

ISSN 1045-6333

IN NEED OF TREATMENT?
MERGER CONTROL, PHARMACEUTICAL
INNOVATION & CONSUMER WELFARE

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Discussion Paper No. 270

12/99

Harvard Law School
Cambridge, MA 02138

The Center for Law, Economics, and Business is supported by
a grant from the John M. Olin Foundation.

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Forthcoming in *Journal of Legal Medicine*

JEL Class: E65, I11, I18, K21, L1, L4, L65, O3

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Dror Ben-Asher*

Abstract

The application of the antitrust laws to high technology industries - as seen, for example, in the recent Microsoft and Intel cases - is subject to much controversy. All the same, little attention has been paid to the antitrust implications of combinations in the research-based pharmaceutical sector. In attempting to prevent harm to competition and consumers, antitrust merger analysis ought to focus on industry-specific conditions. Indeed, the unique and strictly regulated pharmaceutical industry deserves a separate treatment. Accordingly, this paper makes two basic claims. First, competition in markets for prescription drugs is primarily over new treatments of superior quality, and barriers to entry are exceptionally high. A separate forward-looking merger analysis focusing on drug innovation markets is therefore an appropriate tool for preventing post-merger neglect, or delayed introduction, of experimental treatments for which consumers - patients - may be desperately waiting. Second, in deciding whether or not to investigate and challenge a merger, the antitrust enforcement agencies should look beyond the current size, sales and assets of the merging firms. Simply put, it is the merging firms' respective share and strength in particular therapeutic R&D markets, rather than their current share in markets for existing treatments, which should be the determining factor. It follows that the law and practice must embrace not only large mergers but also - provided they have a sufficiently large share of the R&D market for a particular disease - mergers involving currently small, perhaps even loss-making, but highly innovative, drug firms.

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- December 1999 -

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The author would like to thank the *Olin Center for Law & Economics at Harvard Law School* and professor Louis Kaplow of Harvard Law School for supporting this paper in numerous ways.

The author also wishes to thank professor F.M Scherer of the Kennedy School of Government, Harvard University, Peter B. Hutt of Covington & Burling, Josh Lerner of the Harvard Business School, Eli Wald, Amir Licht, and the participants in the Law & Economics Seminar, Harvard Law School (Spring, 1999), for their comments on earlier drafts.

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“This case is about saving lives...”

(William J. Baer, Director of the FTC’s Bureau of Competition, Ciba-Geigy/Sandoz, 1996)

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INTRODUCTION

Hardly a week goes by without a prominent article in *The Wall Street Journal* heralding a new drug, discussing new pharmaceutical research and development strategies, or detailing the latest settlement in a lawsuit brought against pharmaceutical companies. Hardly a Congress adjourns before conducting hearings on pharmaceutical firms' prices or practices. Hardly a physician or patient is not touched by the emerging prominence of managed care and its effect on pharmaceutical prescribing, dispensing, and payment.¹

In recent years, worldwide mergers have achieved record highs,² and antitrust enforcement authorities are facing new challenges involving high-technology industries.³ Much consolidation activity has taken place in the research-based prescription drugs industry (hereinafter the "ethical" pharmaceutical industry⁴), since the 1980s.⁵ The recently announced mega-mergers between Astra and Zeneca, and Hoechst and Rhone-Poulenc, as well as the recently failed merger plans involving SmithKline Beecham, Glaxo Wellcome, American Home Product (hereinafter AHP), and Monsanto, indicate that the intense merger activity of the 1990s is far from over.⁶ All the same, the legal

¹ Sara Fisher Ellison, *Book Review* 36 J. ECON. LIT. 1521 (1998) (reviewing STUART O. SCHWEITZER, PHARMACEUTICAL ECONOMICS AND POLICY (1997)).

² See, William Lewis, *M&A Activity Heads for Record Book*, FT, June 30, 1998 <<http://www.ft.com>>; For a useful chart, see, *All Fall Down*, THE ECONOMIST, Feb. 28, 1998, at 65.

³ On antitrust and high-technology industries, see, Allan Murray, *Antitrust Isn't Obsolete in an Era of High-Tech*, THE WALL ST. J., Nov., 10, 1997, at A-1; George J. Alexander, *Competing in Global Product Innovation: Is Antitrust Immunity Necessary?*, 6 SANTA CLARA COMPUTER & HIGH TECH L.J. 147 (1991); But cf. Richard Wolffe, *Fed Chief Hits at Antitrust Officials*, FT, June 17, 1998, at 1; See also, Bill Gates, *Why the Justice Department is Wrong*, WALL ST J., Nov. 10, 1997, at A-22.

⁴ Research-based pharmaceutical companies typically produce ethical (or "Rx") drugs. Those are prescription-only drugs for which much scientific research is required. The development process of such drugs is heavily regulated; This paper interchangeably refers to "drugs", "medicines", "vaccines" "pharmaceuticals" etc. In general, they are all "inputs into the provision of healthcare." F. M. Scherer, *The Pharmaceutical Industry 1* (1997 Revision), (unpublished manuscript, on file with the author, Kennedy School of Government, Harvard University).

⁵ According to F. M. Scherer, *The Pharmaceutical Industry 7* (Aug. 1998 Revision) (unpublished manuscript, on file with the author, Kennedy School of Government, Harvard University), pharmaceutical company acquisitions well beyond \$200bn occurred between 1989 and 1998 (excluding, among others, the recently announced Hoechst/Rhone-Poulenc and Astra/Zeneca mergers).

⁶ See, David Pilling *et al*, *Astra and Zeneca Confirm \$35bn Deal*, FT, Dec. 10, 1998 <<http://www.ft.com>>; *All Fall Down*, *supra* note 2, at 65; William Lewis *et al.*, *Zeneca and Astra Announce \$67bn Merger*, FT, Dec. 9, 1998 <<http://www.ft.com>>; Daniel Green, *Merger Fever Returns to the Drugs Industry*, FT, Jan. 21, 1998, at 23, available in 1998 WL 3526519; Ron Winslow, *Another Dose of Merger Mania May Be Headed for Drug Firms*, WALL ST. J., Jan. 21, 1998, at C1, available in 1998 WL-WSJ 3479663; See also, on the recent merger of two medium sized French pharmaceutical companies, *Sanofi-Synthelabo Aim for World's Top Ten Position*, LE FIGARO, Dec. 4, 1998, at 33, abstract

literature has, so far, paid little attention to the antitrust implications of combinations in that sector.⁷ Broadly speaking, combinations involving research-based pharmaceutical firms get much the same treatment as combinations in other industries where, in seeking to prevent anti-competitive effects, traditional antitrust analysis generally focuses on existing product markets in which the merging firms are actual or potential competitors.

Competition among research-based pharmaceutical firms is largely over new products of superior quality. The introduction of innovative products demonstrating high efficacy, little side effects in optimal doses and other important product attributes, generally ensures premium prices.⁸ A striking example is Pfizer's new impotence pill - Viagra - which was introduced in March 1998 and sold \$78m worth of prescriptions in its first 48 hours on the market, at \$7 a pill.⁹

The source of new and improved drugs possessing those attributes is innovation.¹⁰ A less effective drug, or a drug demonstrating more negative side-effects, is likely to lose

available in 1998 WL 8453592; For Switzerland's Roche 1998 acquisition of the German pharmaceutical and diagnostics group Boehringer Mannheim, *see Roche Completes Acquisition of Boehringer, Final Price of 10.3 bn*, CHEMICAL BUS. NEWSBASE, March, 13, 1998, available in 1998 WL 10604695.

⁷ The term "combination" in this paper interchangeably refers to mergers & acquisitions (M&A), Joint ventures (JVs) and other forms of concentrations. An overview of antitrust enforcement in the pharmaceutical sector is found in Mark D. Whitener, *Competition and Antitrust Enforcement in the Changing Pharmaceutical Marketplace*, 50 FOOD & DRUG L.J. 301 (1995); *See also*, Roy Levy, *The Pharmaceutical Industry: A Discussion of Competitive and Antitrust Issues in an Environment of Change*, Bureau of Economics Staff Report, Federal Trade Commission, March 1999; For a discussion of antitrust and the wider healthcare market *see* Marting Gaynor and William B. Vogt, *Antitrust and Competition in Health Care Markets*, in HANDBOOK OF HEALTH ECONOMICS (Anthony J. Culyer and Joseph P. Newhouse eds., forthcoming); JOHN J. MILES, HEALTH CARE & ANTITRUST LAW: PRINCIPLES AND PRACTICE Vol. 1-4 (West Group, 1992-98).

⁸ *See*, F. M. SCHERER, PRICES, PROFITS AND TECHNOLOGICAL PROGRESS IN THE PHARMACEUTICAL INDUSTRY 16-17 (April, 1993) (Faculty Research Working Papers Series, R 93-6, John F. Kennedy School of Government, Harvard University). Scherer cites a Grabowski & Vernon (1990) who found that fifty five percent of the revenues of their 100 new drugs sample came from the top ten drugs, whose average discounted revenues exceeded discounted R&D costs by a factor of five. Accordingly, "...new drug development resembles a risky lottery that throws out rich rewards to a few big winners while the majority of entries lose money."

⁹ *See*, Judy Foreman, *Treating Impotence Getting Easier*, BOSTON GLOBE, April 20, 1998, at C1.

¹⁰ The process of industrial innovation may be considered as "...a set of activities which transform client orders, market demands and technological advancements into product and process designs." S. W. F.

market share to its competitors even if it is significantly cheaper.¹¹ To be sure, a recent study comparing 135 companies in 10 high-technology industries indicated that the branded ethical drug industry attains both the highest short-term and long-term return on R&D investment.¹² The study concludes that competitiveness in the pharmaceutical industry depends on technological performance.¹³ As one industry expert puts it: "innovation is the name of the game."¹⁴ The significance of innovation as a source of competition in the pharmaceutical sector suggests that merger analysis in that sector should focus not only on existing product market but also on competition over R&D.

This paper primarily aims to show that in the context of mergers in the ethical pharmaceutical sector, the focus of merger analysis on the market for innovation is necessary, possible and desirable.¹⁵ In addition, it is argued that, notwithstanding some recent improvement, current antitrust enforcement does not go far enough in order to effectively deal with the serious issues raised by certain combinations in that sector.¹⁶

The paper takes the following form: *Part I* outlines the relevant features of the ethical pharmaceutical industry. *Part II* describes the current state of the law and its response to

OMTA, CRITICAL SUCCESS FACTORS IN BIOMEDICAL RESEARCH AND PHARMACEUTICAL INNOVATION 23 (1995), citing De Weerd-Nederhop *et al.* (1994), at 12.

¹¹ See, ALFONSO GAMBARDELLA, SCIENCE AND INNOVATION: THE US PHARMACEUTICAL INDUSTRY DURING THE 1980's 142 (1995). Gambardella, employing a 1968-91 sample of the fourteen largest US-based pharmaceutical companies, concluded that: "...research and innovation are the most important determinants of competitive performance and profitability."

¹² See, OMTA, *supra* note 10, at 32 (citing Capron in Khalil and Bayraktar eds. 1994, pp. 466-467).

¹³ *Id.*, Omta (p. 27) argues that the ethical drugs industry is "...the most technology driven of all industries."

¹⁴ J. Black, *Afterword*, in SUCCESS AND CREATIVITY IN PHARMACEUTICAL R&D 111, 112 (Bruce Durie ed., 1991).

¹⁵ For a partial bibliography on "markets for innovation" see Terry Calvani, *Two Books on Merger Law*, 42 ANTITRUST BULL. 215, 224 (1997), at Appendix: *A Brief Note on "Markets for Innovation"*, note 3.

¹⁶ It is possible that certain concerns dealt with here such as a possible post-merger harm to innovation, can be addressed by compulsory licensing or similar interventions after the merger took place. However, leaving aside the practical and legal difficulties involved in doing so, interventions of this type appear to be beyond the reach of the antitrust laws.

the relevant concerns, and considers the new “innovation market” analysis. *Part III* focuses on the allegations that some inherent weaknesses preclude the use of innovation market analysis for antitrust purposes. It is argued that theory, empirical studies, and agencies' practice provide sufficient support for the application of that doctrine to drug mergers. Thus, as far as big pharmaceutical mergers are at stake, antitrust analysis took the right direction. *Part IV* explains why pharmaceutical mergers analysis should go an extra mile and look at currently small, perhaps loss-making, but highly innovative, drug companies. *Part V* deals with existing gaps in the law and practice and discusses possible ways for covering them. In particular, it offers new industry-specific pre-notification requirements and a number of methods for analyzing the information gathered once these requirements are in place.

The approach developed here is that the rigor of antitrust enforcement in high-technology industries ought to depend on industry-specific conditions. The computer industry - Intel and Microsoft included - is one thing, the ethical drug industry is another. In that industry, post-merger anti-competitive effects, particularly the danger of delayed introduction or outright loss of superior treatments, call for a more daring and forward-looking analysis. It is argued that the relevant legal framework and agencies' practice should accommodate such a development. In order to become more effective and coherent, the law must embrace mergers involving small research-based pharmaceutical companies which have a sufficiently large share of the R&D market for a particular treatment. Insufficient focus on innovation risks overlooking some serious anti-competitive effects and ensuing welfare losses.

I. THE ETHICAL PHARMACEUTICAL INDUSTRY

A. General

The drug industry is not in the business of producing commodities of convenience, ease, or luxury.¹⁷ Rather, the business of the drug industry is human health.¹⁸ Pharmaceutical products cure and prevent disease, alleviate suffering, and save lives.¹⁹ In their modern form, the large chemical-based pharmaceutical companies emerged following World War Two.²⁰ These firms, helped with patent protection, became highly profitable.²¹ In general, the pharmaceutical industry is globalized and fragmented.²² The ethical pharmaceutical market is the biggest and the most important to the industry as a whole.²³ Ethical drugs are available with prescription only and profit margins are traditionally high, especially for new innovative products which command significant premium prices.²⁴

¹⁷ See, D. A. Siskind, *Contributions of the Pharmaceutical Industry to Improved Health*, in THE PHARMACEUTICAL INDUSTRY: ECONOMICS, PERFORMANCE, AND GOVERNMENT REGULATION 41 (Cotton M. Lindsay ed., 1978). Siskind quantitatively measured the industry's contributions to improved health since 1940 and concluded, citing Silverman and Lee (1974): "...few if any other industries have contributed so magnificently to the health and welfare of the public, to the control of pain and sickness, and to the prolongation of life." Furthermore (p. 67), "...a portion of the industry's contribution lies beyond quantitative assessment. Numbers cannot really measure the relief from pain and sickness enjoyed by a single individual, nor can statistics honestly gauge the enhanced quality of life permitted by a healthy existence."

¹⁸ *Id.*

¹⁹ *Id.*; Such products are difficult to price, *see generally*, E. M. KOLASSA, ELEMENTS OF PHARMACEUTICAL PRICING (1997), *passim*; *See also*, F. M. Scherer, *How US Antitrust Can Go Astray*, 4 INT'L J. OF THE ECONOMICS OF BUSINESS 239 (1997), (considering in detail the "price wars" and litigation involving drug manufacturers, HMOs, and retail pharmacists).

²⁰ See, S. LEE, GLOBAL PHARMACEUTICALS: WINNING STRATEGIES IN THE MAJOR MANUFACTURING MARKETS 7-9 (Financial Times Management Reports, 1995); For a brief history of the pharmaceutical industry, *see generally*, GARY PISANO, THE DEVELOPMENT FACTORY: UNLOCKING THE POTENTIAL OF PROCESS INNOVATION 52-57 (1997).

²¹ LEE, *supra* note 20.

²² No single company has over 4.5% share of the total pharmaceutical market. *See, Pharmaceuticals*, FT Survey, April 24, 1997, at I. Note, however, that this data pre-dated the mega-mergers of 1998-99; SARAH RICKWOOD, GLOBAL PHARMACEUTICALS: TRENDS AND PROSPECTS 7 (Financial Times Management Reports, 1993).

²³ See, LEE, *supra* note 20, pp. 13-19.

²⁴ See, Scherer, (1993), *supra* note 8, at 3: "Between 1960 and 1991, pharmaceuticals held first or second rank in 24 years out of 32 on Fortune magazine's annual tabulation of median after-tax profit on

B. Recent Developments

Today, the industry faces a number of major scientific challenges including widespread epidemics such as Tuberculosis and AIDS, diseases of modern civilization such as cancer and stroke,²⁵ and old age diseases such as Alzheimer's and Parkinson's.²⁶ Considerable consolidation has taken place since the 1980's in response to a variety of pressures on the industry.²⁷ In particular, profit margins have come under increasing

stockholders' equity for its 500 largest industrial corporations, classified into between 21 to 28 industry categories." However, profits are cannibalized by "me, too" drugs (drugs with similar efficacy), and, after patent expiry, by generic competition. Scherer therefore argues that claims of excess profits and supra-natural returns in the pharmaceutical industry are generally overstated.

²⁵ Such diseases are largely associated with modern environmental conditions and nutrition, and the increasing life expectancy in the developed world.

²⁶ As of 1991, there remained an estimated 18,000 diseases for which there are few effective treatments or cure. *See*, PHARMACEUTICALS: A CONSUMER PRESCRIPTION 1 (National Consumer Council (UK) discussion paper, 1991).

²⁷ *See generally*, S. MANNING, THE PHARMACEUTICAL INDUSTRY AND MARKET DEMAND 1-2 (Financial Times Management Reports, 1995); RICKWOOD, *supra* note 22, pp. 1-2; BARRIE G. JAMES, THE GLOBAL PHARMACEUTICAL INDUSTRY IN THE 1990's, THE CHALLENGE OF CHANGE 2 (The Economist Intelligence Unit, 1990); But note that these pressures are offset, to some extent, by a number of positive trends including: (1) The growth of wealthy and health-conscious aging populations in the major markets; (2) Increasing demand in the Developing World; (3) Recent technology advances that are likely to lead to innovations offering significant therapeutic and economic advantages translating into high profit margins; (4) International harmonization of patent protection and regulatory requirement is apt to extend the period of effective patent protection. *See generally*: Sharon Smith Holston, *An Overview of International Cooperation*, 52 FOOD & DRUG L.J. 197 (1997). *See also*, Ileana Doninguez-Urban, *Harmonization in the Regulation of Pharmaceutical Research and Human Rights: The Need to Think Globally*, 30 CORNELL INT'L L.J. 245 (1997); Expedition of the drug approval process is also very much on the agenda and there were several initiatives to that end. Notably, the FDA has issued new rulings allowing for earlier access to Investigational New Drugs (INDs) aimed at "life-threatening" or "serious" diseases, and accelerated regulatory approval seeks to reduce FDA mean approval time by 45%. *See generally*, STUART O. SCHWEITZER, PHARMACEUTICAL ECONOMICS AND POLICY 159 (1997). Efforts to streamline the process review "...appear to have had some success." In 1995, the FDA approved 28 new molecular entities (NMEs) compared to 22 in 1994. Similarly, the mean approval time appears to have been reduced; One drug, Viracept, an HIV-protease inhibitor, is a successful product of computerized drug design and accelerated FDA approval process aimed at "life-and-death" products. Viracept was developed by a relatively small company, Agouron, and was launched by Eli Lilly in March 1997 after only six years of R&D - half the industry's average. Its sales then quickly overtook all but one of its competitors on the Aids market. *See*, *The Alchemists*, THE ECONOMIST, Feb. 21, 1998, at 11, and the figures therein; *See also*, Clive Cookson, *Pharmaceuticals: Another Golden Year in Prospect*, FT, Jan. 13, 1998, according to which improved outlook is also a result of the pharmaceutical industry success in convincing governments that drugs actually help save money rather than being a drain on health care costs. According to Hoechst Marion Roussel's American chief executive, Richard Markman (quoted by Cookson), "...[t]he industry's growing band of pharmaco-economists is producing increasingly sophisticated analysis to show that innovative drugs lead to savings far greater than their own costs, for example by reducing the time that patients need to spend in hospital." Mr. Markman argues that "...[i]t is becoming increasingly clear that the pharmaceutical industry will be the saviour in the fight to cut healthcare costs."

pressures that are partly attributed to various countries' health-care reforms designed to reduce rapidly escalating health-care costs, and to the changing structure of the US health-care market.²⁸ Average development time has effectively doubled since the 1970's to 10-15 years, causing a significant decrease in effective patent life.²⁹ Perhaps most importantly, innovation costs are soaring and the price of reaching the market is rising fast. The average cost of bringing an ethical product to the market is expected to rise from as much as \$350m in 1995 to an estimated \$500m by the year 2000.³⁰ The organization of drug innovation is changing as new technologies emerge largely outside

²⁸ See generally, PISANO, *supra* note 20, pp. 57-59: "Growth of sales and earnings began to slow dramatically [at the outset of the 1990s]." Declining pricing flexibility is a major reason for that trend; The "customer function" of the pharmaceutical industry can be divided into three entities: the consuming patient, the prescribing physician, and the paying agency. Pressures for price-cuts mainly originate from the patients through their representatives (who ultimately bear the costs) and the agencies (who possess buyers' bargaining power). These reforms have taken a variety of forms including enforced price cuts, reimbursement changes and, in the US, 'voluntary' price control. See, JAMES, *id.*, at 2; SCHERER (1993) (*supra* note 8, *passim*), generally attributes those pressures to the exaggerated notion that pharmaceutical companies have traditionally made, and continue to make, supra-normal returns on their investment; At present, Health Maintenance Organizations (HMOs) rely on lists of approved drugs to control demand, especially for costly drugs. Physicians who prescribe drugs that are not on the formulary are asked to justify their choice and may be subject to a variety of sanctions. See, SCWEITZER, *id.*, pp. 27-28 (citing Pollard (1993)).

