

cost, and without incurring the cost burdens of excess capacity, which one suspects are characteristic of industries like drugs which shun price competition and rely on product differentiation.¹⁹ Although very large investments in plant and equipment are common in the heavy chemicals industry, in the pharmaceuticals field this is not the rule. The investment in facilities required for the production of the active ingredients varies considerably from drug to drug. For those active ingredients which can most efficiently be produced by truly mass-production techniques, production by makers of fine chemicals or even bulk chemicals would be indicated. But for many drugs, the required investment is relatively modest in comparison with the supply of funds available in capital markets. Relatively small firms can efficiently produce the active ingredients for such drugs. Mass production methods are not appropriate for many drugs since the physically minute quantities used in dosage forms require only a small total annual volume of output. But it still might be more efficient for a small firm to buy the basic ingredient under contract from a larger firm. If the market were competitive, the relative economies of scale in production versus those in dosage form preparation and in distribution should govern the extent of the functions assumed by different producers at different stages in the industry. If patents posed no real barrier to entry into drug selling, chemical raw materials and intermediates could be made by bulk chemical companies, the active ingredient could be made by fine chemicals producers, and the finished dosage forms could be tableted and packaged by drug makers to be distributed through various channels. Without barriers to entry, the comparative costs of each stage in the industry would determine the allocation of functions among different firms. As far as financial requirements are concerned, there is no reason why a large number of relatively small firms might not compete effectively in the drug market.

But under present market conditions there are a number of factors which distort the division of labor among firms and introduce other criteria than comparative costs as determinants of The Degree of Specialization within and Among Firms. A relatively small drug maker might find a new drug, patent it, and undertake production of the active ingredient on his own premises, despite the circumstance that his costs might be high due to his inexperience, inappropriate facilities, and overall lack of adaption of his operation to the requirements of fine chemicals manufacture. Production would still be undertaken at higher costs, however, if the patent holder wished to prevent the "know-how" which is ordinarily not disclosed in the patent, from being acquired by another firm. The inefficiencies inherent in this arrangement could be partially overcome by the merger of the small firm with a larger producer of bulk or fine chemicals, but this would increase the market power of the formerly small firm relative to its rivals.

Forward integration by merger is also stimulated by marketing practices. The intense sales promotion of drugs under brand names particularly thru nationwide advertising and detailing, is a practice which creates economies of large scale marketing even though none may exist in production. This is unusual; ordinarily it is economies of large-scale production which prevent the successful operation of a large number of small firms, but in drugs it appears that while efficient production might occur at a very small level of output, the exploitation of modern marketing techniques in the drug market context can be taken full advantage of only by a very large firm.

Where the factor of "know-how" is not important, drug firms may contract out the production of the active ingredient to specialists. In such cases, the ratio of the price of the bulk drug to the market value of the substance when embodied in final dosage forms and sold to distributors is well worth noting. Ratios of the order of magnitude of one hundred to one are not unknown.²⁰ This is very simply explained. There is price competition among the firms which make the active ingredient, but none in the sale of the finished product. If competition were to be

¹⁹ By way of example, when Bristol was producing about one-third of national tetracycline output, it still had 80% excess capacity in this drug. Drug Industry Antitrust Act Hearings, part 4, p. 2056.

²⁰ During the recent Canadian Hearings, Empire, a small generic firm, estimated that it could manufacture the drug diazepam for \$68 per kilogram and a kilogram of diazepam embodied in dosage forms is worth about \$20,000—a ratio of 125 to 1. (This makes diazepam worth about 16 times as much as gold.) See Alberta Government Submission, *op. cit.*, p. 34.