output effect. As a result, the equity share allocation to the LF will, paradoxically, be less. In view of (13), the precise condition for this outcome is that

$$R > \frac{1+b^2}{1-b}. \tag{14}$$

How does such a tax affect social welfare? Consumer surplus and profits of other domestic firms are unaffected. By virtue of the envelope property, the change in the joint surplus is given

by $-(1-s)[s+b(1-\tau+s\tau)]$. At $\tau=0$, this reduces to $-(1-s)(s+b)$ and the net payoff of the LF to α times this expression. Revenues are equal to $\tau(1-s)x(\cdot)$. Hence $d[\tau(1-s)x(\cdot)]/d\tau|_{\tau=0} = (1-s)x(\cdot) = (1-s)[s+b(1-s)]$. Then

$$\left.\frac{dW}{d\tau}\right|_{\tau=0} = (1-s)[s(1-\alpha)+b(1-s-\alpha)].$$

The closed-form solution of s is already given in (13). Upon

substitution and rearrangement, it follows that

$$\left.\frac{dW}{d\tau}\right|_{\tau=0} \gtreqless 0 \quad \text{as} \quad \alpha \lesseqgtr \frac{1+b(R+b)}{1+b(1+R+b)}.$$

Therefore, whether a discriminatory tax is welfare-improving or worsening depends on the bargaining powers. If $\alpha=0$, there is only the revenue motive, and, tax improves welfare. If $\alpha=1$, a tax on the MNF only accentuates the internal inefficiency of the firm, lowers the LF's net payoff and welfare. In summary

Proposition 3: A marginal, discriminatory tax on foreign income increases or decreases the equity share of the LF as the degree of risk-aversion falls short of or exceeds a critical value. Domestic welfare increases or decreases as the relative bargaining power of the LF falls short of or is above a critical value.

Domestic Resource Requirement Restriction

Foreign enterprises in developing countries are subject to various quantity restrictions such as domestic content or employment requirements. A meaningful analysis of these regulations would, however, have to abandon our assumption that other inputs (than e and e_f) – local, foreign or both – are used in fixed proportion to output. The common element between these two regulations is that the employment of some domestic resource be greater than what the enterprise would (otherwise) choose in equilibrium. In what follows, we extend our analysis and introduce a third variable factor L and interpret as a domestic resource and examine the implications of a regulation, namely, $L \geq \underline{L} \geq L_o$ where $\underline{L}$ and L_o denote respectively the miminum required level of employment by the international JV and the unrestricted level of employment in equilibrium. This is called the domestic resource requirement restriction.[4] "Surprising" implications of such a regulation are that it may *enhance* the joint net surplus of the venture, the net surplus of the LF firm and hence welfare of the host country; they improve unambigously if such a regulation is marginal, i.e., if $|\underline{L} - L_o|$ is not large.

Instead of our earlier production function, let $x = (e + e_f)^{\alpha} L^{1-\alpha}$, where $0 < \alpha < 1$, and let w be its unit cost of L. As before, the share parameter and the lump-sum transfer are determined in the first stage and effort inputs in the second. In addition, we suppose that either the MNF and LF chooses the employment input L in the second stage; it does not make any difference which of the two parties makes this choice. For tractability we assume that the LF is risk-neutral also, i.e., $R = 0$. All other assumptions remain unchanged.

To begin with, we analyze the behavior of the JV without any regulation. The accounting profits are now $P(e + e_f)^{\alpha} L^{1-\alpha} - wL$. The first order conditions of individual net-payoff maximization

[4]Domestic content requirement would, more appropriately, require still another set of factors of production, namely, foreign inputs.

conditions in stage two are then:

$$\alpha s P(e+e_f)^{\alpha-1}L^{1-\alpha} = e; \quad \alpha(1-s)P(e+e_f)^{\alpha-1}L^{1-\alpha} = \frac{e_f}{b} \tag{15}$$

$$(1-\alpha)P(e+e_f)^{\alpha}L^{-\alpha} = w. \tag{16}$$

The first two equations in (15) are analogs of eqs. (1). The last one is the resource employment choice rule. Note that this is independent of the share parameter and thus independent of who decides it, because, the resource costs are part of the accounting profits and hence are 'common' to both parties. Solving these, we have

$$L \equiv L(s) = \frac{\alpha(1-\alpha)^{(2-\alpha)/\alpha}P^{2/\alpha}[s+b(1-s)]}{w^{(2-\alpha)/\alpha}} \tag{17}$$

$$e \equiv e(s, L(\cdot)) = \frac{s(\alpha P)^{1/(2-\alpha)}}{[s+b(1-s)]^{(1-\alpha)/(2-\alpha)}}L^{(1-\alpha)/(2-\alpha)} \tag{18}$$

$$e_f \equiv e_f(s, L(\cdot)) = \frac{b(1-s)(\alpha P)^{1/(2-\alpha)}}{[s+b(1-s)]^{(1-\alpha)/(2-\alpha)}}L^{(1-\alpha)/(2-\alpha)}. \tag{19}$$