²⁹ For an illustration, see the figures in *The Alchemists*, *supra* note 27; BARRY G. JAMES, THE PHARMACEUTICAL INDUSTRY IN 2000: REINVENTING THE PHARMACEUTICAL COMPANY 45 (The Economist Intelligence Unit, 1994); PISANO, *supra* note 20, pp. 62-63; The decline in the post-approval period of patent protection is largely a result of a more stringent regulation which followed safety scandals such as the Thalidomide disaster. See, MANNING, *supra* note 27, at 15; RICKWOOD, *supra* note 22, at 70; According to a recent estimate, for an average drug, every day of delay after patent application has been filed, costs \$1m in protected sales. See, *The Alchemists*, *supra* note 27, at 5.

³⁰ See e.g., Lewis *et al.*, (1998) *supra* note 6, who estimate an "...average of \$500m on each new drug". The figure of \$500m by year 2000 may be a conservative one. For example, Lehman Brothers (1997) estimated that the cost of bringing a new prescription drug to the market has already reached \$600m. See, *Pharmaceuticals* (The Lex Column) FT, Jan. 3, 1998, at 18, available in 1998 WL 3522706; Some researchers attribute the rising costs of R&D to the current focus on complex degenerative disorders, growing scientific elaboration, and stringent regulatory demands. See, MANNING, *supra* note 27, at 16; See also, RICKWOOD, *supra* note 27, at 2; GAMBARDILLA, *supra* note 11, at 20; Pharmaceutical research expenditure in the US increased from \$1.5bn in 1980 to \$10bn in 1993 representing an increase from 11.7% of 1980 sales to 16.7% of 1992 sales. See, SCWEITZER, *supra* note 27, at 115, citing Boston Consulting Group (April, 1993); Similarly, R&D expenditure as a percentage of sales by British companies rose from 9.1% in 1970 to 20.5% in 1985. See, National Consumer Council (1991), *supra* note 26, at 22; The Office of Technology Assessment (OTA) estimated (1993) that the pretax R&D costs of a representative new drug was \$359m in 1990 terms. See, HENRY G. GRABOWSKI, HEALTH REFORM AND PHARMACEUTICAL INNOVATION 11-12 (1994).

the traditional chemical-based industry and large firms attempt to access and integrate them.³¹

The industry faces greater pressures as a result of the above-mentioned developments. Research-based pharmaceutical companies need volume-driven sales-growth deriving from a strongly patented drug portfolio.³² Promising R&D pipeline as well as biotechnology expertise are essential in order to secure a steady stream of significantly improved and cost-effective products.³³ Company strategies respond to the pressures mentioned above in a number of ways including: (1) Increasing size by M&A in order to enjoy the benefits associated with critical mass and combined drug portfolios;³⁴ (2) Globalization³⁵; (3) Therapeutic specialization³⁶; (4) Strategic alliances³⁷; (5) Expansion

³¹ "Outsiders" include relatively small pharmaceutical companies (particularly biopharmaceuticals), universities, and some non-profit scientific institutions some of which receive government support. See generally, GAMBARDELLA, *supra* note 11, pp. 42-81. Gambardella considers the increasing role of these "outsiders" and the changing R&D division of labor emerging as a result.

³² See, Daniel Green, *Beyond the Barriers of Alchemy*, FT, Dec. 16, 1995, Section II, at 4.

³³ See, LEE, *supra* note 20, at 3; GAMBARDELLA, *supra* note 11, pp. 146-167. Gambardella shows that large pharmaceutical firms pursue four main strategies for external linkages (agreements with other companies, agreements with universities and other non-profit research centers, minority participations, and acquisitions of majority stake). His study shows, *inter alia*, that in biotechnology large firms take all these four strategies at once.

³⁴ Squeezed resources and escalating R&D costs force research-based drug companies to become bigger. Development costs generally escalate faster than inflation and pharmaceutical companies find it difficult to increase prices. Since organic growth is hard to sustain under such conditions, M&A is the preferred growth engine. For example, it is clear that the recently announced Zeneca/Astra merger has much to do with the threat of big patent expiries. Astra's anti-ulcer treatment - Losec - estimated to account for over \$5bn or 60 per cent of the company's sales next year, loses its US patent in 2001, and Zeneca's leading heart drug loses its protection in the same year. See, *Aiming for the Stars*, FT, Dec. 9, 1998, The Lex Column <<http://www.ft.com>>; See also, David Pilling and Tim Burt, *Implications: Search for a Chemical Attraction*, FT, Dec. 9, 1998 <<http://www.ft.com>>: "[Astra's] main concern has been the imminent patent expiration of Losec, the world's best-selling drug, on which Astra is overly dependent."; It is also clear that the need to reduce dependency on a single blockbuster (Zantac) and rationalize soaring R&D costs were important motives for the 1995 take-over of Wellcome by Glaxo. See, R. Evans, *Lukewarm Wellcome*, FW, June 6, 1995, pp. 46-48; LEE, *supra* note 20, pp. 53, 82-84; On critical mass generally, see, LEE, *supra* note 20, pp. 53-55; JAMES (1990), *supra* note 27, pp. 65-67, 82; A. D. PORTER, PHARMACEUTICAL EQUITIES: EVALUATION AND TRADING 49-50 (1993); RICKWOOD, *supra* note 22, at 7.

³⁵ See e.g., Pilling and Burt, *id.*, citing geographic expansion as one of the reasons for the Astra/Zeneca merger ("Astra's European presence...would neatly complement Zeneca's foothold in the US."); See generally, *FTC Hearings on enforcement Policy Delve into Dynamics of Global Rivalry*, 69 ANTITRUST 487, 490 (1995); JAMES, *supra* note 27, pp. 67-69; LEE, *supra* note 20, pp. 10-11; PORTER (1993), *supra* note 34, pp. 1, 43-45.

³⁶ Development of core capabilities seeks to exploit competitive advantages and strengthen niche

into new areas including acquisitions of health maintenance organizations (HMOs). Each one of these strategies is likely to involve combinations in various forms.

C. Research & Development

1. General

The ability to introduce innovative new products is the key to success for ethical pharmaceutical companies.³⁸ Such products define new therapeutic markets and are therefore less vulnerable to competition.³⁹ For example, it is estimated that an annual market of \$5bn will be the financial prize for producing an effective Rheumatoid Arthritis treatment.⁴⁰ The leading American and European firms recognize that

positions. Many biotechnology companies functionally specialize in research in narrow fields. *See, e.g.*, FT, Feb. 11, 1997, at 25 (about Peptide Therapeutics, a biotech start-up specializing in development of allergy vaccines); *See also*, Pilling and Burt, *supra* note 34 (Astra is largely specialized, and therefore strong, in gastrointestinal products, cardiovascular treatment, and respiratory drugs. Zeneca is specialized in oncology).

³⁷ In general, large pharmaceutical companies pursue products, technology and skill to supplement their in-house research, while small and medium-sized firms seek critical mass. *See generally*, GAMBARDELLA, *supra* note 11, pp. 146-167; *See e.g.*, FT, Dec. 11, 1996, at 35 (Biogen & Creative Bio Molecules); FT, Jan. 24, 1997, at 24; *See also*, Daniel Green, *Biotechnology*, FT Special Survey, Nov. 22, 1996, at 8 (Peptide Therapeutics & Medeva).

³⁸ For an illustration see the tables in K. W. Clarkson, *The Effects of Research and Promotion on Rates of Return*, in *COMPETITIVE STRATEGIES IN THE PHARMACEUTICAL INDUSTRY* 255 (Helves R.B. ed., 1996); Between 1966 and 1991, the leading pharmaceutical companies nearly doubled the percentage of resources allocated to R&D from revenues from 8.5% to over 16%, while production costs fell over the same period. Compared to 15 other industries, the non-federal R&D expenditure of the broad "Drugs and Medicines" sector as a percent of net sales in 1990 ranked second only to the "Office, Computing and Accounting" sector. *See*, SCHWEITZER, *supra* note 27, pp. 25-27, Table 1.3 and Figure 1.1.

³⁹ Thus, in the Glaxo case, both the FTC (File No. 951-0054, 3/16/95), and the European Commission (Decision IV/M.555, 28.02.1995), thought that Glaxo's non-injectable migraine treatment created a new product market, separate from injectable treatments. Thanks to its superior qualities, particularly the fact that the non-injectable drug was easier to administer, it was clearly preferred by doctors and patients and its sales were rising fast.

⁴⁰ *See*, Clive Cookson, *Cautionary Tale for Optimists*, FT, Oct. 31, 1996, at 12; *See also*, *Immunex Trial Data is Positive for Enbrel, Arthritis Treatment*, WALL ST. J., Nov. 10, 1997, at A-4..

innovative performance boosts profitability.⁴¹ They therefore systematically invest in R&D and wish to continue doing so despite the enormous difficulties outlined above.⁴²

Drug innovation raises a number of important issues for the purposes of the discussion that follows.⁴³ First, the very nature of pharmaceuticals calls for exceptionally heavy government regulation of the drug innovation process,⁴⁴ and there are constant political pressures to continue doing so.⁴⁵ Second, it is innovation rather than production that predominately drives the industry's growth.⁴⁶ Third, early research stages are the most creative steps of the innovation cycle and generally play a more meaningful role than in other industries.⁴⁷ Fourth, government regulation, particularly the costs and complexity of clinical trials, constitute a serious barrier to entry. Further, feedback cycles from clinical trials are long and expensive because of the need to go back to regulatory tests. Accordingly, learning-by-using is lengthy and complex and drugs, unlike other

⁴¹ See GAMBARDELLA, *supra* note 11, pp. 82-105: Case studies of Merck, Eli Lilly, Bristol-Myers, Squibb, SmithKline, Syntex (merged with Roche of Switzerland), American Home Products, and Rorer (merged with Rhone Poulenc of France), overall covering 36 percent of the 1986 US pharmaceutical sales of the top fifty companies, clearly show that drug innovation and market performance are closely related. In general, firms that invested heavily and consistently in R&D were found to have performed better.

⁴² By contrast, Japanese firms traditionally focused on alteration of existing products and their current ability to introduce novel innovative drugs is believed to be inferior as a result. See, *Japan's Sickly Drug Firms*, THE ECONOMIST, Oct. 19, 1996, at 99; See also, Jenny Luesby, *Germany: A Failure of Innovation*, FT, April 24, 1997.

⁴³ On drug innovation, See generally, GAMBARDELLA, *supra* note 11, pp. 14-16; See also, SCHERER (1993), *supra* note 8, *passim*.

⁴⁴ See, GAMBARDELLA, *supra* note 11, pp. 14-16; On the regulation of pharmaceuticals in the US see generally: Peter Barton Hutt, *The Regulation of Pharmaceutical Products in the USA*, in PHARMACEUTICAL MEDICINE 211 (Denis M. Burley *et al.*, ed., Second ed., 1993); See also, Peter Barton Hutt, *The Legal Requirement that Drugs Be Proved Safe and Effective Before Their Use*, in CONTROVERSIES IN THERAPEUTICS 495 (Louis Lasagna ed., 1980).

⁴⁵ For example, President Clinton recently proposed a new requirement to be embodied in the FDA approval process: drug-safety tests on children. See, Laurie McGinley, *Pharmaceuticals: Clinton Wants Drug-Safety Tests for Children*, WALL ST. J., Aug. 13, 1997, at B1, Available in 1997 WL-WSJ 2431346.

⁴⁶ GAMBARDELLA, *supra* note 11, pp. 14-16; See, Robert Pear, *Medical Research to get More Money from Government*, N.Y. TIMES, Jan. 3, 1998, at 1. (1998). Pear argues that even the most skeptical Republican Senators have been persuaded that biomedical research is the engine of economic growth not only for the drug industry, but also for other sectors such as agriculture. Consequently, Congress is now united over the issue of increasing Federal biomedical R&D spending.

⁴⁷ See the table in Clarkson, *supra* note 38, at 255; GAMBARDELLA, *Id.*

high-tech products such as software, cannot be rapidly improved or utilized for a new purpose.⁴⁸ Fifth, the drug-innovation process often reveals that a drug works on other ailments.⁴⁹ A single aspect of the research, say the drug's delivery mechanism, may also be applied to other treatments. Hence, abandonment of a research effort may result in a loss of potentially beneficial products.⁵⁰ Sixth, product-failure rate is very high. For every 10,000 pharmaceuticals patented about 100 will get into human trials and less than 10 will actually reach the market.⁵¹ Some of these will fail after marketing.⁵² Only 1 out of approximately 5,000 compounds synthesized will eventually reach the market.⁵³ Seventh, a broad range of basic research and experimental sciences affect drugs research.

⁴⁸ F. M. Scherer, (Aug. 1998 Revision), *supra* note 5, at 18, argues that "...drug product patents, unlike the patents in many other fields of technology, protect a clearly identified chemical molecule around which the marketing of substitute variants is impossible without undergoing a complete array of FDA clinical trials." This, of course, is a significant barrier to entry.

⁴⁹ For example, Genetech's Human Growth Hormone, originally for children with dwarfism, now treats other growth deficiencies. See, Victoria Griffith, *Orphan's home*, FT. Nov. 22, 1996; A striking example is Pfizer's blockbuster, Viagra - a pill for impotence - submitted to FDA approval in Sep. 1997 and approved in March 1998: "Viagra was originally developed to treat high blood pressure. It didn't work, but researchers noticed that their subject didn't want to give back their test samples." See, John Leland, *A Pill for Impotence*, NEWSEEEK, Nov. 17, 1997, at 64.

⁵⁰ As will be shown later in this paper, one of the main antitrust concerns is that certain mergers will result in R&D cuts that might harm consumers. R&D cuts mean that certain R&D tracks will be abandoned or delayed. If the potential benefit of the abandoned or delayed project goes beyond its originally intended use (what is often referred to as a 'spillover' effect), there is a risk that this added value will not be discovered at all or will be discovered later than otherwise could have been. Obviously, if an added value of an experimental drug (on which large resources have already been spent) will not be discovered, there is likely to be a welfare loss. If the added value was discovered before the R&D path in question has been abandoned, then the merged company will probably attempt to develop it (unless, perhaps, when the new use of the abandoned product threatens to cannibalize the merged firm's existing profits-generating drugs). A more detailed discussion of R&D efficiency, duplication, R&D spillovers, and related issues is found below.

⁵¹ See the tables in Joseph D. Jackson, *Pricing and Perspectives*, in STUDIES IN PHARMACEUTICAL ECONOMICS 359, 368 (Mickey C. Smith ed., 1996), and in Julian H. Shelley, *The Ocean and the Bucket*, in Bruce Durrie ed. (1991), *supra* note 14, at 13; See, PORTER (1993), *supra* note 34, at 120; See also, *The Alchemists*, *supra* note 27, at 4: "For every approved drug that comes out of a pipeline, about 10,000 molecules have gone in and got lost somewhere on the way."; But note the effect of improvement in computerized drug design considered below.

⁵² See, e.g., Laura Johnannes, *Significant Heart-Valve Leaks Found in Large-Scale Study of Diet-Pill Users*, WALL ST. J., Nov. 12, 1997, at B-6; See also, *Class Action*, PR Presswire, Story # 26512 (Oct. 30, 1997) <ehl@prwire.com>.

⁵³ PORTER (1993), *supra* note 34, at 120; Halliday R. et al, *R&D philosophy and Management in the World's Leading Pharmaceutical Companies*, 2 J. PHARMA. MED. 139 (1992).; GRABOWSKI (1994), *supra* note 30, at 12, refers to the R&D process in pharmaceuticals as "...an economic investment decision under uncertainty."

That fact largely explains the unusually strong influence of academic research. Relevant sciences include, among others, organic chemistry, microbiology, biochemistry, molecular biology and genetic engineering. Eighth, patent protection of drug innovation is considered effective and provides a powerful incentive to obtain a lead-time in the race for a patent claim.⁵⁴ Consequently, competition for eminent human capital - a crucial factor for achieving a lead-time - is intense.⁵⁵ Finally, there are several stages in drug development. It can take 10-20 years from basic research to the market with average time from initial synthesis to final approval of nearly 12 years.⁵⁶ Later stages are more costly but the risk of total failure is gradually and significantly reduced.⁵⁷ A product may be at different stages at the same time for different uses or in a different country.

⁵⁴ See GAMBARDELLA, *supra* note 11, at 44: "Because patents are effective, pharmaceutical companies rush to patent their new entities as early as possible." Gambardella cites Levine *et al.* (1987), who found (in response to a questionnaire survey of 650 managers in various industries), that the highest degree of protection provided by patents (6.5 on a 1-7 scale) came from the responses of drug industry managers; *See also*, SCHERER (1993), *supra* note 8, pp. 24-26: Effective product patent protection guarantees much higher profits. The loss of such profits pushed US pharmaceutical makers to successfully pressure Canada into amending its patent laws in 1987 to grant 7 to 10 years exclusivity (from compulsory licensing) on new drugs. That is also why pharmaceutical makers from the US, EC, and Japan joined forces to make the strengthening of intellectual property a top priority in the Uruguay Round to amend GATT.

⁵⁵ *See*, GAMBARDELLA, *supra* note 11, at 45: "The scale of laboratories is no longer the only critical asset for discovery [and] successful drug companies will increasingly organize their discovery process around a group of talented scientists."

⁵⁶ *See* figures in JAMES (1994), *supra* note 29, at 45, Clarkson, *supra* note 38, at 256, and *The Alchemists*, *supra* note 27; *See also*, GAMBARDELLA, *supra* note 11, at 19; Full development in 1960 took 3 years, in 1970-1975 it took 6-8 years, and in 1991 roughly 10-12 years, sometimes much longer. *See*, National Consumer Council (1991), *supra* note 26, at 35; J. A. Di Masi *et al.*, *Cost of Innovation in the Pharmaceutical Industry*, 10 J. HEALTH & ECON. 107, 124 (1991).

⁵⁷ *See* the exhibits in JAMES (1994), *supra* note 29, at 15, and *The Alchemists*, *supra* note 27; *See, From Test Tube to Patient*, FDA CONSUMER (Special Report, HHS Publication # (FDA) 88-3168) (Jan., 1988): About 70 out of 100 drugs beginning human clinical trials complete phase I. 33 complete phase II, and another 25-30 complete phase III; Halliday *et al*, *supra* note 53: About two-thirds of the drugs entering phase III eventually reach the market; Di Masi *et al.*, *id*: 23 percent of compounds tested on humans receive approval for marketing; GAMBARDELLA, *supra* note 11, at 21, maintains that "[c]ompounds that overcome clinical trials phase II have a relatively good chance of becoming new drugs. However, as phase III is the more costly R&D stage, one failure out of three products may still imply a considerable loss of resources."; *See also infra* note 434 and surrounding text.

