I. OUTSOURCING AND THE BOUNDARY OF THE MULTINATIONAL FIRM

A. Outsourcing, Relationship-Specific Investment, and the Product Cycle

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Outsourcing and Offshoring

- When the literature on "outsourcing" began, the term referred to purchasing an input from outside the country. Whether this meant purchase from inside or outside the firm was not specified.

- Recently, the international trade literature on purchasing inputs from abroad has been merging with the "make or buy" industrial organization literature. Pol Antràs has been one of the leading economists in this effort.

- To distinguish outside the firm from outside the country, the latter has been relabeled "offshoring" and the former is now called "outsourcing."

The product cycle

- As originally described by Vernon (1966), the product cycle dealt with both offshoring and outsourcing, though not necessarily of inputs.

- Offshoring came first, as standardization diminished the need for proximity to customers. Outsourcing came later, if ever, as foreign firms learned the technology and the new product became "old."

- The model of Antràs is the first to incorporate offshoring and outsourcing as separate decisions. Another key difference between his model and earlier models is that the "Northern" firm is involved in both the offshoring and outsourcing decisions, rather than these being out of its control because undertaken by a competitor.

A partial equilibrium model of the product cycle

- All of the important ideas in the Antràs model are in the partial equilibrium version. The general equilibrium version is available in a working paper (Antràs 2004)
- Two countries, North and South
- One good, y
- One primary factor, labor
- Exogenously given wages , w^N and w^S
- Isoelastic demand, $y = \lambda p^{-1/(1-\alpha)}$, $0 < \alpha < 1$, λ a given parameter

A product cycle model with continuing Northern participation in Southern production

- A Research Center in the North and a Manufacturer respectively contribute high-tech input x_h and low-tech input x_l to a Cobb-Douglas production function for y with exponents $1-z$ and z. These are produced using labor and are useless outside the relationship.

- The Research Center can contract on quality of x_l only if Manufacturer is in North. Hiring Manufacturer in South therefore leads to "holdup problem," which gives rise to suboptimal relationship-specific investments by the parties.

- In choosing between domestic and overseas manufacturing, Research Center therefore faces trade-off between lower costs of Southern manufacturing and higher incomplete-contracting distortions associated with it.

Tradeoff changes as product becomes standardized

- It is assumed that z increases with time (standardization)

- When the good is new and unstandardized, Southern production is very unattractive because it bears the full cost of incomplete contracting, with little benefit from the lower wage in the South.

- When the good is mature and requires very little product development, the benefits from lower wages in the South fare much better against the distortions from incomplete contracting.

- If the Southern wage is low enough, the good is manufactured in the South: the product cycle.

A role for multinational corporations

- As in Grossman and Hart (1986), associate ownership with the entitlement of some residual rights of control: in this case, which party gets to keep output if relationship breaks down.

- When parties undertake noncontractible, relationship-specific investments, the allocation of these residual rights has a critical effect on each party's ex post outside option, which in turn determines each party's ex ante incentives to invest.

- Ex ante efficiency (i.e., transaction-cost minimization) is shown to dictate that residual rights be controlled by the party whose investment contributes most to the value of the relationship.

- In terms of the model, the attractiveness of integrating the transfer of production to the South for a Northern product development manager is shown to be increasing in the output elasticity of product development, and thus decreasing in the maturity of the good at the time of the transfer.

A role for multinational corporations (continued)

- If the maturity at which manufacturing is shifted to the South is low enough, production will be transferred internally to a wholly owned foreign affiliate in the South, and the Northern firm will become a multinational firm.

- In such case, only at a later stage in the product's life cycle will the product development manager find it optimal to give away the residual rights of control and assign assembly to an independent subcontractor in the South, an arrangement that is analogous to the Northern firm licensing its technology (high-tech input).

- For a higher maturity of the good at the time of the transfer, the model predicts that the transfer to the South will occur directly at arm's length and multinationals will not arise.

Manufacturing by an independent plant in the North

- The two parties can write an ex ante quality-contingent contract that will not be renegotiated ex post. The initial contract stipulates production of good-quality inputs in an amount that maximizes the research center's ex ante profits

- This can be shown to yield $p^N(z) = w^N/\alpha$, since the Cobb-Douglas cost function with w^N as price of both inputs yields unit cost = w^N

Noncontractibility

- It is assumed that only when both inputs are produced in the same country can an outside party distinguish between a good-quality and a bad-quality intermediate input.

- Hence, the manager of the research center and that of a Southern manufacturing plant cannot sign an enforceable contract specifying the purchase of a certain type of intermediate input for a certain price. If they did, the party receiving a positive payment would have an incentive to produce the bad-quality input at negligible cost.