Notice that $L'(s) > 0$, because the LF is more efficient in supplying the effort input, and effort and labor are complementary inputs. Eqs. (18) and (19) spell the 'conditional' input demand functions, derived from (15) only, not using (16).[5] For later use,

$$\frac{\partial e}{\partial s} = e\left[\frac{1}{s} - \frac{1-\alpha}{2-\alpha}\cdot\frac{1-b}{s+b(1-s)}\right] > 0; \quad \frac{\partial e_f}{\partial s} = -e_f\left[\frac{1}{1-s} + \frac{1-\alpha}{2-\alpha}\cdot\frac{1-b}{s+b(1-s)}\right] < 0. \tag{20}$$

[5]Substititution of (17) into (18) and (19) would give unconditional closed-form solutions of e and e_f, but these are not necessary.

Given $L(s)$, $e(s, L(\cdot))$ and $e_f(s, L(\cdot))$ functions, we can express the joint net payoff as

$$\begin{aligned}\pi &= [e(\cdot) + e_f(\cdot)]^{\alpha}[L(\cdot)]^{1-\alpha} - wL(\cdot) - \frac{[e(\cdot)]^2]}{2} - \frac{[e_f(\cdot)]^2]}{2} \\ &\equiv \tilde{\pi}[L(s), e(s, L(s), e_f(s, L(s))] \\ &\equiv \bar{\pi}(s, L(s)).\end{aligned}$$

By using the stage-two rules for the choices of e, e_f and L, we have

$$\frac{\partial \tilde{\pi}}{\partial e} = \frac{e(1-s)}{s}; \quad \frac{\partial \tilde{\pi}}{\partial e_f} = \frac{e_f s}{b(1-s)}; \quad \frac{\partial \tilde{\pi}}{\partial L} = 0. \tag{21}$$

In stage one, π is maximized with respect to s and the first order condition is:

$$\frac{\partial \bar{\pi}}{\partial s} + \frac{\partial \bar{\pi}}{\partial L} L'(s) = 0. \tag{22}$$

Substituting (20) and the partials of the $\tilde{\pi}$ function, we obtain

$$\begin{aligned}\frac{\partial \bar{\pi}}{\partial s} &= \frac{e(1-s)}{s}\frac{\partial e}{\partial s} + \frac{e_f s}{b(1-s)}\frac{\partial e_f}{\partial s} \\ &= \frac{(\alpha P)^{2/(2-\alpha)} L^{2(1-\alpha)/(2-\alpha)} s(1-s)}{[s + b(1-s)]^{2(1-\alpha)/(2-\alpha)}} \left\{ \frac{1}{s} - \frac{b}{1-s} - \frac{(1-\alpha)(1-b^2)}{(2-\alpha)[s + b(1-s)]} \right\} \qquad (23) \\ \frac{\partial \bar{\pi}}{\partial L} &= \frac{e(1-s)}{s}\frac{\partial e}{\partial L} + \frac{e_f s}{b(1-s)}\frac{\partial e_f}{\partial L} \\ &= \frac{(1+b)(1-\alpha)}{(2-\alpha)L^{\alpha/(2-\alpha)}} \cdot \frac{s(1-s)}{[s + b(1-s)]^{2(1-\alpha)/(2-\alpha)}} > 0. \qquad (24)\end{aligned}$$

In view of these expressions, it is easy to see that the l.h.s. of (22) is positive and negative respectively at $s = 0$ and at $s = 1$. Thus a solution the eq. (22) exists in the open interval (0,1).

Using (23), (24) and that $L'(s)$ is independent of s, it will be convinient to define two functions:

$$\frac{[s+b(1-s)]^{2(1-\alpha)/(2-\alpha)}}{s(1-s)L^{2(1-\alpha)/(2-\alpha)}}\frac{\partial\bar{\pi}}{\partial s} \equiv f(s); \quad \frac{[s+b(1-s)]^{2(1-\alpha)/(2-\alpha)}}{s(1-s)L^{2(1-\alpha)/(2-\alpha)}}\frac{\partial\bar{\pi}}{\partial L}L'(s) \equiv g(L(s))$$

and express the first order condition (22) equivalently as

$$f(s) + g(L(s)) = 0. \tag{25}$$

It is straightforward to derive that both $f(s)$ and $g(L(s))$ are decreasing in s. Hence there is a unique solution and the second-order condition is met. Let s_o denote the equilibrium share allocation.