2. *The Drug Development Process*

The principal stages in drug development may be summarized as follows; The Pre-clinical stage involves large scale screening of many molecules in order to identify a 'leading compound' followed by in-vivo experiments on animals. Usually a patent is claimed at this stage.⁵⁸ Next come human clinical trials. The decision to progress into clinical phases, the longest and most expensive element of drug development, indicates that the product is taken seriously by the company.⁵⁹

Human clinical trials typically include three phases. Phase I tests safety on a small number of patients and Phase II is the first major test for efficacy, side effects, and dosage of the drug on a large group of patients. Phase III is the most expensive and complex trial enrolling hundreds or even thousands of patients. Mass tests usually take place in a number of trial centers in order to allow for regional and ethnic variations. Efficacy must be demonstrated through a comparison with placebo and possibly a comparison with competing drugs.⁶⁰ At the same time companies study the results and prepare submission for approval. Approval, if granted,⁶¹ and subsequent launch in all major markets may take a few more years. Launch may be followed by post-marketing studies in the form of "Phase IV" head-to-head trials attempting to demonstrate specific advantages over

⁵⁸ Because Investigational New Drug (hereinafter IND) application makes the compound a public information, it appears that no molecule enters clinical trials without having been patented. However, drug companies attempt to patent their compounds as late as possible so as to waste as little as possible of the patent's life. See, *The Alchemists*, *supra* note 27, at 13.

⁵⁹ See e.g., SCOTIA HOLDINGS PLC REPORTS AND ACCOUNTS 9 (1996). Considering the constant discussion - throughout the clinical trials - between the company and the regulation authorities in the US and abroad, the decision to progress probably indicates that the experimental product is also taken seriously by the regulators.

⁶⁰ Failure rate at this stage is still high. See, Halliday *et al.*, *supra* note 53; Most recently, shares in a small biotechnology company, Stanford Rook Holdings, lost 72% of their value after 3rd stage clinical trials concluded that its experimental TB drug added nothing to existing treatments. See, Roger Taylor, *Infected by the Feelbad Factor*, FT (Weekend Money Section), Oct. 4, 1997, at 1.

⁶¹ Failure at this stage is not uncommon. One recent failure at this stage is Scotia's EF-4 compound (also called "Tarabetic") for the treatment of diabetic neuropathy. See, SCOTIA HOLDINGS PLC REPORTS AND ACCOUNTS (1997).

competing products. As shown by the recent FDA recall of certain diet drugs, failure at this stage or even much later, due to unexpected side-effects, is not uncommon.⁶² Such failure may lead to significant product liability litigation.⁶³

3. *The Ethical Pharmaceutical Industry: Trends*

It appears that the nature of drug R&D has changed in recent years. Advance in molecular biology and genetic engineering is generally switching research from a chemical basis to a biological basis.⁶⁴ The latter is based more on understanding of the human body and pathologies than on the more traditional large scale systematic assays of many molecules.⁶⁵ Advance in instrumentation, particularly computerized drug design, may help predict failures. Consequently, there should be fewer novel drugs introduced overall, but those introduced could be of higher quality. It is becoming harder to introduce a safe but fairly ineffective drug.⁶⁶

⁶² For example, Glaxo Wellcome's recently issued a warning about newly discovered side effects of its epilepsy drug Lamictal, FT. Apr. 4, 1997, at 40, and FT. March 7, 1997 at 25; *See also, infra* note 63.

⁶³ *E.g.*, American Home Products (AHP). could face as much as \$4bn in liabilities suits over the claim that its anti-obesity drugs Redux and Pondimin cause heart valve abnormalities. *See* Tracy Corrigan and William Lewis, *Union Could Put Future of AHP at Risk*, FT, Jan. 31, 1998, at 17, available in 1998 WL 3529046; *See also.*, Johannes, *supra* note 52; National Consumer Council (1991), *supra* note 26: "The goods produced by the [drug] industry are unusual. Unlike many other consumable products, they must be seen (if they are at all effective) as toxic and sometimes potentially lethal - poisons that heal. Drugs may improve health, and prevent and cure diseases. They can also cause irreversible damage and kill."; Pharmaceutical and health-care products represented 13.5% of the 85,694 federal product liability cases filed between 1974 and 1986. *See*, SCHWEITZER, *supra* note 27, at 36 (citing Dungworth (1988)). One example, given by Schweitzer (p. 37) is the Dalkon Shield litigation. Dalkon Shield, a contraceptive device, was marketed by A.H. Robins in 1971. In 1974 the company withdrew the device from the market after a number of complications including infections and septic abortions were reported. 320,000 suits were filed against the company 4,400 of which resulted in litigation and \$250m were paid in out-of-court settlements. Another \$25m were paid in punitive awards imposed by juries around the country. In result, Robins went bankrupt; Bristol-Myers Squibb recently took \$800m pretax charge for various litigation of breast implants liability and prescription drug prices cases. *See, Bristol-Myers Q4 EPS, Pre-ex, in-line with Forecasts, Earnings Hurt by Charges*, AFX NEWS, Jan. 20, 1999, available in 1999 WL 2514960.

⁶⁴ *See generally*, GAMBARDELLA, Chapters 2-3, *passim*.

⁶⁵ *Id.*

⁶⁶ *See* GAMBARDELLA, at 162: "In the past, once it had been established that patients were not at great risk, many drugs were sold just because there was no compelling evidence that they were not effective - even though they were, in fact, fairly ineffective." Today, thanks to advance in molecular biology, genetic engineering and experimentation technologies (particularly, computerized drug design), "...one can rationally anticipate that certain compounds will be ineffective."

It is therefore increasingly difficult to obtain commercial success to provide the means for soaring R&D costs.⁶⁷ Critical mass is important but the shift to biological basis suggests that creativity and human expertise are the most important resources in drug research.⁶⁸ There is some evidence suggesting that scientific creativity is more likely to be found in small drug firms.⁶⁹ This view is supported by the rapid growth of biotech firms in recent years.⁷⁰ In general, large pharmaceutical firms have a very high actual R&D spend but that expenditure is among the lowest in the industry as a proportion of their potential. It appears that smaller and less well-established firms spend less, but a much higher proportion of their potential profits, on R&D.⁷¹ It also seems that they carry on research despite the lack of resources needed for full commercialization of the inventions. Patent-protected research outcome is expected to be sold or licensed, one way or the other, to cash-rich large firms who are better placed to bring the product to the market.⁷² According to Gambardella (1995), this is an optimal division of labor that intensifies the market of innovation.⁷³

⁶⁷ *Id.*; See also, SCHERER (1993), *supra* note 8, *passim*.

⁶⁸ See, GAMBARDELLA, *supra* note 11, at 163.

⁶⁹ The relationship of size and innovation is discussed in greater detail below; GAMBARDELLA, *supra* note 11, at 45, argues that "[the view that small informal organizations are conducive to innovation]...is especially true of pharmaceutical research."; See also, Rebecca Henderson and Kim B. Clark, *Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*, 35 ADMINIS. SCI. Q. 9 (1990).

⁷⁰ See e.g., OPPORTUNITIES IN BIOTECHNOLOGY (Lehman Brothers, 1997); THE MERCK/BIOTECH INDEX - A COMPARISON (Ernst & Young, 1997). Small pharmaceutical companies are discussed in greater detail in parts III and IV of this paper.

⁷¹ See, RICKWOOD, *supra* note 22, pp. 70-71. As discussed in greater detail below, R&D is the very business of certain small drug firms. Many of them are drug-research firms which make discoveries but leave the clinical development and marketing to big pharma.

⁷² A more detailed discussion follows below in parts III and IV of this paper.

⁷³ See, GAMBARDELLA, *supra* note 11, pp. 76-81, 157-158.

D. The Pharmaceutical Industry: Overview

From the points raised so far it may be inferred that the ethical pharmaceutical industry differs from other industries in several important respects.⁷⁴ The objectives of improvement of human health and relief from suffering are difficult to price and involve an important aspect of social welfare. There is strong public interest in new, innovative, effective and safe treatments. Consequently, the prescription drug sector is heavily regulated. Despite the fact that the industry as a whole is generally fragmented, there are typically a few competitors for every particular treatment. Entry by others is likely to face high barriers to entry and could take many years.⁷⁵ Drug development is an extremely long, expensive and complex process. Systematic introduction of effective innovative products is vital and innovation seems to be the main competitive factor.

There is some evidence, to be discussed in greater length below, that smaller pharmaceutical firms tend to be more creative. The mutual interests of younger and

⁷⁴ SCHERER (1993), *supra* note 8, at 4, discusses additional distinguishing characteristics such as the fact that most high-potency drugs are available through prescription only, thus the "...consumer and the consumption decision-maker (the prescribing physician) are not the same."

⁷⁵ Thus the fact that the pharmaceutical industry as a whole is not concentrated means very little in practice. *See*, SCHWEITZER, *supra* note 27, at 23: "In the pharmaceutical market the degree of market concentration changes as we look more and more narrowly at specific therapeutic products. When the industry is viewed as one market producing all drugs, there are hundreds of firms producing products. Such a market, with so many producers, appears competitive. But when one considers a specific therapeutic class, the number of firms producing such drugs will be much fewer."; For example, the 1987 4-firm concentration ratio in other industries such as Cigarettes, Motor Vehicles/Car bodies, and Electronic Computers, was much higher than in the pharmaceutical industry. But this probably means very little because of the higher likelihood of supply/demand substitutability (*i.e.*, greater cross-elasticity) in those industries. *See*, PHILLIP AREEDA AND LOUIS KAPLOW, *ANTITRUST ANALYSIS* 787 (Fifth ed., 1997), at Table I. By contrast, it can take many years for a competing pharmaceutical company to successfully switch into an area neglected by a merged firm. Similarly, consumers may be unable to find effective substitution for a drug that would have reached the market but/for the merger. It is one thing to switch from one brand of cigarettes to another brand, or even to pipe smoking, or from a Toshiba laptop to an IBM one, it is another thing to switch from an effective cancer treatment to a less effective one. In short, both supply cross elasticity and demand cross elasticity are very limited; J. HOWELLS AND I. NEARY, *INTERVENTION AND TECHNOLOGICAL INNOVATION: GOVERNMENT AND THE PHARMACEUTICAL INDUSTRY IN THE UK AND JAPAN* 66 (1995), surveying the UK and Japanese pharmaceutical industries, argue that in the ethical therapeutic "sub-markets price competition is rare." Low elasticity of demand for ethical drugs appear to stem from the 'necessity' effect; On demand elasticities generally *see*: Gregory J. Werden, *Demand Elasticities in Antitrust Analysis*, 66 *ANTITRUST L.J.* 363 (1998); On consumers and the nature of demand for pharmaceuticals, *see*: SCHWEITZER, *supra* note 27, at Section II.

smaller firms, and bigger well-established cash-rich firms, largely explain the propensity within the industry to consolidate and form alliances. Innovation performance in the pharmaceutical industry is self-reinforcing inasmuch as significant innovative drugs yield healthy profits reinvested in R&D thus generating new innovative drugs. Breaking into this cycle by 'playing it alone' is increasingly hard to do.⁷⁶

II. ANTITRUST LAW AND PHARMACEUTICAL MERGERS: GENERAL

A. Federal Merger Control: Overview

The oldest antitrust statute is the Sherman Act of 1890 which prohibits combinations in restraint of trade, monopolization, and attempts to monopolize.⁷⁷ The Federal Trade Commission Act of 1914 established the Federal Trade Commission (hereinafter FTC) as a regulatory agency empowering it to prevent unfair methods of competition.⁷⁸ The most important antitrust statute governing mergers is the Clayton Act which prohibits mergers and acquisitions the effect of which may be substantially to lessen competition in any line of commerce, or any activity affecting commerce.⁷⁹ Also important, though not binding, is the Joint Horizontal Mergers Guidelines of 1992⁸⁰ to which the courts pay close attention.⁸¹

⁷⁶ See, e.g., Daniel Vasella, *Catalyst for Top-down Change*, FT, Feb. 10, 1997, at 10, where Sandoz's recent strategies are discussed. Sandoz's strategies included the addition of greater biotechnology exposure through acquisitions, and the addition of significantly greater critical mass through the merger with Ciba (forming a new company, Novartis); See also, FT, Nov. 12, 1996 at 27, and FT, Feb. 12, 1997, at 32.

⁷⁷ 26 Stat. 206 (1890), sections 1 and 2.

⁷⁸ 38 Stat. 717 (1914) § 5.

⁷⁹ 38 Stat. 730 (1914) § 7; For an overview of, and comparison with, European Union (hereinafter EU) merger law see, Paul-Henry Freret, *The European Union Regulation on "Concentrations" and United States Merger Laws*, 2 TUL. J. INT'L & COMP. L. 143 (1994).

⁸⁰ 57 Fed. Reg. 41552 (Sep. 10, 1992) and 4 Trade Reg. Rep. (CCH) 13, 104; See generally, AREEDA & KAPLOW, supra note 75, pp. 853-860. The 1992 Guidelines spell out the analysis to be used by the antitrust enforcement agencies in determining the legality of mergers.

⁸¹ See, HERBERT HOVENKAMP, *FEDERAL ANTITRUST POLICY: THE LAW OF COMPETITION AND ITS PRACTICE* 444 (1994); Also relevant is the National Cooperative Research Act 15 U.S.C §§ 4301-05

Section 7 of the Clayton Act only condemns mergers the effect of which "...may be substantially to lessen competition". Thus, mergers are not condemned *per se*. Instead, prior notification is required for mergers over certain sales and assets thresholds.⁸² The acquiring company must have a total assets or annual sales of \$100m or more and the acquired company must have assets or sales of \$10m or more.⁸³ This means that only large mergers are subject to the notification requirement. It has been argued that, in practice, mergers not challenged by the government at the notification stage are unlikely to be challenged by private parties or states.⁸⁴

The antitrust laws do not state their purpose and there seems to be an ever-present tension between the view that antitrust should go beyond mere efficiency,⁸⁵ and the view that it is primarily, if not exclusively, about promotion of optimal use of resources.⁸⁶ Nevertheless, it is relatively clear that the principal economic concerns are oligopolistic behavior and creation of a monopoly, both of which are believed to upset allocative efficiencies and prevent the economy from catering to consumer tastes.⁸⁷ In essence, the task of the enforcement agencies is to identify mergers entailing these anti-competitive

(1993) which aims to facilitate certain research joint ventures.

⁸² See *infra* note 382.

⁸³ For the transaction to be covered by the notification requirement the acquiring company must hold either more than \$15m worth or at least 15% of the acquired company.

⁸⁴ AREEDA & KAPLOW, *supra* note 75, at 31; See also, *infra* notes 392-393 and surrounding text.

⁸⁵ *E.g.*, must seek to achieve social goals such as consumer choice. See, Harry First, Antitrust Law, in FUNDAMENTALS OF AMERICAN LAW 432, 497 (Allan B. Morrison ed. 1996); See also, ERNEST GELLHORN AND WILLIAM E. KOVACIC, ANTITRUST LAW AND ECONOMICS 497 (1994).

⁸⁶ See, Derek C. Bok, *Section 7 of the Clayton Act and the Merging of Law and Economics*, 74 HARV. L. REV. 226, 307, 318 (1960); On the uncertainty as to the basis for the antitrust laws, see generally, AREEDA & KAPLOW, *supra* note 75, pp. 5-35, in particular § 125; See also, HERBERT HOVENKAMP, ECONOMICS AND FEDERAL ANTITRUST LAW (1985), Chapters 1, 11 *passim*; For a partial bibliography on the goal of the US antitrust laws see, John J. Flynn, *Antitrust Policy, Innovation Efficiencies, and the Suppression of Technology*, 66 ANTITRUST L.J. 487, 490, (1998), at note 10.

⁸⁷ See, ROBERT BORK, THE ANTITRUST PARADOX 89 (1978): "...the case is overwhelming for judicial adherence to the single goal of consumer welfare in the interpretation of the antitrust laws."

effects and, provided the anti-competitive effects out-balance likely post-merger benefits, prevent them.⁸⁸

The formula to be used by the agencies for identifying these anti-competitive mergers has been subject to much discussion.⁸⁹ In *United States v. General Dynamics Corp.* the Supreme Court, confirming earlier decisions, held that mergers must be functionally viewed through examination of all factors.⁹⁰ On this reading, the quantitative market shares of the merging firms is not the only factor to be considered.⁹¹ The Joint Horizontal Mergers Guidelines of 1992 follow that approach by requiring consideration of non-structural evidence. Today, factors such as future entry, future anti-competitive effect, and efficiencies are taken into account.⁹²

From the points raised so far it can be seen that only mergers involving relatively large companies will be looked at, yet once a merger is investigated, the test of compatibility with section 7, Clayton Act (that is, will the merger substantially lessen competition in the relevant line of commerce), is functional, and does not necessarily depend on the market shares held by the merging companies.⁹³ As evident from the on-going Intel and

⁸⁸ See, HOVENKAMP (1994), *supra* note 81, at 445.

⁸⁹ *Id.*, at 444-445.

⁹⁰ 415 U.S. 486 (1974), not following its earlier ruling in *United States v. Philadelphia National Bank* 374 U.S. 321 (1963), where the Court outlined quantitative market share thresholds above which anti-competitive effect may be predicted.

⁹¹ *Id.*

⁹² See, Thomas N. Dahdouh and James F. Mongoven, *The Shape of Things to Come: Innovation Market Analysis in Merger Cases*, 64 ANTITRUST L.J. 405 (1995); On the Horizontal Merger Guidelines and market definition, see Alan J. Cox, *Antitrust and Intellectual Property Market Definition*, 483 PLI/Pat 131 (1997, Practising Law Institute); See also, David S. Evans, *Market Definition in Antitrust and Patent-Infringement Litigation*, 414 PLI/Pat 595 (1995, Practising Law Institute); For an overview of historical developments in US antitrust enforcement, see, Roger Lowenstein, *From Sherman to Pitofsky*, WALL ST. J. Feb. 27, 1997, at A1, available in 1997 WL-WSJ2411075; See also, Gerald Dumenil *et al.*, *Competition Policy in America 1888-1992: History, Rhetoric, Law (Book Reviews)*, ANTITRUST BULL. (June, 22, 1997), available in 1997 WL-12280186.

⁹³ For example, in *United States v. Von's Grocery Co.* 384 U.S. 270 (1966), the Supreme Court condemned a merger where the merging parties had only 4.7% and 4.2% of the relevant market (the retail grocery market in the Los Angeles area), but there was a clear trend towards decrease in the number of

Microsoft cases, recent administrations recognize the importance of innovation for the economy as a whole.⁹⁴ The antitrust enforcement agencies followed the Supreme Court's functional effects analysis by developing a separate "innovation market" merger analysis.⁹⁵ Although it seems that no court has ruled directly on the validity of that theory, it has been used in a number of settled complaints.⁹⁶

B. Antitrust Merger Analysis: the "Innovation Market" Doctrine

The new innovation market analysis contemplates the competitive importance of a merger's effects on innovation. An innovation market may be defined as "...the research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development."⁹⁷

single,-store grocers and increase in the number of supermarket chains. In other words, the court looked at the reality of the market instead of focusing on the existing market structure and the merging parties' market shares in it.

⁹⁴ Innovation is widely believed to be a central driving force for economic growth. See, Robert M. Solow, *Technical Change and the Aggregate Production Function*, 39 REV. ECON. & STAT. 312 (1957); See also, *FTC Staff Report, Competition Policy in the High-tech, Global Marketplace*, 64 ANTITRUST L.J. 569 (1996); Joseph Brodley, *The Economic Goals of Antitrust: Efficiency, Consumer Welfare and Technological Process*, 62 N.Y.U. L. REV. 1020 (1987) (arguing that innovation and production efficiency - partly driven by competition - should be a high priority goal of antitrust enforcement). See generally, Flynn, *supra* note 86.

⁹⁵ Consideration of innovation and other non-price competition is not new. For a survey of the treatment of innovation under the antitrust laws (1945-1988) see, James Langenfeld and David Scheffman, *Innovation and U.S. Competition Policy*, 34 ANTITRUST BULL., 1 (1989); See, e.g., *Kellogg Co.*, 99 F.T.C. 8 (1982), *United States v. Aluminum Co. of America*, 148 F. (2nd Cir. 1945) ("Alcoa"). See also, Flynn, *supra* note 86, at 497: "...innovation and production efficiencies have in fact been a central concern of antitrust policy since the beginning, and have been a principle reason for instituting some of antitrust's most doctrinally significant and successful cases." (Footnotes omitted).

⁹⁶ See, Ronald S. Katz, and Janet Arnold Hart, *Extremism in Defense of Market Definition is a Vice*, Available in WL: CA 26 ALI-ABA 1 (Jan. 25, 1996).