- It is equally assumed that no outside party can verify the amount of ex ante investments in labor. If these were verifiable, the managers could contract on them, and the cost-reducing benefit of producing a bad-quality input would disappear. For the same reason, it is assumed that the parties cannot write contracts contingent on the volume of sale revenues obtained when the final good is sold.

Bargaining

- Important to assume no firm is cash-constrained ("transferable utility") so that parties bargain over division of maximized joint profits

- Specifically, when the low-tech input is produced by a plant in the South, no enforceable contract will be signed ex ante and the two parties will bargain over the surplus of the relationship after the inputs have been produced.

- At this point, the quality of the inputs is observable to both parties and thus the costless bargaining will yield an ex post efficient outcome.

- Model this ex post bargaining as a Symmetric Nash Bargaining game in which the parties share equally the ex post gains from trade.

- Because the inputs are tailored specifically to the other party in the transaction, if the two parties fail to agree on a division of the surplus, both are left with nothing.

Bargaining over revenue R

	Outsourcing (separate firms)	Insourcing (vertical integration)
Disagreement: Research Center	0	$\delta^\alpha R$
Disagreement: Manufacturer	0	0
Agreement: Research Center	$(1/2)R + 0$	$(1/2)(1-\delta^\alpha)R + \delta^\alpha R$
Agreement: Manufacturer	$(1/2)R + 0$	$(1/2)(1-\delta^\alpha)R + 0$
Objective: Research Center	Max $(1/2)R - w^N x_h$	Max $(1/2)(1+\delta^\alpha)R - w^N x_h$
Objective: Manufacturer	Max $(1/2)R - w^S x_l$	Max $(1/2)(1-\delta^\alpha)R - w^S x_l$
Equilibrium price	$2(w^N)^{1-z}(w^S)^z/\alpha$	$\dfrac{2(w^N)^{1-z}(w^S)^z}{\alpha(1+\delta^\alpha)^{1-z}(1-\delta^\alpha)^z}$

Intuition for equilibrium price

- If parties could write complete contracts in international transactions, the research center would instead set a price equal to $(w^N)^{1-z}(w^S)^z/\alpha$

- The overinflated price reflects the distortions arising from incomplete contracting. Intuitively, the parties will tend to underinvest in x_h *and* x_l because in the ex post bargaining they fail to capture the full marginal return to their investments.

- As a result, output will tend to be suboptimal and the move along the demand function will also be reflected in an inefficiently high price.

- As z increases, the advantage of hiring the Southern manufacturer increases, eventually dominating the inefficiency from incomplete contracting: a product cycle!

Vertical integration

- The research center is now given the option of vertically integrating the manufacturing plant and, in the case of Southern assembly, of thus becoming a multinational firm.

- Following the property rights approach of the theory of firm, vertical integration has the benefit of strengthening the ex post bargaining power of the integrating party (the research center), but the cost of reducing the ex post bargaining power of the integrated party (the manufacturing plant).

- In particular, by integrating the production of the low-tech input, the manager of the manufacturing plant becomes an employee of the research center manager. This implies that if the manufacturing plant manager refuses to trade after the sunk costs have been incurred, the research center manager now has the option of firing the overseas manager and seizing the amount of x_l produced.

Surplus from agreement
under vertical integration

- If there were no costs associated with firing the manufacturing plant manager, there would be no surplus to bargain over after production, and the manufacturing plant manager would ex ante optimally set $x_I = 0$ (which of course would imply $y = 0$). In that case, integration would never be chosen.

- To make things more interesting, assume that firing the manufacturing plant manager results in a negative productivity shock that leads to a loss of a fraction $1 - \delta$ of final-good production.

