16
Industrial organization and competitive advantage in multinational industries

A. Michael Spence
Harvard University

Chapter 16. *Mathematical Models in Economics*. MOL Bacharach, MAH Dempster, and JL Enos, eds. University of Oxford (1990).

16

Industrial organization and competitive advantage in multinational industries

A. Michael Spence
Harvard University

Abstract

My purpose in this paper is to outline some of the recent developments in the study of industrial organization and evolution, and of competitive strategy, that are pertinent to the evaluation or assessment of policies whose purpose is to change the pace or direction of industrial development or the relative competitive position of 'domestic' firms in a multinational industry.

1. Introduction

Industries (even concentrated manufacturing industries) are sharply distinguished from each other by their structural characteristics; the latter affect competitive conduct, indeed, even what are the important dimensions of competition – evolution and dynamic performance. That proposition appears at face value to be rather obvious, but it is worth noting that it is inconsistent with studying 'the oligopoly problem', or with basing policy on a sample division of industries into two categories, such as sunrise and sunset.

It is appropriate to ask what accounts for the differences in the relative performance of countries (or firms based in separate countries) in multinational industries. This question has achieved some immediacy because of increased market share, in the United States, and in worldwide markets, achieved by non-US multinationals. Generally, the rate of growth and trade flows (exports and imports) in many industries

This research was supported by the National Science Foundation, the Kennedy School of Government, and the Harvard Business School. The paper is a shortened version of 'Industrial organization, competitive advantage in multinational industries and industrial development policies.' HIER discussion paper, January 1984, which cites the related literature.

exceeds (often by factors of 2 or 3) the rates of growth of domestic output in *any* single country.

One of the lessons of the study of multinational industries is that there are numerous policies that influence them. They include (in no particular order): (1) policies that operate on domestic industry structure (horizontal concentration, vertical integration, specialization), (2) export promotion *and* designation of authorized exporters, (3) import restrictions, (4) restrictions on foreign direct investment flowing in and out of a country, (5) policies affecting inter-firm transfers of technology within the domestic industry and multinationally, including licensing of technology, and the uses and protection of intellectual property, (6) policies that operate on costs or input prices, including interest rates, costs of capital, risk-spreading investment subsidies (including those to R&D), (7) various other features of the tax system, and 8) policies designed to achieve some level of coordination or convergence of expectations among competitors within an industry and with government. The impact of these policy options can be observed in many detailed case studies.

2. The market failure/competitive advantage approach

There are three categories of public sector activity that can be used by governments under certain structural conditions to increase their country's net surplus, profits, and share.

2.1 The strategic use of blocked access to domestic markets

The first category is blocking access to markets in industries with declining average costs. Scale economies of static and dynamic kinds characterize many components of costs. Their importance in a multinational industry is related to three structural features of the industry: the fraction of total costs accounted for by each component; the elasticity of unit costs with respect to volume (or in the case of the learning curve, accumulated volume); and whether the scale economies get truncated at national boundaries, as tends to be the case in marketing and distribution, but not in R&D, and only partially in manufacturing. With respect to those components of cost in which there are substantially negative elasticities of unit cost with respect to volume, access to major markets or market segments is a significant part of establishing a firm's relative cost and competitive position. For example, if the elasticity of unit costs with respect to accumulated volume is 0.32, then costs go down by 20 per cent each time volume doubles. Suppose there are three market areas, A, B and C, representing 40, 30, and

30 per cent, respectively. A firm based in A has the share S_1 in markets A and B (it is excluded from C). Firm 2 has the share S_2 of A, B, and C. The ratio of the unit costs of firm 2 to firm 1 is $(0.7S_1/S_2)^{0.32}$. The unit costs are the same if $S_2 = 1.43S_1$. Alternatively, if $S_1 = S_2 = 25$ per cent, then firm 2 will have an 11 per cent cost disadvantage, a matter of some competitive significance.

R&D is a more complex subject than the sample analysis of scale economies might suggest, but scale economies are a part of the competitive relevance of R&D. The costs of achieving a given rate or level of product development or cost reduction are largely fixed. As a result, the elasticity of unit costs with respect to volume is minus one. Because R&D-induced scale economies tend not to be truncated by national market boundaries, share and market access is particularly important in R&D-intensive multinational industries. If, as is true in the technologically advanced sectors, R&D runs in the range of 10 to 15 per cent of sales, then a relative market share of 0.5 may give rise to a 10 per cent cost disadvantage by itself.[1] While the share of costs is relatively small, the elasticity of unit cost with respect to volume tends to be large (because the costs themselves are insensitive to volume). Thus, in the R&D-intensive industries, there is a premium placed on having access to major markets, to obtain sales against which to amortize the R&D costs.