⁹⁷ Dept. of Justice & FTC, *Antitrust Guidelines for the Licensing of Intellectual Property* (April 6, 1995) (hereinafter IP Guidelines) § 3.2.3; For example, one product market considered in the 1995 merger of Glaxo and Wellcome (discussed below) was the R&D market for non-injectable migraine treatments; See also, 68 ANTITRUST 387 (1995), per Commissioner Varney; Richard M. Brunell, *Symposium: A Critical Appraisal of the "Innovation Market" Approach - Editor's Note*, 64 ANTITRUST L.J. 1 (1995); On the IP Guidelines see, Robert A. Mctamoney, *Antitrust and Intellectual Property Rights: The Devil is in the Details*, 219 N.Y.L.J 7 (Feb. 2, 1998).

Once defined, the innovation market analysis takes a future oriented direction and seeks to prevent mergers that are likely to harm competition in the defined R&D market. It does so by asking whether the ".hypothetical monopolist would impose at least a small but significant and non transitory reduction in R&D effort."⁹⁸ To put it more simply, R&D directed at a particular down-stream product, say, an experimental treatment for a particular disease, is looked at as a separate market. Prospective harm to competition in that "innovation market" resulting from a merger will justify the condemnation of that merger. For instance, considering the 1995 merger of Glaxo and Wellcome, the FTC concluded that the likelihood of a reduction in competition was high given the small number of competitors in R&D for non-injectable migraine treatments, and given the merging parties strength in that innovation market.

C. Innovation Market Approach and Ethical Pharmaceutical Mergers: General

In the United States, it has been recognized that competition in the health care field calls for "special attention" and "diminished innovation" in that field raises a "central antitrust question".⁹⁹ Consumers expect the pharmaceutical industry to deliver safe and effective products at the lowest possible prices, and competition among pharmaceutical firms is believed to be essential to that end.

1. The Legal Basis

Critics charge that innovation market analysis has no satisfactory legal basis because internal R&D does not typically involve commercial transactions within the meaning of

⁹⁸ See, Richard J. Gilbert and Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 64 ANTITRUST L.J. 569, 594 (1995).

⁹⁹ 70 ANTITRUST 4 (1996), per William J. Baer, Director of FTC Bureau of Competition; See also, *Whitener Outlines Main Concerns of FTC in Pharmaceutical Markets*, 68 ANTITRUST 11 (1995), arguing that pharmaceutical markets have always been an important focus of antitrust enforcement; Recently, two proposed mergers of giant drug wholesalers, McKesson Corp./Amerisource Health Corp., and Cardinal Health Inc./Bergens Brunswig Corp. were blocked by a Federal judge who sided with the FTC, holding that the proposed combinations would lead to higher drug prices and reduce services. See, Milt Freudenheim, *Judge Rejects Two Separate Drug Mergers*, N.Y. TIMES, Aug. 1, 1998, at B1.

section 7, Clayton Act.¹⁰⁰ However, there is little doubt that innovation markets can be incorporated into section 7 analysis as either "activity affecting commerce,"¹⁰¹ or as an open market for innovation which falls squarely within the prerequisite "line of commerce". Clearly, some mergers are driven by the desire to acquire particular innovation efforts,¹⁰² and there are markets for R&D services or intellectual property licenses.¹⁰³ Moreover, innovation market analysis may be seen as simply a tool assisting the agencies to identify combinations that are likely to reduce innovation competition with a resulting downstream welfare effect.¹⁰⁴ Arguably, this is precisely what merger analysis is about. This paper will therefore proceed on the assumption that there is an adequate legal basis for the utilization of the innovation markets analysis.

2. *The Principal Antitrust Concerns: an Illustration*

It has been argued above that in the prevailing business environment pharmaceutical firms may have a genuine need to consolidate. This section illustrates some of the concerns that might arise from certain combinations among competing ethical drug

¹⁰⁰ See e.g., Robert J. Hoerner, *Innovation Markets: New Wine in Old Bottles?*, 64 ANTITRUST L.J. 49, 50 (1995), citing *American Medicorp, Inc. v. Humana, Inc.*, 445 F. Supp. 589 (E.D. Pa. 1977); See also, Calvani, *supra* note 15, pp. 233-236, citing *SCM Corp. v. Xerox Corp.* 645 F.2d 1195 (2d Cir. 1981), *cert. denied*, 455 U.S. 1016 (1982) (the law does not reach an "inchoate" market); See also, Katz and Hart, *supra* note 96, at 8: "Because reasonable interchangeability analyzes products, not research and development, it is difficult to see how this concept will be accepted by the courts."

¹⁰¹ Internal R&D affects supply and demand just like any other input product into production. See, Dahdouh & Mongoven, *supra* note 92, pp. 412-413 citing, *inter alia*, *Radovich v. NFL*, 352 U.S. 445 (1957) (dealing with spill-over effects of internal activities).

¹⁰² See, Dahdouh & Mongoven, *id.*; See also, Gilbert & Sunshine, *supra* note 98, pp. 599-601, citing, *inter alia*, *United States v. Radio Corp. of Am.*, 1954 Trade Cas. (CCH) 67, 704 (D.Del. 1954); See also, Richard J. Gilbert and Steven C. Sunshine, *The Use of Innovation Markets: A Reply to Hay, Rapp, and Hoerner*, 64 ANTITRUST L.J. 75, 79 (1995), citing *United States v. General Motors Corp.*, No. 93-530 (D. Del. filed Nov. 16, 1993) (where the Department of Justice alleged output effect arising from elimination of horizontal competition over automatic transmissions' R&D).

¹⁰³ See, Gilbert and Sunshine, *supra* note 98, at 599.

¹⁰⁴ *Id.*, at 601; It is also interesting to note that innovation market cases appear to fall within section 5, FTC Act. See, *FTC v. PPG Industries, Inc.*, 798 F.2d 1500 (D.C. Cir. 1986), *rev'g* 628 F. Supp. 881 (D.D.C. 1986). See Calvani, *supra* note 15, at 236, and note 26.

firms.¹⁰⁵ To that end, the merger of two large innovative companies, Glaxo and Wellcome, and certain post-merger developments, are described below.

In 1995, Glaxo, a large UK pharmaceutical company, took over Wellcome - another large UK company. The merger was, at the time, the biggest in the history of the industry.¹⁰⁶ The FTC initiated a merger investigation stating that the proposed merger *prima facie* raises anti-competitive concerns. The complaints specified, among other things, that the merging parties were potential competitors in the highly concentrated market for development of non-injectable migraine drugs.

Glaxo was already marketing a non-injectable drug, and developed an improved agonist - Naramig. Wellcome did not have a migraine product on the market but its phase III drug - Zomig - was expected to be introduced during 1997 and thereafter "compete closely" with Glaxo's drug.¹⁰⁷ Accordingly, the concern was that future competition in the market for non-injectable migraine drugs will be eliminated as a result of the proposed merger.¹⁰⁸ The merged firm - Glaxo Wellcome - was therefore required by a consent order to divest, within a specified time limit, Wellcome's Zomig to an FTC-approved third party.

¹⁰⁵ As explained earlier, *supra* note 4 and surrounding text, this paper concentrates on research-based companies rather than manufacturers of over the counter (OTC) products or manufacturers of generic drugs which involve relatively small R&D expenditure and are not subject to the same rigorous regulatory regime.

¹⁰⁶ See generally, Evans (1995), *supra* note 34, at 46.

¹⁰⁷ See, Glaxo (European Commission), *supra* note 39, at para. 28.

¹⁰⁸ Another important overlap between Glaxo and Wellcome was identified by the European Commission (*supra* note 39, para. 33). The Commission examined the overlap in R&D of AIDS/HIV therapy. Wellcome's Retrovir was the leading HIV/AIDS drug at the time of the merger and Glaxo was developing 3TC. The European Commission nevertheless concluded that "[i]n the absence of definite treatment for HIV/AIDS, the combination of R&D resources is not expected to inhibit [total] R&D to a significant extent."; The threat that the possible loss of extremely valuable experimental treatments might be overlooked by the antitrust agencies is highlighted by the fact that the European Commission considered that 3TC will be licensed ("if at all") only as a complimentary product for Retrovir. As it turned out, 3TC proved to be one of the most important HIV/AIDS drugs ever introduced (largely as a part of a widely prescribed cocktail).

A divestiture of Wellcome's Zomig to Zeneca was approved about a year later.¹⁰⁹ Glaxo Wellcome and Zeneca recently announced regulatory approvals of Naramig and Zomig respectively.¹¹⁰ As a result, the dominance of Glaxo Wellcome's Imitrex over the migraine treatment market is likely to be seriously challenged by Zeneca's Zomig which is believed to offer significant advantages.¹¹¹ It seems that the FTC intervention in the Glaxo case preserved, if not boosted, competition in the migraine market for the benefit of America's millions of migraine sufferers.¹¹²

The Glaxo/Wellcome merger shows that combinations in the ethical pharmaceutical sector can raise important issues of consumer welfare and general public health. There is a danger that potentially beneficial treatments will be delayed, or even lost, as a result of otherwise perfectly legitimate commercial transactions. Superior products may be delayed for many years if the merged firm has the ability and incentive to do so.¹¹³ The

¹⁰⁹ See, 70 ANTITRUST 327 (1996).

¹¹⁰ See, FT, March 12, 1997; Zeneca also received FDA clearance in November 1997. See, Robert Langreth, *Zeneca's Migraine-Headache Drug Gets Marketing Approval as Rivalry Grows*, WALL ST. J., Nov. 28, 1997, at B6.

¹¹¹ Langreth, *id.*

¹¹² *Id.*: The approval "...is expected to boost competition in the \$1bn migraine drug market and provide migraine sufferers more options for pain relief."; See also, *Glaxo, Zeneca Set for Migraine Battle*, FT, March 12, 1998, at 23, available in 1998 WL 3779395; Ronald Alsop, *Splitting the Headache Market, Drug Firms Create a Big Niche in Migraines*, WALL ST J. Jan. 22, 1998, at A1, available in 1998 WL-WSJ 3479981.

¹¹³ The necessary components for suppression of technology - "ability" and "incentive" - are discussed in more detail below; The so-called "suppression of technology" issue was recently explored in a number of articles. See, *Symposium: Antitrust and the Suppression of Technology in the United States and Europe: Is there a Remedy?* 66 ANTITRUST L.J 415 (1998), in particular: Joel M. Cohen, *An Overview of the Antitrust Analysis of Suppression of Technology*, 66 ANTITRUST L.J. 421, 422 (1998) (discussing various forms of suppression such as "...situations in which a firm attempts to block the development or marketing of a competing technology through the acquisition of intellectual property"); "Suppression of technology" has been broadly described as "...the nonutilization and nondiffusion of a developed technology by those with control over the technology." See, Richard Dunford, *The Suppression of Technology as a Strategy for Controlling Resource Dependence*, 32 ADMIN. SCI. Q. 512, 513 (1987).

complexity, expense, and length of the development process, as described earlier, mean that timely, likely and sufficient competition is, in practice, unlikely.¹¹⁴

3. *The Objectives of the Innovation Market Analysis*

The innovation market doctrine intends to remedy the flaws of traditional merger analysis which focuses on actual or potential competition in the current product market. It is based on the notion that in a world of rapid technological advance the dynamic efficiency of the economy must be addressed.¹¹⁵ Innovation raises competitive concerns not met by static merger analysis. In the real world, goes the argument, important effects of a merger occur in the future when the products may be quite different than what they are now.¹¹⁶

Static merger analysis might overlook some important consequences of altered innovation because adverse effects on innovation can affect prices and products even where there is no actual or potential competition between the merging firms.¹¹⁷ The innovation market approach covers that gap by looking at the source of future competition; the upstream innovation markets. For example, traditional potential competition doctrine is unsatisfactory in markets where no merging firm competes prior to the merger, or where the merging firms search for products that do not yet exist.¹¹⁸

¹¹⁴ Under the 1992 Horizontal Merger Guidelines, § 3, the agencies consider ‘timely’, “...only those committed entry alternatives that can be achieved within two years from the initial planning to significant market impact.”

¹¹⁵ For an overview of high technology antitrust market definition, see, Rodger D. Young *et al.*, *Legal Attributes on High Technology Markets: The Outcome Determinative Role of Market Definition*, Available on WL: C137 ALI-ABA 1(Jan. 26, 1995)

¹¹⁶ See *e.g.*, David T. Scheffman, *Making Sense of Mergers*, 38 ANTITRUST 715, 724 (1993).

¹¹⁷ See, Gilbert & Sunshine, *supra* note 98, pp. 570-571; See also, *FTC Hearings*, *supra* note 35, pp. 487, 491 (1995), *per* David Mowrey.

¹¹⁸ See, George A. Hay, *Innovations in Antitrust Enforcement*, 64 ANTITRUST L.J. 7 (1995), at 7; See generally, Gilbert and Sunshine, *supra* note 102, at 81.

Finally, it is argued that the new analysis adequately addresses the current reality because competition in many industries is focused on innovation output more than on price.¹¹⁹ High level of R&D investment is believed to deliver significant social returns,¹²⁰ and welfare gains from increased innovation is easier to show than welfare gains from other forms of non-price competition.¹²¹ All told, innovation market analysis is not without controversy. For example, Alan Greenspan, chairman of the Federal Reserve, recently stated:

“I would feel very uncomfortable if we excluded various types of mergers and acquisitions of the basis of estimates and projections about how markets or technologies will evolve. History is strewn with people who made predictions that proved to be wrong. I would like to see far more firm roots to our judgments.”¹²²

4. *The Main Criticism*

Speaking generally, critics of separate analysis for innovation markets focus on two main arguments. First, it is contended that innovation is adequately dealt with by the existing doctrines of potential and actual competition as well as specific legislation.¹²³ In relation to potential competition, the main argument as voiced by Rapp (1995), is that the innovation markets analysis does not improve merger analysis in;

¹¹⁹ See, Dahdoun & Mongoven, *supra* note 92, at 409.

¹²⁰ See, Edwin Mansfield *et al.*, *Social and Private Returns from Industrial Innovation*, 91 Q.J. ECON. 221 (1977).

¹²¹ See, Gilbert & Sunshine, *supra* note 98, at 573; Given the uncertainty surrounding the economic basis for the antitrust laws, it is not unthinkable that welfare gains from increased innovation is even easier to show than welfare gains from price competition.

¹²² See, Wolffe, *supra* note 3; For a more detailed criticism see, Hay, *supra* note 118; Richard T. Rapp, *The Misapplication of the Innovation Market Approach to Merger Analysis*, 64 ANTITRUST L.J. 19 (1995); Hoerner, *supra* note 100; In the EU, the innovation market analysis is not, as such, formally recognized. For useful overviews see, Lawrence B. Landman, *Innovation Markets in Europe*, 11 E.C.L.R. 21 (1998), and John Temple Lang, *European Community Antitrust Law: Innovation Markets and High Technology Industries*, 20 FORDHAM INT'L L.J. 717 (1997).

¹²³ See, Rapp, *id.*, pp. 37-46. legislation include The National Cooperative Research Act 15 U.S.C. (1993) which aims to mitigate the antitrust implication of R&D collaborations.

"...potential competition cases, where one [merging firm] or the other [merging] firm is a potential entrant into the product market of the other (with both entrant and incumbent engaging in R&D), and traditional potential competition analysis will generally suffice."¹²⁴

According to Rapp, the *Glaxo* case, outlined earlier, "...poses a straightforward potential competition problem" because Glaxo's non-injectable drug was already on the market and Wellcome was simply a potential entrant.¹²⁵

The second main argument advanced by critics is based on the unclear relationship between market structure and innovation.¹²⁶ Since commercialization is far-off, they say, utilization of the new approach is so uncertain that it might impede innovation rather than encourage it.¹²⁷ The new concept, goes the argument, lacks a proper theoretical and empirical foundation because no economic theory or empirical basis conclusively link less R&D competition to less R&D, or less R&D to welfare losses.¹²⁸ More R&D input,

¹²⁴ Rapp, *id.*, at 40; *See also*, Katz and Hart (1996), *supra* note 96, at 8: "It is also difficult to see what this theory adds to established theories like potential competition."

¹²⁵ Rapp, *id.*, at 43. However, Rapp acknowledges that cases such as American Home Products (AHP), FTC, File No. 941-0116, 11/10/94 (discussed below), and Sensormatic Elec. Corp., FTC File No. 941-0126, 60 Fed. Reg. 5428 (Jan. 27, 1995) "...do not fit neatly into the conventional product competition or potential competition categories" because the only overlap in these cases was in the upstream R&D market and no downstream market yet existed; Indeed, as will be shown later, potential (actual or perceived) and actual competition suffers from three main defects: First, they are inadequate where the products under developments are likely to make the current market obsolete. Second, where current product market is, as yet, nonexistent. Third, where future competition in existing market will be harmed by combination of R&D assets today. *See generally*, Gilbert & Sunshine, *supra* note 102, pp. 79-82. In short, anti-competitive effect may be found where there is "...neither actual nor potential competition" (p. 81). Moreover, even if one agrees with Rapp's analysis, the innovation market analysis, as a tool aiding in the analysis of competitive effects, can simply "...support a potential competition case" (p. 82); For a comparison of the potential competition and innovation market theories, *see*, Calvani, *supra* note 15, at 231, note 16.

¹²⁶ For a summary of the main economic literature *see*, Willow A. Sheremata, *Barriers to Innovation: A Monopoly, Network Externalities, and the Speed of Innovation*, ANTITRUST BULL., Dec. 22, 1997. Available in 1997 WL 12280195.

¹²⁷ *See* Rapp, *supra* note 122, at 43; James Langenfeld and David Schefman, *Innovation and U.S. Competition Policy*, 34 ANTITRUST BULL. 1 (1989). *See also*, James B. Kobak Jr. and Richard P. McGuire, *FTC looks at Merger's Antitrust Effects on R&D: Agency Alleges that a Merger would Reduce Competition to Develop Future Drug Products*, 19 NAT'L L.J. C3 (03, 31, 1997).

¹²⁸ This issue calls for a considerable discussion and therefore forms a major part of the later parts of this paper. For a useful general discussion *see*, KIP W. VISCUSI ET AL, *ECONOMICS OF REGULATION AND ANTITRUST* 74-93 (Second ed., 1997); F. M. SCHERER & DAVID ROSS, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE* 600-682 (Third ed., 1990); Paul A. Geroski, *Innovation, Technological*

critics charge, does not necessarily mean more innovation because much R&D can be duplicative and wasteful, and there is no basis for distinguishing between "anti-competitive" and other R&D cuts.¹²⁹ Since the optimal amount of R&D is unknown, mistaking efficient combinations for "anti-competitive" ones could lead to over-enforcement.¹³⁰ As one commentator puts it: "Not only is the burden of the search enormous, but the reliability of what is found may be highly suspect at best...Why fight a Cold War if there is no enemy? Why launch an expensive, dangerous hunt for nonexistent Red Octobers?"¹³¹

5. *Innovation Market: Analysis of Conflicting Arguments*

A synthesis of the arguments mentioned above indicates that there is less disagreement than first meets the eye.¹³² For one, there is little controversy as to the important role of

Opportunity, and Market Structure, 42 OXFORD ECON. PAPERS 586 (1990); Wesley M. Cohen *et al.*, *Firms Size and R&D Intensity: A Re-Examination*, 33 J. INDUS. ECON. 543 (1987); F. M. Scherer, *Schumpeter and Plausible Capitalism*, 30 J. ECON. LIT. 1416 (1992); THOMAS M. JORDE AND DAVID J. TEECE (eds.), *ANTITRUST, INNOVATION, AND COMPETITIVENESS* (1992), *passim*. In that book, Baumol and Ordover point out that although monopoly may have negative effects on static efficiency, its effects on dynamic efficiency "are not so one sided" (p. 17); Calvani, *supra* note 15, pp. 228-229, asserts that "...if the executives who plow these fields have a difficult time [predicting the effect of a combination on the rate of innovation with any degree of confidence], the federal antitrust agencies may be particularly ill-equipped to do so."

¹²⁹ See Rapp, *supra* note 122, pp. 33-36; See also, Hay, *supra* note 118, at 16; Douglas H. Ginsburg, *Antitrust, Uncertainty, and Technological Innovation*, 24 ANTITRUST 635, 644-660 (1979); *FTC Open Hearings on Enforcement Policy Forged by Globalized Markets, Innovation*, 69 ANTITRUST 431 (1995), *per* James F. Rill.