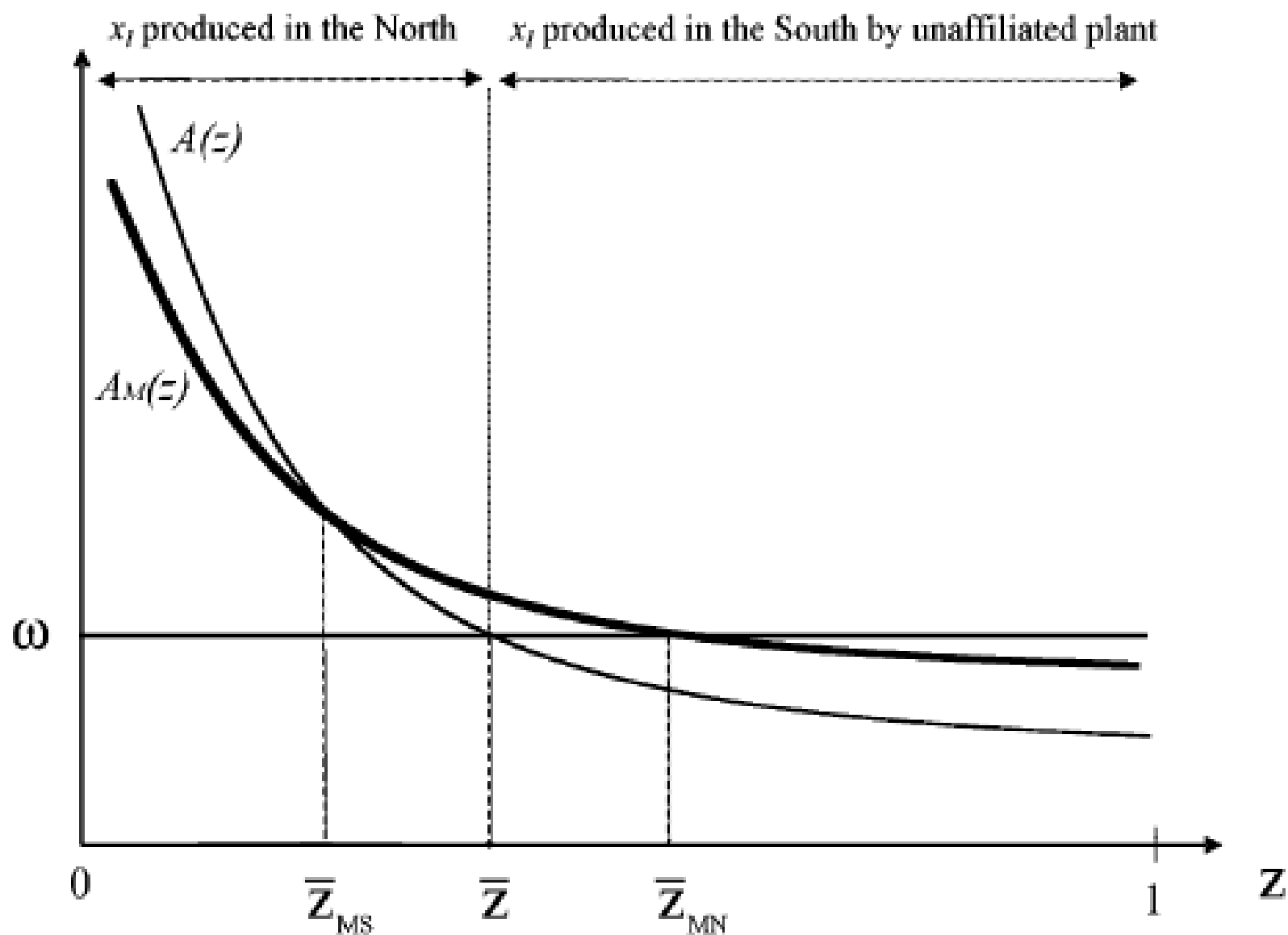- This translates into sales revenues of $\delta^\alpha R$

The role of multinationals in the product cycle

- If production of the final good requires mostly product development (i.e., z is low), the investment made by the manufacturing plant manager will be relatively small, and thus it will be optimal to assign the residual rights of control to the research center.

- Conversely, when the low-tech input is important in production, the research center will optimally choose to tilt the bargaining power in favor of the manufacturing plant by giving away these same residual rights.