Note that, in equilibrium, $f(s) < 0$, or, equivalently, $\partial\bar{\pi}/\partial s < 0$, i.e., there is "excess" equity allocation to the LF. The reason is that because of moral hazard problems and noncooperative behavior, there is "underuse" of effort inputs (because the effective product price facing the LF and MNF are Ps and $P(1-s)$ respectively, not P. Hence, in the presence of a third input, an increase in s tends to increase $e + e_f$ (as the LF is more efficient in providing the effort input) at given L, thereby raise the marginal product of L, which, in turn, induces more employment of L and induces the firms to supply more of e and e_f. This enhances the joint net payoff of the venture (i.e. $g(L(s)) > 0$) – since there is underuse of the resource input – and explains why excess equity allocation to the LF is the equilibrium outcome. Put differently, there is one instrument – that is, equity allocation – and two objectives: (a) balancing between two moral hazard problems facing the two firms and (b) increasing the use of the joint effort input $e + e_f$ through influencing the employment of the third factor. The effect of an increase in s on the joint net payoff through (b) being positive, 'excess' share is allocated to the (more efficient) LF.

The solution of s_o is illustrated in Figure 2, which will prove useful in evaluating the effect of

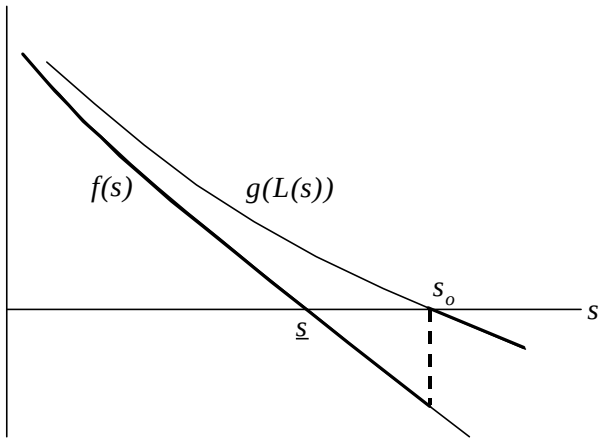

Figure 2: Optimal Share Distribution Without Domestic Resource Requirement Restriction

domestic resource requirement regulation below. It graphs the function $f(s)$, as well as the function $f(s) + g(L(s))$ – the l.h.s. of the first order contion (25). The intersection of the latter with the horizontal axis determines the solution point s_o. (Ignore for now the partly heavy marking of the two lines, dashed vertical line at s_o and the point $\underline{s}$.) Let L_o mark the associated level of domestic resource employment. This completes characterization of the international JV without regulations.

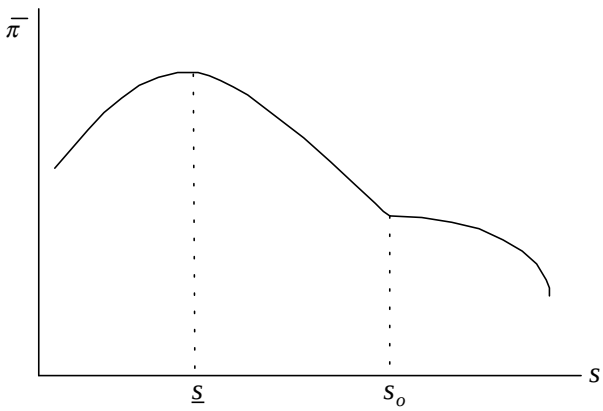

Figure 3: Joint Net Payoff Function under Domestic Resource Requirement Restriction When $L = L_o$

We are now ready to analyze the restriction. Consider first a marginal regulation, i.e., a quantity constraint $\underline{L} \geq L_o$. As L is an increasing function of s in the unrestricted case, in terms of Figure

2, this constraint is binding – i.e. $L'(s) = 0$ – in the range 0 to s_o; hence, the marginal effect of s on $\bar{\pi}$ is given by the $f(s)$ line only. For higher values of s, the constraint is not binding, and, as before, the line $f(s) + g(L(s))$ represent the marginal effect of s. The heavy line with discontinuity at s_o is then the new "marginal effect" schedule. In turn, this implies a profit function of the kind shown in Figure 3. It is seen that a point such as $\underline{s}$ is the solution, i.e., the equity share of the LF falls, and, "paradoxically", the joint net payoff the venture is *higher*! A smaller equity share is allocated to the LF, because, when the constraint is binding, there is no scope to 'burden' the equity-share instrument to improve the overall use of the effort input – i.e., the 'excess' allocation of equity share to the LF is eliminated. By 'freeing' s from this burden, the regulation enables the venture to reap a higher joint net surplus.[6]

It follows immediately that the LF's net payoff increases too (despite its having a lower equity share) and hence a marginal domestic resource requirement restriction is welfare improving to the host country.