¹³⁰ See, Rapp, *id.* at 46; See also, Sumanth Addanki, *The DOJ's Draft Intellectual Property Guidelines: An Economist's First Look*, 4 E.C.L.R. 220 (1995); Andrew C. Hruska, *A Broad Market Approach to Antitrust Product Market Definition in Innovative Industries*, 102 YALE L.J. 305 (1992); Note also the argument that the new concept does no more than employ new rhetoric to turn potential entry cases into horizontal cases. See, Hoerner, *supra* note 100, at 49; Lawrence B. Landman, *Did Congress Actually Create Innovation Markets?*, 13 BERKELEY TECH. L.J. 721 (1998) (contending that what the agencies actually protected in innovation market cases is competition in future goods markets rather than competition in innovation markets); See also, Nicholas A. Widenell, *The Crystal Ball of Innovation Market Analysis in Merger Review: An Appropriate Means of Predicting the Future?* 4 GEO. MASON. L. REV. 369 (1996), (alleging that the current use of innovation market is inconsistent with the Horizontal Mergers Guidelines' theory of harm).

¹³¹ James B. Kobak, Jr., *Running the Gauntlet: Antitrust and Intellectual Property Pitfalls on the Two Sides of the Atlantic*, 64 ANTITRUST L.J. 341, 361-362 (1996).

¹³² See, Brunell, *supra* note 97.

innovation in driving economic growth,¹³³ or that R&D concentration might slow innovation and can, under certain circumstances, raise anti-competitive concerns.¹³⁴ As far as isolation of anti-competitive mergers is concerned, application of the innovation markets approach to industry-specific situations does not seem to be ruled out. Logic dictates that provided the agencies can rationally link, within a specific industry, concentration, harm to innovation, and eventual welfare loss, the utilization of the innovation market doctrine in that industry may well be justified. It is also widely acknowledged, by advocates and critics alike,¹³⁵ that there may be welfare losses - such as delay in the introduction of new products that do not currently exist - that are not captured by traditional merger analysis.¹³⁶

All things considered, the real controversy appears to surround the facts and whether they are ascertainable.¹³⁷ The core of that controversy lies in the relative lack of validated hypotheses linking market structure to reduction in R&D, and reduction in R&D to diminished innovation. In other words, the main concern is about the ability of the agencies to correctly delineate the innovation market and isolate anti-competitive combinations. To be sure, that is precisely what the agencies do all the time.¹³⁸

¹³³ See, e.g., Rapp, *supra* note 122, at 25; Gilbert & Sunshine, *supra* note 98, at 569.

¹³⁴ See, Kenneth J. Arrow, *Innovation in Large and Small Firms*, in ENTREPRENEURSHIP 15 (Joshua Ronen ed., 1983); F. M. SCHERER, INNOVATION AND GROWTH: SCHUMPETERIAN PERSPECTIVES (1984); See also, Hay, *supra* note 118, pp. 16-17; *FTC Staff Report* (1996), *supra* note 94, per Janusz A. Ordover and Robert D. Willig; Gilbert & Sunshine, *supra* note 98, pp. 76-78; *FTC Hearings on Enforcement Policy*, (1995), *supra* note 35, at 492, per Judy Whally. *But cf.*, per Dennis W. Carlton.

¹³⁵ Surely, the latter are somewhat more reluctant. See, e.g., Rapp, *supra* note 122.

¹³⁶ See, Gilbert & Sunshine, *supra* note 102, at 82; Rapp, *supra* note 122, pp. 43-46; Hay, *supra* note 118, pp. 15-16; Dahdough & Mongoven, *supra* note 92, at 431.

¹³⁷ See, Brunell, *supra* note 97.

¹³⁸ See, John H. Shenefield, *Antitrust - The Next One Hundred Years*, 70 ST. JOHN. L. REV. 189 (1996); See also, Andrew Chin, *Analyzing Mergers in Innovation Markets*, 38 JURIMETRICS J. 119, 120 (1998) (“...factual uncertainty is an inherent part of most adjudication, and merger review is no exception.”); Jonathan B. Baker, *Contemporary Empirical Merger Analysis* (Remarks Before The George Mason University Law Review Symposium on “Antitrust in the Information Revolution: New Economic Approaches for Analyzing Antitrust Issues”, Key Bridge Marriott Hotel, Rosslyn, Virginia, Oct. 11, 1996, on file at the FTC), published in 5 GEORGE MASON L. REV. 347 (1997).

Therefore, it is submitted here that factual difficulty should not, in principle, preclude utilization of the new concept.¹³⁹

III. THE ALLEGED "MISSING LINKS" BETWEEN MARKET STRUCTURE, R&D INPUT, AND INNOVATION: FURTHER ANALYSIS

A. General

It has been submitted above that provided it is possible to predict harm to competition with sufficient certainty, utilization of the new concept for isolating anti-competitive combinations should be welcome. The pharmaceutical industry seems to be an "ideal" target for the use of the innovation market doctrine since it is driven by high-tech innovations and the characteristics of the drug industry, as outlined earlier, mean that in many cases the only horizontal competition overlap of merging firms is in R&D. While it is probably true that in high-tech industries "the pace of innovation is fast [and] the case for policy intervention to remove or prevent temporary market power is reduced"¹⁴⁰, the slow-paced drug development - as noted above - is clearly different. Moreover, the nature of the consumer interest at stake implies that it should not be ignored, occasionally or even sporadically. Hence, it will be argued here that, in certain situations, the use of innovation market analysis in the context of horizontal mergers between ethical pharmaceutical companies, is the right policy.

¹³⁹ See e.g., Chin (1998), *id.*, pp. 129-145 (proposing a useful construction which tackles the exact issue of market structure and innovation in the context of antitrust innovation markets analysis); See also, Andrew Chin, *Antitrust By Chance: A Unified Theory of Horizontal Mergers Doctrine*, 106 YALE L.J. 1165,1167 (1997) (arguing that provided the right "dynamic market model" is used, "...the Horizontal Merger Guidelines do express a rational, coherent enforcement policy, informed by the dynamic behavior of market structure").

¹⁴⁰ Bill Bishop and Cristina Caffarra, *Dynamic Competition and Aftermarkets*, 19 E.C.L.R. 265, 266 (1998) (discussing the fast changes in the European market for "extra-large clinical chemistry analysers" and giving the recent Hoffman-La Roche/Boehringer Mannheim merger (European Commission Press Release, 4 C.M.L.R. 412 (1998)), as an illustration of how the dynamic nature of competition can reduce concerns about creation of market power). See also, Richard J. Urowsky *et al.*, *Market Definition and "Standards"*, available in 1996 WL CA26 ALI-ABA 19 (Jan. 25, 1996) ("high-technology markets may be dramatically altered in as short a period as a year or even a matter of months").

It may be seen from the discussion in the previous section that the remaining skepticism surrounding the innovation market concept centers on the following question: Does utilization of the innovation market approach make it possible to identify a merger's anti-competitive effects with sufficient certainty despite the lack of a satisfying all-embracing theory linking market structure and innovation?¹⁴¹

B. Is There a Connection Between Concentration and R&D Slowdown?

1. Size and R&D Slowdown?

The relationship between size and innovation has long been a 'hot' issue among economists.¹⁴² The debate is by no means settled. One cross-industry study identified small firms as contributing 2.45 times more innovations per employee.¹⁴³ Others, in the spirit of the "Schumpeterian hypothesis", would disagree.¹⁴⁴ Scherer has warned that "[t]he search for a firm size uniquely and unambiguously optimal for invention and innovation is misguided,"¹⁴⁵ but went on to summarize the innovation-related advantages

¹⁴¹ The current position on the relationship of market structure and innovation may be summarized as follows (SCHERER & ROSS, *supra* note 128, at 682): "...a considerable volume of research suggest that the links between market structure and innovation are weak, surrounded by much "noise" associated with other measured and unmeasured influences...[While] a bit of monopoly power in the form of structural concentration is conducive to innovation...very high concentration has a positive effect only in rare cases, and more often it is apt to retard progress by restricting the number of independent sources of initiative and by dampening firms' incentives to gain market position through accelerated R&D".

¹⁴² *See, e.g.*, Zoltan J. Acs and David B. Audertesch (eds.), *INNOVATION AND TECHNOLOGICAL CHANGE* (1991), *passim*.

¹⁴³ *Id.*, at 6. The use of a different database produced similar results (2.38 more innovation per employee than do larger firms).

¹⁴⁴ *See, id.*, at 10 (quoting Galbraith (1956)): "There is no more pleasant fiction than that technical change is the product of the matchless ingenuity of the small man forced by competition to employ his wits to better his neighbor. Unhappily, it is a fiction."

¹⁴⁵ F. M. SCHERER AND D. ROSS, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE* 418 (Second ed., 1980).

of small firms compared to large firms, particularly their less bureaucratic structure and their ability to sustain "a fever pitch excitement."¹⁴⁶

There have been a number of studies of the relationship between size and innovation input and, overall, the empirical evidence appears to support Scherer's conclusion that the relationship is "roughly proportional."¹⁴⁷ In contrast, the generation of patents appears to increase "...at a less than proportional rate along with firm size."¹⁴⁸ A number of studies support that conclusion.¹⁴⁹ The 1994 report of the President on the state of small business contains a useful overview of innovation and small firms:

Small firms are estimated by The Futures Group to be responsible for 55 percent of manufacturing product innovations and produce twice as many innovations per employee as large firms, as well as twice as many significant innovations...The small firm percentage share of nonfederal R&D funds is almost three times its percentage

¹⁴⁶ F. M. Scherer, *Innovation and Small Firms*, Testimony before the Subcommittee on Monopolies and Commercial Law, Committee on the Judiciary, US House of Representatives, February 24, 1988, pp. 4-5, (cited by Acs and Audertsch, *supra* note 142, at 10); JOSHUA RONEN (ed.), *ENTREPRENEURSHIP* 4 (1983), maintains: "[i]n my own interviews, it seemed evident that bolder entrepreneurs found the large organization stifling, the need to justify plans and investment inhibiting. This pointed to the strong possibility that mutual self-selection links the novelty-seeking, independent-minded entrepreneur with the small firm, the managerial type with the larger organization."; MICHAEL E. PORTER, *THE COMPETITIVE ADVANTAGE OF NATIONS* 49 (1990), argues that "[c]ompanies that innovate are frequently not established leaders, or even large companies....Any economies of scale in R&D that would favor large firms are outweighed by the fact that many innovations do not involve complicated technology, and large firms face many barriers to perceiving and acting discontinuities."

¹⁴⁷ F. M. Scherer, *Does Antitrust Compromise Technological Efficiency?*, 15 *EASTERN ECON. J.* 1, 2 (1989), cited by Acs and Audertsch, *supra* note 142, at 11. Acs and Audertsch conclude (p. 12), Citing Comanor (1967), Mansfield (1968), Mansfield *et al* (1971), Soete (1979), Bound *et al.*, (1984), and Scherer (1984), , that "...the empirical evidence seems to generally support the Schumpeterian hypothesis that research effort is positively associated with firm size."

¹⁴⁸ Acs and Audertsch, *supra* note 142, at 11.

¹⁴⁹ *Id.*, at 12, citing, Scherer (1965), Bound *et. al.* (1984); *See also*, Joachim Schwalbach and Klaus F. Zimmermann, *A Poisson Model of Patenting and Firm Structure in Germany*, in Acs and Audertsch eds. (1991), *supra* note 142, , finding that in the (former) West Germany larger firms tended to patent less than smaller firms; Acs and Audertsch, *supra* note 142, sampled over 700 enterprises and concluded that larger firms are more R&D intensive than smaller firms but "the productivity of R&D apparently falls along firm size" (p. 13); F. M. Scherer, *Changing Perspectives on the Firm Size Problem*, in Acs and Audertsch, *supra* note 142, at 24, suggests that small firms may have an advantage at product innovation whereas larger firms may have an advantage at process innovations; Wesley M. Cohen and Steven Klepper, *Firm Size Versus Diversity in the Achievement of Technological Advance*, in Acs and Audertsch, *supra* note 142, at 183, confirm that industries composed of many small firms tend to exhibit greater diversity in the approaches to innovation and more rapid technological change.

share of federal funds. A federal R&D dollar to a small firm is more than four times as likely to be used for basic research as federal R&D dollar to a large firm. The estimated rates of return on R&D are higher for firms with a university relationship. Compared with large firms, small firms appear to be able to transfer knowledge gained from external research associations more effectively, and thus to increase the returns to their total R&D activities.¹⁵⁰

On the whole, cross-industry studies appear to indicate that in today's environment in which the cost of R&D is generally high, both small and large firms play an important role in contributing to innovation.¹⁵¹

Turning to the subject-matter of this paper - medical research - Omta (1995) states that "[s]ize can be considered to be by far the most important contingency in relation to performance. But does larger size also lead to higher effectiveness? In other words, can 'economies of scale' be observed in biomedical research and pharmaceutical innovation?"¹⁵² The literature offers the following observations.¹⁵³ A minimum investment in pharmaceutical R&D is generally needed in order to achieve satisfactory

¹⁵⁰ THE STATE OF SMALL BUSINESS: A REPORT OF THE PRESIDENT 109-131, 1994 (together with the Annual Report on Small Business and Competition and Annual Report on Federal Procurement Preference Goals of the U.S. Small Business Administration) (United States Government Printing Office, Washington, 1995). The Report also points to small businesses' growing share of federal contracts in R&D.

¹⁵¹ Acs and Audretsch, *supra* note 142, at 16; Paolo Sylos-Labini, *Capitalism, Socialism, and Democracy, and Large-Scale Firms*, in ENTREPRENEURSHIP, TECHNOLOGICAL INNOVATION, AND ECONOMIC GROWTH: STUDIES IN THE SCHUMPETERIAN TRADITION 55-64 (F. M. Scherer and Mark Perlman, eds., Forth ed., 1995), argues that Schumpeter did not appreciate the synergistic influence of small, research-based firms on large corporations and consequently underestimated their role in capitalist economies. This, according to Sylos-Labini, is particularly so in light industries "...where the role of dynamic, small firms appears to be essential, especially in that group of industries that has taken the lead in many processes of innovation" (p. 63); Jonathan B. Baker, *Fringe Firms and Incentives to Innovate*, 63 ANTITRUST L.J. 621, 639 (1995), concludes that "...with the differing innovation incentives of fringe and leading firms, the theoretical and empirical studies of influence of seller concentration on innovation have not led to the identification of a general rule applicable to most industries"; Kenneth J. Arrow, *supra* note 134, pp. 26-27, suggests that, due to the need to specialize, the less costly and more original innovations are initiated by small firms while innovations that are more expensive and less radical in their nature are produced by larger firms; This essentially suggest a division of labor according to firms size under which smaller specialize more in research while larger firms devote more efforts to larger development and will pay, one way or the other, to access the technologies developed by smaller firms; Ronen, in turn, argues that this specialization create opportunities for takeover and mergers. See, Ronen, *supra* note 146, at 4.

¹⁵² OMTA, *supra* note 10, at 109.

¹⁵³ See generally, *id.*, pp. 111-112.

returns on investment.¹⁵⁴ Several researchers found that above that minimum level pharmaceutical innovation brings about increasing returns on investment.¹⁵⁵ Others, by comparison, point to decreasing returns on investment.¹⁵⁶ Alexander (1996), sampling 26 international pharmaceutical firms, showed that a relationship between firm size and R&D productivity does exist.¹⁵⁷

Some researchers claim that, at least in academic organizations, larger size creates a poor research environment and a negative relationship between size and effectiveness has actually been shown in several studies.¹⁵⁸ Omta (1995), offers the following observations about economies of scale:¹⁵⁹

¹⁵⁴ *Id.*, at 111 (citing Taggart (1993)).

¹⁵⁵ *Id.*, (citing Angillery (1973), and Shrieves (1978)).

¹⁵⁶ *Id.*, (citing Soete (1979), and Graves and Langowitz (1993)). The latter compared pharmaceutical firms and biotechnology firms and concluded that returns on biomedical R&D diminishes as the size of R&D increases.

¹⁵⁷ Donald L. Alexander, *R&D Productivity and Global Market Share in the Pharmaceutical Industry*, in Helmes ed., (1996), *supra* note 38, pp. 130-151. Alexander looked at the number of R&D compounds patented, the number of R&D employees, the nominal firm level pharmaceutical R&D expenditures, the total number of employees, sales data, and total number of sales employees. He concludes (p. 151): "For plausible R&D staff sizes, increases in firm size have a positive effect on average R&D productivity but a negative effect on marginal R&D productivity. Moreover, the marginal effect of an additional dollar spent on R&D becomes smaller as firm size increases, perhaps owing to the bureaucratic inefficiencies associated with larger firms." In other words "...firm size affects R&D productivity only up to a certain size."

¹⁵⁸ OMTA, *supra* note 10, at 111 (citing Stroup (1966), Bresser and Dunbar (1986)); M. J. Crumpton, *Research Outside Industry - The Contrasts*, in Bruce Durie ed., (1991), *supra* note 14, surveys the factors necessary for creativity outside the industry and concludes (p. 27): "The fundamental difference between a research institute and the pharmaceutical industry is that the former's investigations are principally curiosity-driven and its achievements are measured in terms of conceptual advances. In contrast, the industry is primarily concerned with realising specific aims and achieving these through directed programs which exploit established concepts."; OMTA, *id.*, hypothesized that "[t]here is some literature about optimum size of research unit, but no information exists concerning minimum size." A certain thresholds exists, "...beneath which pharmaceutical innovation will be difficult to maintain,...Above this level economies of scale will appear, with increasing research and innovative performance and effectiveness [thanks to positive influence of personnel control, resources control, planning, research process communication, and external control]. This will continue until an optimum level is reached, above which the effectiveness will decline ['economies of scale' may turn into 'dis-economies of scale' because the span of control of the head of the unit may put limits on the size of the unit because of coordination problems due to weaker control capacity]." See also Omta's exhibit on p. 112). Testing this hypothesis against empirical data gathered in universities, Omta concludes (p. 198) that "no 'economies' nor 'diseconomies of scale' could be observed. Indeed many high performing units were not large. In some cases this was the strategic choice of the head of the unit." In relation to other institutes, Omta states (pp. 199-200) that "...no optimum project size can be established....However, the average project size in institutes is significantly smaller than in universities, which might be interpreted as confirming evidence for the Mayntz's observation [Mayntz, R. 1985,

R&D expenditure as a percentage of sales - "At lower sales levels the R&D expenditures increases almost linearly with size, indicating that the companies in this category increase their innovative potential in proportion to the sales-volume. At the highest sales-volumes, however, a saturation level seems to be reached. Apparently, there is no further need to invest the extra sales-volume in innovative potential."¹⁶⁰

Number of patents in relation to the investment in discovery - "The larger firms clearly submit more patents per invested dollar than the smaller ones. This could be a clear indication of their higher innovative effectiveness. Another explanation could be that larger companies submit their patents relatively earlier than smaller ones."¹⁶¹

Forschungsmanagement: Steuerungsversuche Zwischen Scylla und Charybdis; Problem der Organisation und Leitung von Hochschulfreien öffentlich finanzierten Forschungsinstituten Westdeutscher Verlag, Opladen], that attaining programmatic homogeneity is more difficult in institutes than in universities, because of the bargaining power of outside contractors."; Another interesting hypothesis made by Omta (p. 119, citing Allen (1977)), is that 'pure play pharmaceuticals', due to their better adaptation to the pharmaceutical market, will perform better than dependent pharmaceutical divisions of conglomerates. According to Omta, this view is supported by recent spin-offs of non-drug interests by some pharmaceutical companies. Omta's data confirms that hypothesis: "[at present] the pure play pharmaceuticals are performing better."; Omta (p. 179) found that, calculated per \$10m investment in discovery, large biomedical companies submit 9.6 patents per year compared to 2.7 patents per year submitted by small biomedical companies. Also, "...the number of therapeutic areas in which the pharmaceutical companies carry out research increases with the size of the R&D expenditures from 5 to 6 therapeutic areas in smaller companies to 8 to 9 in larger ones"; It seems that larger firms benefit from higher barriers to entry (e.g., regulation, long clinical trials etc.) because such changes squeeze out small firms, "...leading to larger optimal size, fewer competitors, and greater concentration, but not necessarily stronger competition." See, WILLIAM C. BOGNER AND HOWARD THOMAS, DRUGS TO MARKET: CREATING VALUE AND ADVANTAGE IN THE PHARMACEUTICAL INDUSTRY 20 (1996).