- Bottom line: increasing z favors shifting production to the South. If this happens *before* outsourcing becomes optimal, Southern manufacturing occurs in the subsidiary of a Northern multinational.
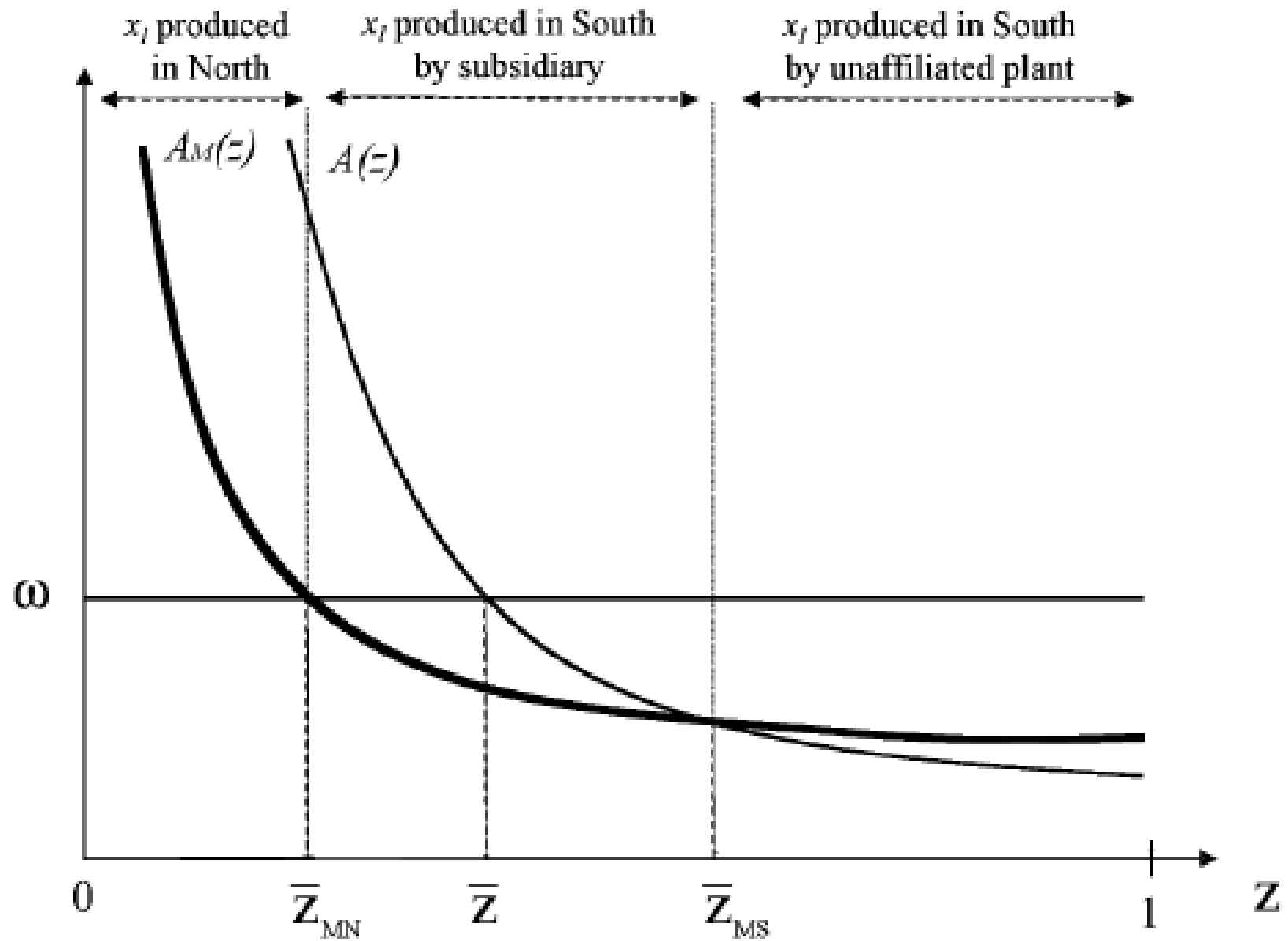
Formalizing the argument

- Antràs formalizes the last point by using the ratio of Research Center profits with Northern manufacturing to Research Center profits with Southern manufacturing to develop two decreasing functions, $A(z)$ and $A_M(z)$. The first reflects relative profitability when the Southern plant is unaffiliated and the second reflects relative profitability when the Southern plant is a multinational subsidiary. The second function decreases less steeply (see Bargaining table)

- The higher is the ratio of the Northern to the Southern wage, the more likely it is that the profit from Northern manufacture is less than the profit from Southern manufacture

- This translates into the following conditions for transfer of production from the North to the South: $A(z) \leq \omega$ and

  $A_M(z) \leq \omega$, where ω is defined as w^N/w^S

- ω must be such that $A(1) < \omega$, otherwise no demand for Southern labor

(a) An equilibrium without multinationals

x_I produced in the North x_I produced in the South by unaffiliated plant

$A(z)$

$A_M(z)$

ω

0 $\overline{z}_{MS}$ $\overline{z}$ $\overline{z}_{MN}$ 1 z

(b) An equilibrium with multinationals

x_I produced in North x_I produced in South by subsidiary x_I produced in South by unaffiliated plant

$A_M(z)$ $A(z)$

ω

0 $\overline{z}_{MN}$ $\overline{z}$ $\overline{z}_{MS}$ 1 z

Empirical evidence

- The model predicts that the probability of a particular North-South transfer occurring within firm boundaries should be decreasing in the maturity of the product at the time of the transfer. This maturity should in turn be positively correlated with both the age of the product and its speed of standardization, and negatively correlated with its R&D intensity.

- Antràs cites a number of studies that support this prediction. For example, Mansfield and Romeo (1980) analyzed 65 technology transfers by 31 U.S.-based firms in a variety of industries. They found that, on average, U.S.-based firms tended to transfer technologies internally to their subsidiaries within six years of their introduction in the United States. The average lag for technologies that were transferred through licensing or through a joint venture was, instead, 13 years.

An alternative explanation

- An alternative explanation is provided by the "knowledge-capital" model of the firm. This model has been developed most extensively by James Markusen and co-authors.

- According to this model, firms are better able to protect technological secrets when they maintain production in-house. When transferring production abroad to take advantage of lower wages, they face a tradeoff between incurring fixed costs of establishing a subsidiary and protecting their technological lead.

- As a product matures, newer technologies and Northern imitators make its technology less valuable, and it is no longer worth the cost of establishing a subsidiary to protect it.