Moreover, note that a decrease in s implies that a lower level of $e + e_f$ and lower value of the marginal product of L. This is less than w and therefore the original level of the domestic resource L_o constitutes an 'over-employment'.

Consider next an increase in the domestic resource requirement from $\underline{L} = L_o$. It has different implications however. Under this constraint, the first order condition is:

$$f(s) = \frac{1}{s} - \frac{b}{1-s} - \frac{(1-\alpha)(1-b^2)}{(2-\alpha)[s + b(1-s)]} = 0, \tag{26}$$

which is independent of L. This is because an increase in L raises proportionately the marginal effect of e and e_f on joint net payoff. The implication is that an incremental domestic resource

[6]In terms of the result, this is similar to the profit enhancing effect of VER under oligopoly competition as in Harris (1985) and Krishna (1989). But the rationale is quite different.

requirement regulation leaves the equity distribution unchanged. How does this affect the joint net payoff of the venture? Instead of $\bar{\pi}(s, L(s))$, we have $\bar{\pi}(s, \underline{L})$, where, by the envelope property,

$$\frac{d\bar{\pi}}{d\underline{L}} = \underbrace{\frac{e(1-s)}{s}\frac{\partial e}{\partial L} + \frac{e_f s}{b(1-s)}\frac{\partial e_f}{\partial L}}_{+} + \underbrace{(1-\alpha)(e+e_f)^{\alpha}L_o^{-\alpha} - w}_{-} \gtreqless 0. \tag{27}$$

By encouraging more effort from both the LF and the MNF, the increase in $\underline{L}$ tends to raise the joint net surplus. On the other hand, as noted earlier, there is over-employment of L (in that the value of the marginal product of L falls short of its price); thus an increase in $\underline{L}$ tends to push down the joint net surplus also. The overall effect is thus ambiguous, and, consequently, the welfare of the host country may improve or deteriorate. Combining the effects of a marginal domestic resource requirement restriction, compared to no regulation, and those of an increase in the requirement, we obtain the following proposition.

Proposition 4: A domestic resource requirement regulation, compared to no regulation, leads to a reallocation of equity share distribution in favor of the MNF. The joint net surplus of the venture and the welfare of the host country are higher if the $|\underline{L} - L_o|$ is not large; otherwise, they may be higher or less (compared to no regulation).

4 Summary and Concluding Remarks

It is well-known that productive activity in the modern world economy is becoming increasingly global. Not only a firm located in a single country uses inputs from various countries and different components are produced in various countries in different stages of production, the ownership of firms is also globally distributed. This paper deals with the last aspect just mentioned.

This paper has specifically examined, in the light of the modern contract theory, the implications of host-country policies in the presence of international joint ventures. This theory holds that, in

the presence of moral hazard, equity sharing is an instrument of extracting efficiency; it is *not* a distributive variable. Distribution of profits is attained through a lump-sum transfer and is determined fundamentally by the relative bargaining strengths. Our policy conclusions are guided by these principles as well as difference in risk-attitudes. A policy of a foreign equity cap hurts welfare by *reducing* the net payoff of the local firm. Trade protection has two first-order effects on welfare: a loss due to leakage of profits since there is foreign ownership and a *gain* since it ameliorates the internal inefficiency arising from the moral hazard problem. Also, an increase in protection implies a higher equity share of the local firm. A discriminatory tax on foreign income may or may not imply a higher equity share of the local firm. Its effects on welfare depends on the relative bargaining strength of the firms. Interestingly, a marginal quantity restriction such as a domestic resource requirement regulation, compared to no regulation, is shown to unambiguously increase the joint net payoff of the venture and thereby the net payoff of the local firm and the welfare of the host country.

Most of the positive and normative analysis of FDI assume that this is channelled through wholly owned subsidiaries. However, for reasons discussed in the Introduction, international JVs are likely to be an important – sometimes dominant – mode of FDI in "emerging markets" of many developing countries. Therefore, the analysis of this paper (hopefully) improves our understanding of FDI policy implications in host countries.

Needless to say, there are avenues for further exploration. For example, we have abstracted from market power. Multinational firms face many informational problems in emerging markets and one rationale for forming international alliance is to minimize these problems. Also, we have looked at policies from the host-country's perspective, not the source country. Relaxation of these assumptions is likely to yield non-obvious policy conclusions.

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