¹⁵⁹ OMTA, *supra* note 10, pp. 208-210.

¹⁶⁰ *Id.*

¹⁶¹ *Id.*, suggesting that "...patent fees and the translation costs constitute a smaller part of the R&D budget of the larger companies, and therefore they are more likely to play for safety." However, Omta's interviews with research directors indicated that patent strategies largely depend on the therapeutic area in question. Patenting is completed at an early stage in a highly competitive area such as Aids; *CF*: A survey of British patents granted in the US (not just pharmaceutical companies) found that "...companies investing 3% of the total business R&D were responsible for 30% of innovation. The top 11 firms (with more than 1000 employees) had 90% of the research and development budget which resulted in 60% of innovations." See, Shelley, *supra* note 51, at 13; The finding that larger pharmaceuticals have more patents does not necessarily mean that they are more creative. There is still the question of the quality of their patents. For example, in some years during the 1980s Japanese pharmaceutical firms as a group produced a larger number of new patents than their US counterparts. However, there is debate about the actual level of innovation of their patented drugs. See, R. Roehl, *The Role of International R&D in the Competence-Building of Japanese Pharmaceutical Firms*, in DYNAMICS OF COMPETENCE-BASED COMPETITION: THEORY AND PRACTICE IN THE NEW STRATEGIC MANAGEMENT 378 (Ron Sanches *et al.*, eds., 1996). It should also be noted that technology may be licensed or sold to large established drug firms before a patent is applied for. That is precisely the nature of the new division of labor in the pharmaceutical industry. Clinical trials and post-approval marketing are conducted by the established firms using their downstream competences while the smaller biotech firms are often the source of the technology itself; E. Änggård, *Knowledge Management in Industry and in the Universities*, in Bruce Durie ed. (1991), *supra* note 14, at 17, suggests that a relation between informal organizations and creativity does exist: "Studies of highly innovative organizations have pointed out how a loose, permissive management style can increase the degree of innovation." Further, "[s]uch an environment should be regarded as a company asset to be

The number of new products launched - "[T]he larger companies in the sample were the only ones who introduced innovative drugs, giving strong support to the thesis of higher innovative strength in larger companies. This result should be interpreted with some caution [for only] the largest companies can finance the huge marketing and sales effort necessary for influencing the prescribing pattern in a desired direction."¹⁶²

The length of the development process¹⁶³ - "The length of the development process transpires to be shorter in the larger companies. This finding can mainly be attributed to the greater size of the development budget."¹⁶⁴

Conclusion - "Although all these parameters can be separately criticized on solid grounds, when combined they point in the same direction, namely, that economies of scale can be observed in pharmaceutical innovation. Therefore, it appears that the recent strategy, developed to cope with the political and economic risks, of increasing concentration by mergers and joint ventures and strategic alliances, is also justifiable from the viewpoint of scale economics in pharmaceutical innovation."¹⁶⁵

nurtured like the goose who lays the golden egg."

¹⁶² The main explanation for that finding is probably that drug innovations that are developed by small companies are licensed out or sold to major companies at earlier stages or even as a result of poor sales. For example, A. Reyntjens and S. Van Reet, *Success Factors of Janssen Research*, in Bruce Durie ed. (1991), *supra* note 14, at 50, observe that "during the early years [of Janssen] many products were partly developed by licensees." As will be seen from the discussion that follows, that description appears to represent the current reality of the industry; Note that Omta, *supra* note 10, at 209, also mentions the possibility that "...smaller companies introduced innovative drugs which did not receive the recognition they deserve."

¹⁶³ According to the model developed by Henry G. Grabowski and John M. Vernon (*Pioneers, Imitators, and Generics*, 102 Q.J. ECON 491 (1987)), each year of earlier launch (than would normally be expected), will provide additional three years of patent protection. See, OMTA, *supra* note 10, at 209.

¹⁶⁴ OMTA, *id.* A further explanation is that "larger companies have more opportunities for parallel development, because it is easier to shift R&D staff between projects."

¹⁶⁵ *Id.*, Omta considers it possible that it is the development phase, not the discovery phase, that is the limiting factor in pharmaceutical innovation. This partly explains the discrepancy between Soete's conclusion (1979) *op. cit.*, and Omta's conclusion. In other words, government regulation is more strict now than in the 1970s. Thus, "...the investments needed, especially for the large scale clinical trials, have increased considerably, while the possibilities to recoup these investments have decreased, especially for the smaller companies which cannot afford a huge marketing and sales force"; This view is supported by Jerome E. Schnee and Erol Caglarcan, *Economic Structure and Performance of the Ethical Pharmaceutical Industry*, in Cotton M. Lindsay ed (1978), *supra* note 17, at 32. They argue that "...the relationship between innovation and firm size has changed significantly since 1962." They cite Henri G. Grabowski (*The Determinants of Industrial Research and Development: A Study of the Chemical, Drug, and Petroleum Industries*, J. POLITIC. ECON 292-305 (March-April, 1963)), and EDWIN MANSFIELD (INDUSTRIAL RESEARCH AND TECHNOLOGICAL INNOVATION (1968)), for the proposition that during the 1945-1962 period the largest firms did not spend more on R&D, relative to sales, than did smaller firms. Based on the study of the 1965-1970 period, David Schwartzman (*Research Activity and Size of Firm in the U.S. Pharmaceutical Industry*, in REGULATION, ECONOMICS AND PHARMACEUTICAL INNOVATION (D. Joseph Cooper ed., 1976)), found (using laboratory employment data) that research effort increases more than proportionally with firm size (see, Lindsay, *id.*, at 32). As to research output and firm size, William S. Comanor (*Research and Technical Change in the Pharmaceutical Industry*, REV. ECON. STATISTICS pp. 182-190 (May, 1965)), found that in the 1955-1960 period, there were substantial diseconomies of scale in R&D which were associated with large firm size (Lindsay, *id.*, at 32). Jerome E. Schnee (*Innovation and Discovery in the*

The same study cautiously concludes that "a minimum annual R&D expenditure of \$200m is needed to maintain the innovative potential."¹⁶⁶

Views such as the one summarized above may be placed against some strong contrary views and evidence. To start, one director of research and development offers the following observations about creativity in pharmaceutical research:

[T]here are many analogies between the environment necessary for drug discovery and that required for artistic creativity...the creation of an environment which is conformist involving formalized approaches to activity and which is highly structured is likely to lead to mediocrity in innovative pharmaceutical research.¹⁶⁷ (footnote added) "[A] bias for action" and "simultaneous loose-type properties"¹⁶⁸ (footnote added) are the very essence of a research environment [however] as discovery research moves from initial identification of potential leads to the optimization of these compounds, a more

U.S. Ethical Pharmaceutical Industry, in RESEARCH AND INNOVATION IN THE MODERN CORPORATION (Edwin Mansfield, *et. al.* eds., 1972), found that the largest drug firms did not produce a disproportionately large share of the most important innovations between 1935 and 1962. The most innovative pharmaceutical firms, relative to their size, were not the largest firms but smaller ones (Lindsay, *id.*, at 32). John Vernon and Peter Gusen (*Technical Change and Firm Size: The Pharmaceutical Industry*, 56 REV. ECON. AND STATISTICS 294-302 (1974)), disapproved with Comanor's 'diseconomies of scale' hypothesis and found that, for the 1965-1970 period, the larger firms appeared to have decided advantages over smaller ones in accomplishing technical changes (Lindsay, *id.*, 32). Schwartzman (1976), *op. cit.*, studied the 1965-1970 period and concluded that the largest drug firms produce more innovations, relative to their size, than do smaller ones (Lindsay, *id.*, 32-33). Accordingly, Lindsay (p. 33) argues that the increased costs resulting from the 1962 amendments to the Food, Drug, and Cosmetic Act "...inadvertently provided an advantage to larger firm, due primarily to the increased costs associated with developing and introducing new drugs since 1962. These huge increases in R&D costs apparently have made it increasingly costly and difficult for small firms to innovate."; More stringent regulation in the US roughly coincided with tougher regulation in other countries such as the UK (The Medicines Act of 1968); B. Richards, *The Transition from Biotechnology to Pharmaceuticals*, in Bruce Durie ed. (1991), *supra* note 14, at 106, states that "[t]echnical and scientific progress can often appear to be easier to achieve than the translation of the results they generate into useful products."; Josh Lerner, *Patenting in the Shadow of Competitors*, 38 J.L. & ECON. 463 (1995), examines the effect of another obstacle faced by biotech firms - patent litigation costs - and concludes (p. 490): "Firms with high litigation costs appear less likely to patent in the same subclass as rivals. These firms seem particularly reluctant to patent after awards to firms that have low litigation costs." In other words, costly patent litigation positively affects their "...willingness to take care."

¹⁶⁶ OMTA, *supra* note 10, at 210.

¹⁶⁷ T. M. Jones, *Organizing Research within Industry*, in Bruce Durie ed. (1991), *supra* note 14, at 37; Stephen S. Hall, *Success is Like a Drug*, N.Y. TIMES MAGAZINE, Nov. 23, 1997, at 68, examined a small biotech start-up, Tularik and reported that "[t]he fact that a talented researcher two years out of graduate school can be entrusted with a major drug-development program helps explain how a small company like Tularik can even presume to compete with big companies." As one researcher put it: "SmithKline Beecham would not be able to hire the top 30 guys at our company, no matter how much money they pay them...It's not just the money. It's the culture. How many companies would give essentially a student out of a Ph.D. program the head of an obesity project?"

¹⁶⁸ Jones, *id.*, at 38, citing Peters and Waterman (1982).

structured environment is necessary since a wider range of functions need to be involved.¹⁶⁹

Small units can therefore be seen as vital for team building and effective communication and so is a simple structure.¹⁷⁰ This proposition, however, must be qualified:

"[T]here are many successful drugs emanating from many different organization structures. Without organization research can become chaotic and unproductive. On the other hand, structuring the organization is no guarantee of success which relies primarily on the teams and their individuals."¹⁷¹

The following story demonstrates just how 'elastic' any opinion on the subject can be. In 1971, Beecham made a £290m offer - later blocked by the UK's Monopolies and Mergers Commission - for Glaxo. Glaxo's defense was that big was not beautiful in R&D. Indeed, Glaxo's scientists made "...an amazing series of discoveries during the 1970s and 80s that propelled their employer almost to the top of the global pharmaceutical league."¹⁷² Although it is impossible to know whether a combined and cumbersome Glaxo/Beecham would have scored better, it is hard to believe that Glaxo, stuck with Beecham's bureaucratic culture, would have competed so effectively.¹⁷³ Upon backing its January 1998 merger plan with SmithKline Beecham, Glaxo seems to have turned its 1971 argument on its head, "...big, it now says, is indeed beautiful in R&D."¹⁷⁴

Even if one accepts that much larger companies do possess scale advantages in drug R&D compared to smaller companies, companies may have different priorities and a

¹⁶⁹ *Id.*, at 38.

¹⁷⁰ *Id.*, ("The process of discovery is difficult enough without seeking to complicate it through bureaucratic, mechanistic procedures and impositions.")

¹⁷¹ *Id.*, at 42.

¹⁷² *Chemical Formula*, FT, Feb. 2, 1998, at 17, available in 1998 WL 3529339.

¹⁷³ *Id.*

¹⁷⁴ *Id.*

small firm may have invested much more within a particular niche in order to create a competitive advantage. Specialization is therefore a key factor and heavy investment in a specific R&D area may compensate for the relative small size of a pharmaceutical company.¹⁷⁵ Indeed, as will be illustrated below, the biotechnology revolution appear to have had an important impact on the ethical drug industry.

The story of Janssen, a pharmaceutical company established in 1953, illustrates the potential merits of small drug research companies. Paul Janssen, a 27-year-old MD, "...short of money but full of ideas," was able to synthesize some new chemical entities (hereinafter NCE) for which some large US companies were prepared to pay.¹⁷⁶ This allowed Janssen "...to build a small laboratory, buy some animals, hire a few people and eventually synthesize and study more compounds."¹⁷⁷ By 1989, Janssen effectively marketed 69 new chemical NCEs, 48 of which for human use, generating sales of over \$3bn. Janssen's innovations made important contributions to several therapeutic fields including new neuroleptics in psychiatry, novel antiallergics, and potent analgesics for anaesthesia.¹⁷⁸ Janssen's research philosophies have been to "...build research around people" and "...let research determine its own course."¹⁷⁹ More specifically, Janssen always kept its hierarchical levels to minimum, guaranteed the right of initiative for everyone, practiced an open-door policy, and maintained a prompt decision-making and

¹⁷⁵ Innovative firms may be specialized enough to have a large share of the global market for R&D or even for production of end products. Examples include Novo-Nordisk, the Danish insulin manufacturer, and Akzo-Pharma, the Dutch contraceptives manufacturer. See, Peter de Wolf, *The Pharmaceutical Industry*, in EUROPEAN INTEGRATION AND COMPETITIVENESS 277, 298 (Frederique Sachwald ed., 1994); Another example is the competition for the introduction of an effective flu treatment. Two small biotech firms specializing in influenza research, Gilead Sciences of California and Australia's Biota Holdings, developed innovative treatments which were licensed to Roche and Glaxo respectively and are currently at late approval stages. See, Michael Waldholz, *Glaxo, Roche Race to Market a New Flu Drug*, WALL ST. J. Oct. 2, 1997, at B7, available in 1997 WL-WSJ 14168502.

¹⁷⁶ Reyntjens and Van Reet, *supra* note 162, at 43.

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*, at 44.

immediate feedback.¹⁸⁰ Presumably, most of these factors will be found "...in other young and successful companies. After all they derive from common sense."¹⁸¹

Another useful illustration is provided by the case of British Biotech, a UK biotech firm. The company was founded in 1986 with £2.5m by a few scientists "let go" following the acquisition of GD Searle by Monsanto.¹⁸² The initial financing came from venture capitalists.¹⁸³ The company concentrated on combining ideas from biotechnology with ideas from the more traditional medicinal chemistry.¹⁸⁴ It focused on a small number of physiological areas believing that doing so is critical for small pharmaceutical companies.¹⁸⁵ It was assumed that the advantages of emerging companies in this respect is that "...they don't have established markets to support or the need to indulge in speculative research."¹⁸⁶ British Biotech now has at least one potential blockbuster - "Marimastat" - a pill undergoing third stage clinical trials for several types of cancer. It is seen by some industry analysts as one of the most promising cancer drugs currently in development, though its eventual success is, just like any other experimental drug, uncertain. Several prominent US, UK, and Japanese pharmaceutical companies have taken equity stake in British Biotech.¹⁸⁷

¹⁸⁰ *Id.*, at 48: "Early feedback is based on direct - if needed, verbal - communication and on a few coordinators who visit and monitor all the research laboratories every day and discuss important observations on a daily basis with top research management."

¹⁸¹ *Id.*, at 50.

¹⁸² Richards, *supra* note 165, at 104.

¹⁸³ *Id.*, at 107.

¹⁸⁴ *Id.* The author, British Biotech's chairman at the time, argues that "[b]ig companies may have the combination of expertise necessary for this approach but also a bureaucracy which can be disabling to its fulfillment."

¹⁸⁵ And "...desirable for larger pharmaceutical companies." *Id.*, at 107,

¹⁸⁶ *Id.*, "At the end of the day, the choice of research programmes is best determined, in an emerging company, by the expertise and interests of those who lead."

¹⁸⁷ Howells & Neary, *supra* note 75, at 74; Note that at the time of writing British Biotech is facing confidence problems on the part of investors and analysts (though these problems appear to be more about management disputes than about the company's core technology). See, Jonathan Guthrie, *The Changing Fortunes of British Biotech*, FT, May 2, 1998, at 22; See also, *Contrasting Fortunes for Two UK Drug Groups*, FT, Dec. 16, 1998 (<http://www.ft.com>)

In addition to looking at individual firms, one may look at individual treatment markets in order to understand 'what is going on' in today's ethical drug industry.¹⁸⁸ Developments in the treatment of diabetes illustrate the type of breakthroughs that can now be expected from small start-ups. In that market, the number of diabetics is rising and demand for better treatments that are easier to administer is growing. While the traditional insulin market is dominated by big pharma such as Eli Lilly, the promising new therapies mostly originated from small companies.¹⁸⁹ For example, Ergo Science developed bromocriptine pills, and Therapeutic Systems developed an inhaler that dispense insulin, both products avoid the use of syringes.¹⁹⁰

Moving on from individual companies and individual markets to a more general outlook; whatever one's view as to the importance of economies of scale in the pharmaceutical sector, the fact remains that the current most significant development with regard to innovation, namely the switch from chemical to molecular basis, emerged largely outside the traditional big players.¹⁹¹ Molecular biology research in the 1970s

¹⁸⁸ To be sure, the reality of the industry is complex. Thus, the "...light hearted view of the prevailing philosophies in both large and small [pharmaceutical] companies,...exacerbates the ineffective dissipation of resources." See Richards, *supra* note 165, at 109 and table therein.

¹⁸⁹ See, Lawrence M. Fisher, *Drug Makers at Thresholds of a New Therapy*, N.Y. TIMES, Jan. 17, 1998, at B1.

¹⁹⁰ *Id.*; Another big market in which small companies seem on their way to overcome traditional difficulties faced by big pharma is the Rheumatoid Arthritis treatment market. Both Immunex's closely watched Enbrel and Centocor's Avakine have successfully concluded respective phases of clinical trials See, WALL ST. J., Nov. 10, 1997, at A4.; The Flu treatment market provides another example. Biota, a small Australian company managed to discover a drug that is believed to be potent against all strains of the influenza virus. The drug, now in advanced stages of development by GlaxoWellcome may well be the first drug on the market to shorten and prevent an Influenza attack. See, Michael Waldholz, *Glaxo, Roche Race to market a New Flu Drug*, WALL ST. J. Oct. 2, 1997, at B7, available in 1997 WL-WSJ 14168502. Gilead Sciences of California licensed its competing influenza drug (to be administered by a tablet rather than an inhaler) to Roche, and is several months behind Biota's drug in the approval process. See Waldholz, *supra* note 175.

¹⁹¹ In the past, drug discovery was very much haphazardious whereas today drug research is much more focused and science-based. See, SCHWEITZER, *supra* note 27, at 30, citing, PHARMACEUTICAL R&D: COSTS, RISKS AND REWARDS (US Congress, Office of Technological Assessment, 1993); Hall, *supra* note 167, at 67:

It is no secret that the world's leading drug companies missed the boat on the pharmaceutical

produced knowledge that was too complex to utilize through the chemical methods used by the traditional pharmaceutical industry.¹⁹² It is believed that biotech R&D is still difficult for major pharmaceutical to develop internally.¹⁹³ That view is strongly supported by the fact that research is increasingly contracted out.¹⁹⁴

The worldwide number of biotech firms is growing,¹⁹⁵ and the role of biotechnology, though still relatively modest in sales, is clearly on the rise. Total sales of biotechnology-based drugs has reached \$7.7bn in 1994 (about 9% of total pharmaceutical industry sales) and as of 1995 biotechnology R&D accounted for about one-third of the drug industry's R&D expenditure.¹⁹⁶ The traditional skills of organic chemistry are not enough for biotech research. Nonetheless, biotechnology-based drugs must go through the same

implications of molecular biology in the 70s. They didn't appreciate the swift impact genetic engineering would have on the drug industry, they didn't have people who knew how to do the work and they rarely nurtured the kind of entrepreneurial culture that could proceed at the breakneck pace of young scientists...[consequently] [t]he big drug companies ("cash rich and technology poor," as one industry report put it) have been on a billion-dollar shopping spree for genomics technology.

¹⁹² See, SCHWEITZER, *supra* note 27, at 33.