Blocking of access to a market or sub-market may be needed to acquire a competitive cost position. Once a competitive cost position is achieved, blocked access will not usually be required to maintain a competitive cost position. Thus the access-blocking tactic should be seen in a strategic context as a device for lowering the cost of entry or expansion. The internal rate of return on the entry investment is *raised* by the blocking of access to the domestic market. Note that in industries with significant scale economies, entry is generally responded to vigorously by established firms because of the importance to them of *not* losing share. That response is largely responsible for making the entry costs high. Blocking access blunts or eliminates the response. Further, the net surplus (in present value terms) to the country that does it, *can be* positive.[2]

I should also add that blocking access to a domestic market is not always undertaken for the strategic reasons outlined above. It can be,

---

[1] The relative market share of a firm is the ratio of its share to that of its largest competitor.

[2] Whether the net surplus is positive depends in part on whether, and by how much, blocking access to the domestic market raises prices to domestic consumers for some period of time.

and is, done simply to protect the domestic industry, which, absent the protection, would not survive in the long run. This last form of access control has a positive cost under most conditions for the country that undertakes it. That is to say, the consumers pay a price for the absence of foreign competitors in the domestic market.

It is also true that a policy of blocking access to reduce the entry cost for domestic competitors to allow them to develop a competitive cost position can fail to increase the domestic surplus. It will fail if scale economies are limited. It will also be ineffective if the developing domestic industry exploits the protection, not to expand share to reduce costs, but rather to appropriate the rents (in the form of increased costs) created by the protection from competition. And, finally, if access to foreign markets is blocked as a countermeasure, then the policy may result in the acquisition of a competitive cost position, but not the capacity to export.

2.2 The use of subsidies to shift the equilibrium in an imperfectly competitive market

It is well known that the relative costs of competitors influence their market shares and profitability. It is also true, that if the costs of a subgroup of competitors in an *imperfectly* competitive (i.e. oligopolistic) industry are subsidized, and if there are no countervailing subsidies provided to competitors outside the group, then the profits of the subsidized group *may* increase by more than the gross amount of the subsidy. The increase in profits results not only from the margin increase, but also the increase in market share.

There is then, under certain structural conditions, a potential *net* benefit to be obtained by lowering the costs of domestic competitors in a multinational industry via the subsidization of costs or input prices, but there are some important qualifications.

Suppose there are two countries, 1 and 2. There are n_1 firms in country 1 with marginal cost c_1 (not volume dependent). I will assume here that the elasticity of demand in each country is β. The price in country 1 is p and in country 2 the price is q. The market in country 2 is ϕ times that in country 1. Here ϕ could be any number greater than zero. Country 2 firms have unit cost c_2. It has two kinds of firms: one group is authorized to export, there are m_1 of them; the second group serves the domestic market and there are m_2 of them. The exporting firms receive a subsidy of $(1 - \theta)$ on their costs for exports. All firms receive a subsidy of $(1 - \delta)$ on domestic sales in country 2. Country 1 does not engage in subsidies, or export

restrictions on particular firms; that is, it is passive. The equilibrium in each market is a Nash equilibrium in quantities.

For this analysis, I will focus on the net surplus in country 2 (including the consumer's surplus, the profits on domestic and foreign sales, and the subsidy, counted negatively). The equilibrium in this model is easy to calculate, and the calculations are of no interest. I proceed directly to the results.

The prices in country 1 are

$$p = (n_1 c_1 + m_1 \theta c_2)/(n_1 + m_1 - 1/\beta), \tag{1}$$

and in country 2,

$$q = (n_1 c_1 + (m_1 + m_2)\delta c_2)/(n_1 + m_1 + m_2 - 1/\beta). \tag{2}$$

The *net surplus* for country 2 is

$$T_2 = \left[\phi/(\beta - 1)q^{1-\beta} + \phi(m_1 + m_2)\beta q^{-(1+\beta)}(q - \delta c_2)(q - c_2)\right] + \left[m_1 \beta p^{-(1+\beta)}(p - \theta c_2)(p - c_2)\right]. \tag{3}$$

The two terms in square brackets are the surplus in the domestic market (term 1) and the profits net of subsidies on export sales in country 1 (term 2).

The first thing to note is that these are separable in the sense that m_1 and θ can be set to maximize foreign profits without influencing term 1 at all. In particular, country size, ϕ, is of no relevance with respect to earnings on non-domestic sales. Note that this would not be true if we forced $\theta = \delta$, *or* if we added economies of scale in the form of marginal costs that decline as volume increases.

The second observation is that the maximum of term 2 (foreign earnings net of subsidies) can be achieved with $\theta = 0$; that is, no subsidy. From the equilibrium price, we find that the earnings of exporting firms in country 2, per unit sold per item, are

$$m_1(p - \theta c_2) = n_1 c_1 - (n_1 - 1/\beta)p. \tag{4}$$

Thus, upon substitution, term 2 in (3) becomes

$$E_2 = \beta p^{-(1+\beta)}(p - c_2) \times (n_1 c_1 - (n_1 - 1/\beta)p). \tag{5}$$

That is, net earnings depend only on the price in country 2. That price will be affected by both m_2 and θ, but it doesn't matter which

combination is chosen. In particular, country 2 can get all the benefits obtainable by setting the subsidy θ equal to zero, and then selecting the number of authorized exporters appropriately. Too many will drive the price in the foreign market down too far, and too few will exploit the profit potential too little.

