Proof not intended for publication - see footnote 6

(Do we need handshakes to cooperate in buyer-supplier relationships? José de Sousa and Xavier Fairise. July 2009)

Proposition 1 Under Assumptions (1) to (6), the first-best outcome can be implemented as a subgame-perfect equilibrium, if parties can commit not to renegotiate their initial contract.

Proof Consider that the second stage of the game determines the optimal quantity:

\[ q^* = q^*(a, j_b, j_s), \]

and the following payment function:

\[ t(a, j_b, j_s) = v(q^*, j_b, j_s) - \Pi(a^*, j_b, j_s^*) + T, \]

with \( T \) a constant. The monetary transfer from the buyer to the seller is contingent on the buyer’s specific investments. This payment function ensures the seller’s participation to the cooperative outcome of the game. At the first stage, objectives to be maximized are:

- for the buyer:

\[ U_b = v(q^*, j_b, j_s) - t(a, j_b, j_s) - j_b, \]

\[ = \Pi(a^*, j_b, j_s^*) - T - j_b. \]

Therefore, the first order condition is:

\[ \frac{\partial U_b}{\partial j_b} = \Pi_2(a^*, j_b^*, j_s^*) - 1 = 0. \] (1)

- for the seller:

\[ U_s = t(a, j_b, j_s) - c(q, a, j_b, j_s) - j_b, \]

\[ = v(q^*, j_b, j_s) - c(q, a, j_b, j_s) - \Pi(a^*, j_b, j_s^*) + T - a - j_s. \]

Therefore, the first order conditions are:

\[ \frac{\partial U_s}{\partial a} = c_2(q^*, a^*, j_b^*, j_s^*) - 1 = 0, \] (2)

\[ \frac{\partial U_s}{\partial j_s} = v_3(q^*, j_b^*, j_s^*) - c_4(q^*, a^*, j_b^*, j_s^*) - 1 = 0. \] (3)
The system of equations (1) to (3) determines the first-best outcome. Thus, the unbreakable fixed-price contract allows to implement the optimal investments \((a^*, j_b^*, j_s^*)\).

The interpretation of this result is quite simple. When committing not to renegotiate the initial contract, the threatpoint deters parties from lying. Then, with an appropriate revelation mechanism, parties truthfully report their types and the first-best outcome can be implemented. Consequently, without renegotiation, the non-verifiability of some variables is not a sufficient condition to induce contractual problems.