¹⁹³ *Id.* Schweitzer also claims (p. 119) that research alliances of the large pharmaceutical firms with the biotechnology industry and outright absorption of biotech firms "...suggest that generally small biotechnology firms have a unique structure or corporate culture that frequently allow them to lead the larger traditional pharmaceutical manufacturers in developing creative new products, contrary to the notion of economies of scale in R&D." Prominent biotech acquisitions include Ciba-Geigy's (now Novartis) acquisition of 49.9% stake in Chiron in 1994 and Roche's 1990 acquisition of 60% of Genetech; After comparing molecular biology and biotechnology to "...more traditional approaches," G. Brefort, *Molecular Biology and Biotechnology Versus More Traditional Approaches*, in Bruce Durie ed. (1991), *supra* note 14, at 103, concludes that "[m]olecular biology and biotechnology bring tools and provide starting points or models to the pharmacologist. They should nowadays be considered *traditional* approaches."; James (1994), *supra* note 29, at 71, points to the "...significant shift in resource away from traditional in-company innovation." For example, as of November 1994, Rhône Poulenc Rohrer's alone had 14 biotechnology research alliances in the US and in France.

¹⁹⁴ See, *The Alchemists*, *supra* note 27, at 13, and chart therein; For example, the "world largest" drug research alliance has recently been announced by Bayer of Germany and Massachusetts-based Millennium Pharmaceuticals. Bayer expects to pay Millennium \$465m over the partnership's 5 year term (\$97m of which is for 14 per cent stake in Millennium). Millennium is expected to supply 225 biological "targets" for use in finding treatments for specified diseases. See, Graham Bowley and Clive Cookson, *Bayer: Drugs Groups Links with Millennium*, FT, Sep. 24, 1998 (<http://www.ft.com>)

¹⁹⁵ See, *The Alchemists*, *supra* note 27, at 7 and figure therein.

¹⁹⁶ PISANO, *supra* note 20, at 69, citing KENNETH LEE AND STEVEN G. BURRILL, BIOTECH 95: REFORM,

evaluation and approval process and are sold largely through the same distribution channels as traditionally discovered drugs.¹⁹⁷ Biotechnology can therefore be seen as complementing, rather than destroying, existing downstream competences of traditional drug manufacturers.¹⁹⁸ This has led Pisano (1997) to argue:

[B]iotechnology innovation has been pursued largely through collaborative arrangements between new biotechnology firms (who do the R&D) and established pharmaceutical companies (who typically undertake clinical trials and marketing).¹⁹⁹ (Footnote added). [This] allows established firms to capture rents on their specialized downstream clinical development and marketing competences, it also allows enough entry to potentially dissipate rents from R&D.²⁰⁰

Small biotech firms seem to proportionally dedicate more of their resources to R&D. For example, between 1993 and 1994 the US biotech industry made on average a 23% increase in R&D.²⁰¹ That can be compared to the leading incumbent pharmaceutical firm, Merck, which made only a 9% increase between 1992 and 1993.²⁰² Biotech firms also produce more patents of genetic sequences and their scientists produce more publications.²⁰³ Most importantly, small biotech firms produce more new biopharmaceuticals. Most of the sixteen biopharmaceuticals approved by the FDA

RESTRUCTURE, RENEWL 9 (Ernst & Young, 1994).

¹⁹⁷ PISANO, *id.*, at 69.

¹⁹⁸ *Id.*; de Wolf, *supra* note 175, at 285, summarizes the position as follows: "It is believed that the biotechnology discoveries will have good chances for development in relatively small newly established firms, while in the later stages of product development and in the marketing phase, alliances with larger pharmaceutical companies will be necessary."

¹⁹⁹ PISANO, *supra* note 20, at 69, citing Gary P. Pisano, *The R&D Boundaries of the Firm: An Empirical Analysis*, 35 ADMIN. SCI. Q. 153 (1990).

²⁰⁰ *Id.*, at 69 and 70 (table); "It has long been recognized that technological change can erode the competitive position of dominant firms while opening the door to new entrants, a process Schumpeter (1934) referred to as "creative destruction"." *Id.*, at 280.

²⁰¹ LYNNE G. ZUCKER AND MICHAEL R. DARBY, COSTLY INFORMATION IN FIRM TRANSFORMATION, EXIT, OR PERSISTENT FAILURE 7-8 (National Bureau of Economic Research Working Paper 5577, May, 1996), citing Ernst & Young (1994), *supra* note 196.

²⁰² *Id.*

²⁰³ *Id.*, pp. 8-9. Zucker and Darby argue (p. 9) that "...though the incumbent pharmaceutical firms are closing the gap in the U.S., even the most transformed incumbent firms still lag the new biotechnology firms in detection, evaluation, and use of the breakthroughs discoveries."

through 1992 originated in biotechnology firms.²⁰⁴ By 1992, biotechnology companies filed twice as much Investigational New Drug Applications (hereinafter IND) at the FDA than pharmaceutical firms.²⁰⁵ Moreover, the cost of biotechnology INDs averaged \$12.4m to \$14.6m compared with over \$20m for the traditional pharmaceutical company.²⁰⁶ Overall development costs of a drug in the biotechnology industry was about \$125m compared with \$255m to \$369m in the pharmaceutical industry.²⁰⁷ Consequently, "...a dramatic change is occurring in the relationship between size and cost in drug innovation."²⁰⁸

A recent Economist survey confirms these findings. As of February 1998, more than half of the substances undergoing trial originated outside the laboratories of established pharmaceutical firms.²⁰⁹ In 1997, these products have led to significant earning gains for biotech firms.²¹⁰ The movement of senior executives from the established industry to biotechnology firms may also indicative of a shift in the center of innovation.²¹¹

The transformation of the ethical drug industry appear to derive from the "...important structural and organizational differences [of biotech firms] from mature drug firms. They are basically research firms,²¹² (footnote added) focused on particular disease and

²⁰⁴ See, GRABOWSKI, *supra* note 30, at 19.

²⁰⁵ See, James (1994), *supra* note 29, at 70.

²⁰⁶ *Id.*

²⁰⁷ *id.*, at 71.

²⁰⁸ *Id.*

²⁰⁹ *The Alchemists*, *supra* note 27, at 5.

²¹⁰ See, Jennifer Fron Mauer, *New Products Expected to Aid Biotech Profits*, WALL ST. J. Jan. 12, 1998, at B12, available in 1998 WL-WSJ 3478492.

²¹¹ *Id.* 1993-1994 examples include movement of executives to fill positions at Affinity Biotech, Affymax, Chiron, Chiroscience, Pharmacopeia, Pharmagenesis, Signal and Synaptic.

²¹² R&D spending of small specialized biotech firms is estimated to account for half of their operating costs. See, PETER DAVIS, *MANAGING MEDICINES: PUBLIC POLICY AND THERAPEUTIC DRUGS* 89 (1997), citing, Ballance *et al.* (1992), at 7.

technology areas."²¹³ Zucker and Darby (1995) found that biotechnology firms are granted more genetic-sequence patents and produce more publications.²¹⁴

James (1994), focusing on the future prospect of the industry, suggests that "premium players" in the industry will consist of large established firms "...horizontally integrated through acquisitions with smaller research-based companies that enhance the aggregate research productivity to provide a fuller line of products."²¹⁵ While there are "...too few really good in-company research pipeline available for acquisition; there is a major opportunity in start-up and biotechnology companies."²¹⁶ A leading example of such a company is the group formed by Roche through the acquisitions of Genetech and Syntex.²¹⁷

In summary, the rapid growth of the biomedical R&D sector suggests that scientific creativity in drug development is likely, perhaps even more likely, to be found in proportionally smaller and more informal organizations.²¹⁸ While there remains the

²¹³ *Id.*; For example, JAMES (1994), *supra* note 29, at 63, discusses the matrix organization structures implemented in the 1970s in many large pharmaceutical companies such as Bayer, Ciba, Dow, Hoechst and Rhône-Poulenc: "Dual reporting relationships have potential to inhibit action, dilute accountability and impede change, particularly under conditions of revolutionary change where a glacial speed of response can be terminal."

²¹⁴ *See*, ZUCKER AND DARBY, *supra* note 201, pp. 8-10, and tables in pp. 21-22.

²¹⁵ JAMES, (1994), *supra* note 29, at 33.

²¹⁶ *Id.*

²¹⁷ *Id.*; *See also*, Roche, *supra* note 6 (Roche's 1998 acquisition of Germany's Boehringer Mannheim).

²¹⁸ *See e.g.*, *Heroes of Medicine*, TIME MAGAZINE (Special Issue # 150/19, Edward L. Jamieson and Barrett Seaman eds., Fall, 1997), where a random survey of innovators of new medical techniques clearly points to the prominence of the independent small organization; *See also*, 2000, *A New Millennium, The Power of Invention*, NEWSWEEK EXTRA (R. M. Smith ed., Winter 1997-98), pp. 69-78, where a Newsweek survey leads to similar conclusion; In fact, one may simply look at the technology sections of quality newspapers to get the impression that most important inventions in many industries originate outside large companies; LINDA MARSA, PRESCRIPTION FOR PROFITS 264 (1997), argues that a comparison between the 25 largest pharmaceuticals and university research shows that the latter is by far more productive in terms of significant therapeutic advance reached; The important role of public research was also emphasized by Iain Cockburn (UBC and NBER) and Rebecca Henderson (MIT and NBER), *Public-Private Interaction in Pharmaceutical Research*, (NBER, Sep. 1995). They found that while most enabling scientific discoveries in the sample (11 out of 14) originated in public institutions, the synthesis of major compound stage (*i.e.*, beginning of development) took place in private hands (12 out of 14); *See also*, GAMBARDILLA, *supra*

possibility that this phenomenon is merely a short-lived one, there is much evidence indicating otherwise.²¹⁹ This view is strongly supported by the prevalent corporate strategies discussed above.²²⁰ In fact, the transforming division of labor in drug R&D outlined here is relatively well documented.²²¹ Along the same lines, a recent Economist survey concludes that "...the proliferation of small biotechnology firms suggests that...economies of scale count for less than they used to, and that barriers to entry are dropping."²²²

In any given case, the possible connection between size and pharmaceutical innovation discussed above probably means very little in the absence of the merged firm's ability and incentive to lessen R&D effort.²²³ Simply put, post-merger R&D cuts will not necessarily take place unless the merged firm has the incentive and the ability to do so.²²⁴ Each will be discussed in turn.

note 11, pp. 61-104. Gambardella uses the example of Lilly's 1986 acquisition of Hybritech, a small research intensive company specializing in diagnostics. Lilly's stiff bureaucratic control caused the departure of Hybritech's original management, "...thereby emptying the company of a significant portion of its human capital value."; Azam. H. Aziz, *Defining Technology and Innovation Markets: The DOJ's Antitrust Guidelines for the Licensing of Intellectual Property*, 24 HOFSTRA L. REV. 475, 507-510 (1995); Acs and Audertsch, *supra* note 142, at 57; See also, THE CONTRIBUTION OF STRATEGIC ALLIANCES TOWARDS REDUCING TIME-TO-MARKET (Coopers & Lybrand, Jan. 1997), and THE CRITICAL ROLE OF ORGANIZATIONAL CULTURE PERFORMANCE IMPROVEMENT (Coopers & Lybrand, Aug. 1996); RICKWOOD, *supra* note 22, pp. 70-71, argues that smaller pharmaceutical firms spend a larger portion of their budgets on R&D and on closer to optimal investments in riskier R&D projects; See also FT, March 13, 1997 at 26; GAMBARDELLA, *supra* note 11, at 76. 161, 174; *But cf.*, some evidence to the contrary in the software industry: *Gentle Giants*, THE ECONOMIST, Dec. 21, 1996, at 15, and in Canada: *Canadian Agency Touts Benefits of 1980's Merger Wave to Economy*, 63 ANTITRUST L.J. 365 (1992).

²¹⁹ Even if one assumes that the emergence of biotechnology largely or entirely outside the traditional and established firms is a sort of coincidence, the continuing (and arguably growing) importance of innovation originated in small drug-research firms is not so easily explained. The reason appear to lie elsewhere, in their structural and organizational differences, their culture, their focused and specialized expertise, the changing nature of drug innovation, the promise of enormous personal gains if the small team "gets it right", their limited financial resources perhaps leading to greater efficiency in research, and other factors some of which were discussed above.

²²⁰ See, de Wolf, *supra* note 175, at 14 (table); See also, FT, March 13, 1997, at 10.

²²¹ For a comprehensive discussion, see, GAMBARDELLA, *passim*.

²²² *The Alchemists*, *supra* note 27, at 14.

²²³ On suppression of technology, antitrust and intellectual property, see generally, "Symposium" (1998), *supra* note 113.

²²⁴ Indeed, the 1995 Intellectual Property Guidelines propose that firms having the capability and

2. Incentive to Reduce R&D?²²⁵

The question of incentive for post-merger reduction of R&D efforts is closely related to the motives for mergers in general.

A number of motives can simultaneously influence merging parties.²²⁶ These include "normal business motives",²²⁷ the "monopoly motive",²²⁸ and "speculative motives".²²⁹ These motives sometimes include some strategic plan for post-merger reduction of spending aimed at achieving greater efficiencies. While a concentrated market, due to economics of scale, can sometimes boost rather than lessen R&D investment,²³⁰ a merged firm may have a strong incentive to slow R&D.²³¹

While the number of drugs and manufacturers at the industry level is large,²³² competition over development of a particular treatment is often limited to a handful of

incentive to compete over R&D should be identified. *See*, IP Guidelines, *supra* note 97, § 3.2.3.

²²⁵ About (a monopolist versus competition) incentive to invent, *see generally*, VISCUSI ET AL., *supra* note 128, pp. 834-838.

²²⁶ *See generally*, SCHERER AND ROSS (1990), *supra* note 128 pp. 159-167.

²²⁷ *E.g.*, capital raising and economies of scale. *Id.*, pp. 162-167.

²²⁸ The desire to achieve or reinforce a monopoly position. *See, id.*, at 160.

²²⁹ The hope that reducing competition will lead to higher profits. *See, id.*, pp. 160-162.

²³⁰ *See generally*, Baker, *supra* note 151; Schumpeter (1942) is frequently cited for the proposition that a monopoly may encourage innovation because of the monopolist's greater access to low cost internal finance, and its greater ability to take advantage of economies of scale and appropriate the full value of new ideas. *See* Baker, *supra* note 151, pp. 639-640.

²³¹ *See*, Baker, *supra* note 151, at 639, citing Arrow (1976). Arrow demonstrated that a monopolist has more to lose from innovation and therefore has a smaller incentive to innovate. To simplify, this is because "...unlike a competitor, it already has most of the business there is to get." The empirical studies that sought to determine which of the theories (*i.e.*, Schumpeter's or Arrow's) is nearer to the truth suffered from methodological problems (*e.g.*, how to measure R&D outcome). Baker therefore concludes (pp. 640-641) that "...the primary determinants of innovation can readily vary from one industry to the next." Clearly, the incentive to increase, reduce, or sustain the pre-merger level of R&D effort has a lot to do with the level of barriers to entry in each industry. Indeed, this is the real starting point of the incentive discussion in the pharmaceutical innovation context.

²³² *See*, SCHWEITZER, *supra* note 27, pp. 23-24, citing Chang R. R., The top 100 Pharmaceutical Products in the United States from 1980 to 1992 (UCLA Dept. of Health and Services, unpublished paper, 1995): In 1992, the top 100 products represented 40% of all prescriptions dispensed in the US drugstores. 159 of the 227 products that constituted the top-selling 100 drugs between 1980 and 1992, were produced by the top

competitors.²³³ In short, in a single therapeutic area, compared with the ethical drug market as a whole, the number of products and the number of competitors are substantially reduced.²³⁴ A merger involving two companies, each developing a competing drug within a typically concentrated R&D market, can raise serious concerns. In light of the generally declining period of effective patent protection, and the constant need to satisfy investors,²³⁵ such a merged firm may be inclined to maximize profits from a drug it has on the market, or from its first drug to reach the market, while neglecting the other, perhaps better, R&D track.²³⁶ Once introduced, experimental drugs trailing

20 pharmaceutical firms (70%).

²³³ See tables in Davis, *supra* note 212, at 84, and SCHWEITZER, *supra* note 27, at 24; Davis, at 84, argues that the lack of concentration in the pharmaceutical industry is an illusion as that competition is more apparent than real. Because companies exploit niche market advantages, within each of the three largest therapeutic sub-classes, on average the three top selling products share about half the market. For example, in Marion Merrell Dow, C-3533 (Sep. 23, 1994), the acquirer (MMD) and the target (Rugby-Darby) were the only two manufacturers of dicyclomine, an irritable bowel syndrome treatment. Similarly, in the AHP case, *supra* note 125, the merging companies were two out of only three companies holding patent rights for cytokines (used for restoration of white blood cell and platelet of cancer patients undergoing certain treatments). Whitener, *supra* note 7, at 307 argues that in the pharmaceutical industry many markets are "...highly concentrated and difficult to enter".

²³⁴ See note 233 *id.*; See, e.g., the market for angiotensin converting enzyme (hereinafter ACE) inhibitors (a drug class used as an antihypertensive). There are 18 ACE inhibitors on the market but the sale of four of them, produced by only 5 firms, made up about 91% of total US market share in 1992. The Herfindah index (HHI) for ACE inhibitors is therefore approximately 0.26, indicating relatively high market concentration. See, SCHWEITZER, *supra* note 27, pp. 23-24, particularly the table at 24.

²³⁵ As to declining effective patent protection period see, PISANO, *supra* note 20, pp. 62-63 and chart and table therein; As to investors, the high risk of failure and the high development cost means that drug firms must assure investors that their return will also be high. After taxes only about three out of ten drugs on the market cover the development costs because many unsuccessful products are developed. See, SCHWEITZER, *supra* note 27, at 27 (citing T. Beardsley, *Blood Money: Critics Question High Pharmaceutical Profits*, 269 (2) SCIENTIFIC AMER. 115 (1993)). Both the need to reward investors and the soaring R&D expenditure constitute motives for maximizing profits. This is part of the reason why drug manufacturers generally maintain high drug prices.

²³⁶ See, Dahdouh & Mongoven, *supra* note 92, pp. 435-437; It has been argued that: "...smart business people often feel compelled to suppress new technology if they fear that its market introduction will trigger a technology war that might render their old product obsolete before they have been able to harvest all of its potential revenues." Eugene Crew, Symposium: *Antitrust and the Suppression of Technology in the United States and Europe: Is There a Remedy?*, Forward, 66 ANTITRUST L.J. 415-419 (1998). *CF*: Jack Kaufman, Symposium: *Antitrust and the Suppression of Technology in the United States and Europe: Is There a Remedy?*, Afterward, 66 ANTITRUST L.J. 527 (1998); See, John J. Flynn, *supra* note 86, at 490: "[While] it is rare to uncover cases where a worthwhile technology has been suppressed altogether...there have been such cases, as well as many cases involving technology suppression in the broader sense of conduct of market structures deterring or impeding incentives for research and innovation efficiencies." Further (pp. 497-498): "While new technology may not have been completely suppressed, innovation was often subject to either rejection for what became known as the N.I.H. syndrome (not invented here) or acquisition by the dominant firm for introduction at its leisure." According to Flynn (pp. 505-506), one way of maintaining

dominance is the acquisition of:

[C]ompeting new technology, or of a competing firm engaged in similar research into new technologies. While such conduct does not often lead to complete suppression of the technology, it may delay a technology's introduction into the market and future incentives to innovate by eliminating or minimizing research competition. A clearer case of technology suppression is the non-use of a viable technology, although it has long been held that the non-use of a patent, standing alone, does not constitute a misuse of the patent or a violation of the antitrust laws, and a refusal to license, standing alone, is not unlawful (Footnotes omitted).;

This may be particularly true in concentrated markets and sub-markets for particular treatments. *See*, Walter Adams and James W. Brock, *Antitrust Ideology and the Arabesques of Economic Theory*, 66 UNIV. OF COLORADO L. REV. 257, 264 (1995), particularly notes 37-41 (referring to a number of prominent examples of suppression of technology); The plant biotech industry is one industry in which in recent years a handful of giants have gone on multibillion-dollar technology shopping sprees during the last several years, gathering up plant biotech start-ups and genomics companies. *See*, David Rotman, *The Next Biotech Harvest*, MIT TECHNOLOGY REV. (Sep./Oct. 1998), at 39; Indeed, the incentive is sometimes obvious, *see e.g.*, Victoria Griffin, *Amgen: Drug Shares Jump 20% on Anaemia Ruling*, FT, Dec. 22, 1998 (<http://www.ft.com>). There, a court arbitration ruling awarded Amgen all rights to a new version of a Johnson & Johnson best selling anaemia drug. J&J argued that the new version was covered under an old licensing arrangement with Amgen. The now threatened sales J&J's product are estimated to reach \$4bn accounting for up to 18 per cent of J&J's pharmaceutical sales this year. Amgen's new version would allow once-a-week dosing of that intravenous drug, currently administered three times a week. "J&J now faces a threat to its best-selling and fastest-growing pharmaceutical product." Griffin, *id.* J&J's incentive to suppress the technology is not hard to detect. One might also ask what would happen had Amgen been acquired by J&J instead of the licensing agreement of a decade ago. Would the new version be suppressed? Would it be developed at all had Amgen not pursued its research independently? Even if such a scenario seems implausible, it is nevertheless possible. For other examples see the facts of *McDonald v. Johnson & Johnson*, 537 F. Supp. 1282 (D.Minn. 1982), 722 F.2s 1370 (8th Cir. 1983) (The defendant, J&J, was the manufacturer of a highly-profitable pain control drugs business and also the licensee of the plaintiff's pain control device. The latter - who eventually lacked standing - alleged that its technology has been suppressed for being a threat to J&J's pain control business), *United States v. Automobile Manufacturers Assoc.*, 307 F. Supp. 617 (C.D. Cal. 1969), and *Alling v. Universal MFG. Corp.*, 7 Cal. Rptr. 2d 718, (Ct. Appeal. 1992) (licensee's suppression of patentee's fluorescent lighting technology dismissed without opinion for lack of standing, but later fraud and tort claims resulted in a \$96m verdict for the plaintiff. *See*, Flynn, *supra* note 86, at 520); *See also* the EU case of *Tetra-Pak v. Commission*, 1990 E.C.R. II-309 (abuse of dominant position for a monopolist in the packaging industry to acquire an exclusive license to certain competing packaging technology thereby preventing the use of the licensed technology by its competitors). For a comprehensive survey of the EU competition law approach to suppression of innovation, including the important *Tetra-Pak* case, *see*, Mauritz Dolmans, *Restrictions on Innovation: An EU Antitrust Approach*, 66 ANTITRUST L.J. 455(1998). *See also*, Jean-François Pons, *A View from the European Commission*, a speech for the 50th Anniversary of the Japan Trade Commission in Tokyo (Dec., 1, 1997) <<http://europa.eu.int/comm/dg04/speech/eight/en/sp98005.htm>>; To be sure, the extent to which suppression of technology is a real problem is by no means clear. Crew, concedes:

[while it may be just] a unicorn in the forest, [there is] a wealth of economic literature on the subject, with many empirics concluding that a firmly entrenched incumbent in an aging market often reveals a strong incentive to acquire a new technology for the purpose of suppressing it from the market so as to prevent it from "Cannibalizing" its sales revenues from older products. The new technology, while kept available but unused, also serves as a potential reactive strike weapon-to be trundled out if and when a rival is emboldened to introduce a new technology of its own.