The purpose of the model is not to dismiss subsidies. Surely if economies of scale were reintroduced, there might be a preference for subsidies over a proliferation of competitors, but competition is to some extent a substitute for subsidies in exploiting the benefits of foreign markets.

The actual optimum is of some interest. Absent competition from country 2, the price in country 1 would be

$$\bar{p} = n_1 c_1/(n_1 - 1/\beta)\,. \tag{6}$$

If $c_2 \geq \bar{p}$, then country 2 can't compete profitably in country 1 and $m_1 = 0$. Otherwise, $c_2 < n_1 c_1/(n_1 - 1/\beta)$. In that case, profits rise and then fall to zero at $p = c_2$ as the price p declines starting at $p = n_1 c_1/(n - 1/\beta)$. The price declines monotonically as m_1 rises. It is easy to establish that $E_{pc_2} > 0$ so that the optimal price is an increasing function of c_2. Whether c_2 is greater than or less than c_1 is not directly relevant, except that for given c_1, a value of $c_2 < c_1$ will result in more competitors m_1 and a lower price than would result from a maximum with $c_2 > c_1$. Given the integer character of m_1, subsidies might be used to get the optimal p, once m_1 is set so as to get as close as possible.

A similar analysis applies to the surplus in the domestic market, but space limitations preclude analysing it.

The general point is that subsidies as 'competitive' weapons are not really of interest because they simply up the balance in the equilibrium in a way that increases net benefits to the subsidizer. The right amount of competition will do the same thing. Rather, subsidies are a way of achieving this effect when scale economies make expanding the number of competitors costly. Moreover, this type of analysis indicates that controlling the amount of competition in the non-domestic market, especially when the country has a cost advantage in the relevant industry, is of central importance.

Finally, this argument and all the conclusions hold, independent of the structure of demand. Nothing in the preceding argument required that the elasticity of demand be independent of the price.

2.3 Research and development: potential and actual spillovers

Research and development attracts attention in multinational competitive analysis because it induces dynamic scale advantages that interact with market share. However, the distinctive feature of the R&D investment is that it generates information that is potentially useful to firms other than the investor. I will call this effect *potential spillovers*. The potential spillovers may or may not be actual: that is, they may not occur.

Spillovers dampen investment incentives. It does not, however, follow (without a considerable amount of argument) that performance is poor. The reason is that there is another effect. Spillovers increase the pace of technological progress at the industry level *for given levels of investment by firms*, because they reduce the redundancy. Put another way, an industry with high potential, but low actual, spillovers will suffer from redundancy (absent some complex interfirm transfers of technology to which I will turn later), and as a result, the dynamic technical efficiency of the industry will be impaired relative to what could be achieved. These effects, the incentive effect and the efficiency effect, work in opposite directions.

Under conditions of high potential spillovers, strictly non-cooperative behaviour leads to suboptimal dynamic performance, independent of the level of actual spillovers. At low actual spillovers, redundancy takes its toll, and as actual spillovers rise, incentives decline.

Market and governmental institutions adapt to the problem. The R&D is directly and indirectly subsidized with beneficial effects on marginal incentives. Firms, with or without the public sector as partners, jointly invest in certain parts of R&D. Firms also engage in voluntary transfers of technology, sometimes in the form of exchanges or cross-licensing agreements. All of the above are observable in several of the electronics industries in several countries.

Broadly speaking, the problem in high potential spillover industries is to obtain the benefits of the spillovers (i.e. make them actual) without diminishing the investment incentives.

In the multinational industry, these problems become more complex for a number of reasons. To the extent that governments are investors (directly or via subsidies) in technology in high spillover environments, the benefits will spill across boundaries unless steps are taken to interdict the transnational flows. There is, then, a second level of the free-rider problem at the country level.

Spillovers between firms in different countries may vary for legal, institutional, and policy reasons. There are obviously a number of

cases here. But the main points are (i) that differences across countries in dealing with these externalities will lead directly to shifts in relative competitive position, (ii) that one-way spillovers will have the same effect, and (iii) that certain forms of cooperative or quasi-cooperative behaviour among firms and among countries are required for dynamic efficiency.

3. Conclusions

The general point is that in certain structural contexts, policies of subsidizing and restricting access can have a significant effect on the relative competitive positions of firms in a multinational industry. These policies have been used in pursuit of competitive advantage, and they could be used strategically to prevent their use by competitors. In R&D, the appropriate objective is to 'internalize' certain externalities by structure or policy. That objective can be pursued at the national level, but it is preferable that it be done multinationally.