This is the so-called "sleeping patent". For a partial bibliography *see*, Crew, *id.*, notes 3-5. Furthermore, the fact that few suppression cases are caught does not disprove the occurrence of suppression and it is particularly difficult for the consumer to discern technology suppression because it is the consumer from which the technology is being deliberately concealed. Crew, *id.*, at 417. If technology suppression is a real problem, how should it be addressed? In contrast to the EU law, under both the US antitrust laws (absent

somewhere behind in the pipeline, threaten to cannibalize existing monopoly profits. Alternatively, these experimental treatments may, like any other drug in development, fail and entail large sunk costs.²³⁷

In practice, merged drug firms tend to reduce their R&D effort as shown by a recent study of the UK-based Centre for Medicine Research (hereinafter CMR).²³⁸ According to that study, the 1995 decline in UK drug R&D expenditure is mainly attributed to recently merged companies. The recovery of pharmaceutical R&D investment in 1996 was led by non-merged firms, domestic and foreign. While non-merged pharmaceutical firms increased their UK R&D expenditure by over 33% between 1994 and the 1996 estimate, merged companies showed a fall of almost 10% over the same period.²³⁹ It is possible that some research has been shifted outside the UK following these recent mergers, but

collusion) and the US patent laws, "...non-use is not a misuse". See, Crew, *id.*, citing, among other sources, SCM Corp. v. Xerox Corp., 645 F. 2d 1195, 1206 (2d Cir. 1981) (under US antitrust law a patent owner can refuse to commercialize an invention), and Continental Paper Bag Co. v. Eastern Paper Bag Co., 210 U.S. 405 (1908) (US patent laws permit the withholding of technology, by a patent owner, from the market). However, the 1995 IP Guidelines (§ 1) provide that both the antitrust laws and the intellectual property laws aim to promote innovation and enhance consumer welfare. See also, Special Equipment Company v. Coe, 35 U.S. 370 (1945) (there Justice Douglas, dissenting, argued that the owner's privilege of suppression cannot be reconciled with the purpose of the Constitution "to promote the Progress of Science and the useful Arts.") Crew therefore concludes by asking: "if the paramount goal of both our antitrust and intellectual property laws is to allow the public the benefit from technological innovation, why is it that neither our antitrust laws nor our intellectual property laws stand in the way of its deliberate suppression from public use?" *Id.*, at 419;

It is submitted here that the antitrust laws probably do provide some cures. Although a unilateral suppression seems to be beyond the outer limits of US antitrust laws, collusion, or as discussed in this paper - a merger - do permit and require antitrust enforcement in order to prevent harm to consumers. Merger enforcement can and should, on its own turf, close the gap created by the current interpretation of the US antitrust and intellectual property rules. Challenging a merger after it took place is also more expensive. Thus, Robert Pitofsky, the FTC chairman, recently stated: "If you challenge a merger before it happens, it is not expensive to remedy it. After the employees have been fired, the management have gone elsewhere and the factory has been sold for junk, putting the company back in business is enormously expensive." See, Wolffe (1998), *supra* note 3. By analogy, this statement applies to R&D facilities just as well.

²³⁷ While early stage product with little sunk costs may be abandoned, a later stage product is probably more likely to be delayed. See *e.g.*, the Hoechst/MMD merger discussed below.

²³⁸ See, A. L. Drasdo, *Mergers and Takeovers Challenge the Pharmaceutical Industry in the UK*, 14 C.M.R. NEWS 1 (1996); See also, Daniel Green, *Tonic for Drug Companies*, FT, Jan. 7, 1997, at 4; Bethan Hutton, *Consolidation Prescribed*, FT, April 24, 1997; But see, *Canadian Agency*, *supra* note 210.

²³⁹ Drasdo, *id.*

this does not appear to be the case.²⁴⁰ Logic dictates that merged firms reduce their R&D because they have some incentive to do so. The question remains as to what is the motive and incentive for drug R&D cuts in specific cases.

One such motive can be 'short-termism'.²⁴¹ Evidence of general post-merger performance may be conducive for determining whether 'short-termism' is really a plausible motive for R&D cuts. Scherer and Ravenscraft looked at the post-merger performance of thousands of US mergers between 1950 and 1976, leading Scherer and Ross (1990) to argue that "[t]he picture that emerges is a pessimistic one: widespread failure, considerable mediocrity, and occasional success."²⁴² Other studies, focusing on the US and other countries, reached similar conclusions.²⁴³ Scherer and Ross therefore conclude:

²⁴⁰ Large pharmaceutical mergers such as Glaxo/Wellcome and RPR/Fisons resulted in many UK lay-offs and the closure of UK-based facilities. These cuts have been generally defended by the merged firms as parts of an overall effort to increase efficiency (*i.e.* as a "rationalization").

²⁴¹ See, e.g., COSH ET AL., TAKEOVERS AND SHORT-TERMISM IN THE UK (Industrial Policy Paper No. 3, Institute for Public Policy Research, London, 1990), at 5, focusing on takeovers in the UK during the 1980s they refer to the "...mounting concern voiced by the Bank of England, [the Department of Trade and Industry] Innovation Advisory Board and many industrialists that the disorderly scramble of takeovers in the last few years has affected business efficiency and is generating a climate of 'short-termism' where companies concentrate on short-term profits and dividends at the expense of long term investment." Further, the evidence and analysis provided by Cosh et al. "...suggests that an unfettered market for corporate control, as witnessed in the stock markets of the UK and the US, may have seriously disadvantaged these economies by shortening the corporate time horizon and raising the target rate of return on investments."; Whether or not one shares that concern, there is little doubt that the relationship between the corporate and financial sectors as developed in recent years raises questions about the claimed efficiency of certain takeovers. For example, SCHERER AND ROSS (1990), *supra* note 128, at 168, confirm the general belief that right before, and at the time of, the merger announcement, the target's ("usually smaller") stock price jumps upward. Indeed, that predictable stock market behavior, as management well knows, creates short term value for shareholders; It also seems that M&A accounting is sometimes abused in order to bolster the benefits of mergers. See, Carty, in *Cosh et al.*, *supra* note 241, pp. 21-32.

²⁴² See, SCHERER AND ROSS (1990), *supra* note 128, at 173. Note, however, that the study included many conglomerate mergers; For a summary of the major US merger waves, see, E. Woodrow Eckard, *The Impact of the 1980's Merger Movement on U.S. Industrial Concentration*, ANTITRUST BULL., June, 22, 1995, available on 1995 WL 12089663.

²⁴³ See, SCHERER AND ROSS, *id.*, citing Rhoades (1986), Mueller *et al.* (1980), Meeks (1977), Cowling *et al.* (1980), and Manmohan and Kumar (1984).

Statistical evidence supporting the hypothesis that profitability and efficiency increase following mergers is at best weak. Indeed, the weight of the evidence points to the opposite direction: efficiency is reduced on average following mergers, especially when relatively small firms are absorbed into much larger and more bureaucratic enterprises lacking experience in the targets' specialized lines of business. To be sure, the statistical average are just that; there is considerable variation from the central tendencies. Individual cases can be found to substantiate virtually all of the efficiency gain hypotheses identifiable in principle. Yet the overall historical record is far from reassuring.²⁴⁴

That view, though generally indicative, should be put in the right perspective: the data relied on is relatively old and not specific to the ethical drug industry. One should therefore turn to industry-specific information.

Broadly speaking, the record of drug merges appears to be no better than that of mergers in general.²⁴⁵ For instance, while the 1995 Pharmacia/Upjohn merger quickly run into trouble, profit warnings and cultural differences, the 1996 Ciba/Sanoz merger cut costs and boosted profitability and is generally considered by analysts as a success.²⁴⁶ Can 'short-termism' or other socially undesirable motives²⁴⁷ be the main drive for certain drug mergers? Hall and Strimpel (1991), who studied M&A in the biotech industry in the 1980s suggest the following:

"While each transaction has its unique components a common motive shared by those biotech companies acquired by larger, established corporations, such as pharmaceutical companies, was the financial "deep pockets" of the acquirer that offered a reprieve from the constant search for new funds."²⁴⁸

²⁴⁴ SCHERER AND ROSS (1990), *supra* note 128, at 174; Similar conclusions were reached by the US Securities and Exchange Commission in its 1980 working paper on acquisitions of small technology-based firms, *see*, ALFRED E. OSBORNE, JR., RETURNS TO SHAREHOLDERS OF ACQUIRING AND ACQUIRED COMPANIES: THE CASE OF ACQUISITIONS OF TECHNOLOGY-BASED FIRMS IN THE OVER-THE-COUNTER MARKET 20 (Securities and Exchange Commission, Capital Market Working Papers # 3, Dec. 1980).

²⁴⁵ *See*, *All Fall Down* (1998), *supra* note 2, at 66.

²⁴⁶ *See*, Stephen D. Moore, *Novartis Considers How to Make a Giant Even Bigger*, WALL ST. J. Aug. 29, 1997, at B3, available in 1997 WL-WSJ 2433196.

²⁴⁷ *E.g.*, pursuance of size for the sake of size alone.

²⁴⁸ C. V. Hall and H. M. Strimpel, *Mergers and Acquisitions within the Biotechnology Industry*, in *THE BUSINESS OF BIOTECHNOLOGY: FROM THE BENCH TO THE STREET* 273 (Richard D. Ono ed., 1991).

In most cases, the combination of drug firms is socially desirable. Particularly so where the parties involved are cash-rich established firms, and innovation-rich but cash-poor small firms. But can there be instances where the opposite is true? A recent Financial Times article on the impact of 1995-1998 merger waves on consumers concludes that although "...on the face of it, there is little to worry about", in particular industries – pharmaceuticals included - in which barriers to entry are high, there is growing concentration which might harm consumers.²⁴⁹ "The threat to consumers...does not come from the merger wave itself. [Rather], it lies in the strategies adopted by some market leaders to inoculate themselves from competitive threat in the future."²⁵⁰

According to Hall and Strimpel, mergers between two biotechnology firms in the 1980s were largely driven by financial considerations by one or both merger partners,²⁵¹ strategic additions to the technology portfolio of one or both firms, or expansion in manufacturing and marketing.²⁵² As to the first, there is little doubt that a significant pressure from venture capitalists or other investors to provide return on investment and liquidity may push such firms to accept offers of mergers "...that formerly would not have been considered seriously."²⁵³ Thus, most of the biotech M&A from 1982 to 1990 were primarily driven by financial motives.²⁵⁴

²⁴⁹ John Willman, *Do Mergers Help Consumers?*, FT, July 23, 1998, at 25.

²⁵⁰ *Id.*

²⁵¹ Hall and Strimpel, *supra* note 248, at 273.

²⁵² *Id.* This motive is of lesser relevance and therefore will not be discussed further.

²⁵³ Hall and Strimpel, *supra* note 248, at 275; This view is supported by a U.S. Securities and Exchange Commission's working paper, 1980, *supra* note 244 (the working paper examined acquisitions of technology-based companies in the Over-The-Counter Market): "The relative inability of private investors to gain liquidity in public capital markets led the SBA [Small Business Association] Task Force on Venture and Equity Capital to suggest that: '...large companies [are] able to entirely buy out successful small companies at a discounted price because the business [has] little alternative in meeting (its) financing and liquidity needs. This is...the major force increasing concentration' (SBA, 1977)."; Similar argument can be made in relation to strategic alliances, JOSH LERNER AND ROBERT P. MERGES, THE CONTROL OF

As to the second motive - strategic additions to technology - acquisitions are a natural extension of successful collaborations, a sort of "...living together before tying the knot."²⁵⁵ The recent failure of the Glaxo Wellcome/SmithKline Beecham merger talks shows that success or failure largely depend on compatibility of the merging firms' corporate cultures.²⁵⁶ As one commentator puts it: "...the combined R&D operation [of Glaxo and SmithKline] may prove so unwieldy that the deal's much-vaunted synergies will be hard to realise."²⁵⁷ For most biotech companies the most valuable asset is their human capital. Arguably, if that segment is harmed then the merger will probably not succeed.²⁵⁸ In some cases, Glaxo/SB and AHP/Monsanto being recent examples, incompatibilities will be discovered at the merger negotiation stage and overshadow the

STRATEGIC ALLIANCES: AN EMPIRICAL ANALYSIS OF BIOTECHNOLOGY COLLABORATIONS (National Bureau of Economic Research, Working Paper # 6014, 1997), conducted studies of the control of biotech strategic alliances and concluded (pp. 27-28) that "...the allocation of control rights to the smaller party increases with its financial health."

²⁵⁴ Hall and Strimpel, *id.*, at 276 and table on page 274. Three such mergers examined by Hall and Strimpel are Damon Biotech/Abbot Laboratories (1989), Gen-Porbe/Chugai Pharmaceutical (1989), and Genetech/Roche Holding (1990).

²⁵⁵ Hall and Strimpel, *id.*, pp. 279-280, 292. Gen-Porbe/Chugai Pharmaceutical (1989) is an example of such an extension. Xoma/Ingene (1990) was a merger of a leading biotech company (Xoma) acquiring a much smaller biotech company (Ingene) in order to broaden its research with the expertise of the acquired company. Hall and Strimpel also examined the 1989 merger of Plant Genetics and Calgene that created a leading agricultural biotech firm.

²⁵⁶ *Id.* The merger of DNAX and Schering-Plough in 1982 is considered as a successful one as the "...evolution from the entrepreneurial culture to a more academically oriented one was successful." By contrast, the 1985 merger between Eli Lili and Hybritech led to clash of cultures (between the entrepreneurial and strong competitive spirit of Hybritech and the more hierarchical structure of Eli Lili) and the "exodus" of many scientists. A failed attempt to merge was Liposome Company/Liposome Technology (1989) where a corporate culture clash led to a call-off; Another merger which seems to have run into cultural tensions is the 1995 merger of Sweden's Pharmacia and US-based Upjohn. See, Greg McIvor and Tim Burt, *Structure: Newlyweds Put Faith in Command System*, FT, Dec. 10, 1998 (<http://www.ft.com>); Daniel Green, *Pharmacia & Upjohn: More Changes at the Top*, FT, Jan. 13, 1998; See also, Jenny Luesby, *MPs Criticise Glaxo/SmithKline 'Adventure'*, FT, June 17, 1998, at 21 (Britain's House of Commons Science and Technology Select Committee "...acknowledged that there were clear differences in the managerial style of the two companies"); *CF: The Lex Column*, FT, June 17, 1998, at 14: "...if the logic for combining the pair's research and development effort remains so strong, surely the management issues that blocked the [Glaxo Wellcome/SmithKline Beecham] merger should be soluble."

²⁵⁷ *The Mother of All Mergers*, THE ECONOMIST, Feb. 7, 1998, at 64. Although splitting scientists into small, autonomous, and competing research teams is an option, splicing the virtues of small biotech start-ups into the genes of the new gigantic ventures "take some wizardry" (p. 64).

²⁵⁸ Hall and Strimpel, *supra* note 248.

pre-merger enthusiasm. In others, however, the merger, sometimes a takeover, will go through anyway. Another important cause for failure is a post-merger change of ownership changing corporate priorities and consequently "altering the marriage."²⁵⁹

While the motives for biotech mergers are relatively clear, it is difficult to assess their relative success. Certainly, as mentioned above, the role of corporate culture is important in that regard.²⁶⁰ It has been argued that "...the strategic long-term focus of the acquirer has been the key factor in determining success, since its priorities determine the funding level and degree of autonomy granted to the formerly independent company."²⁶¹ One reason for the difficulty in evaluating a merger's degree of success is that it may take many years for the merged company to generate revenues and earnings.²⁶² As far as large mergers are concerned, short term profits have generally increased following the merger but in the longer term post-merger profitability has clearly suffered.²⁶³ Returns over investment for the largest pharmaceutical mergers of the last decade have fallen

²⁵⁹ *Id.*, at 285. Two such mergers were Hygeia Sciences/Tambrands (1986) and Genetic System/Bristol-Myers Squibb (1985)

²⁶⁰ Hall and Strimpel, *supra* note 248, at 274.

²⁶¹ *Id.*, pp. 274-275. Interestingly, Hall and Strimpel suggest that while most biotechnology acquisitions are likely to fail "as in other industries," mergers between two biotechnology companies sharing common background and technology bases "will likely fair better."

²⁶² *See, id.*, pp. 287-291. The acquisition of DNAX by Shering-Plough in 1982 appeared to have began to reap its rewards about eight years later when the products of DNAX's biotechnology expertise were approaching the market. Genzyme's 1989 acquisition of majority stake in Integrated Genetics paid off one year after the merger when some of Integrated Genetics assets have been sold by the merged firm; The 1995 acquisition of Affymax NV by Glaxo successfully integrated Affymax's automated chemistry technology into Glaxo's labs and produced important breakthroughs in HIV/Aids research. *See*, Robert Langreth and Stephen D. Moore, *Who's News*, WALL ST. J. Feb. 3, 1998, at B1, available in 1998 WL-WSJ 3481411; SmithKline Beecham's link with Human Genome Sciences (HGS), has provided useful targets for drugs and made SmithKline a world leader in finding genes that cause disease. *See, The Mother, supra* note 257.

²⁶³ *See, The Mother, supra* note 257, at 64. Barrie James of Pharma Strategy Consulting, quoted therein stated: A factory can only be closed once and such short-term savings are offset by longer-term difficulties. Integrating two research teams can distract both managers and scientists and differences in corporate cultures can provoke destructive clashes. Thus, "...when the laid-back Swedes of Pharmacia linked arms with the uptight Americans at Upjohn in 1995", gifted Scandinavian scientists, fed up with constant demands for progress reports and random blood-alcohol tests, defected in scores" (p. 64).

from over 12% to 4% on average three years after their completion.²⁶⁴ To the extent that market share is an indication, it appears that none of the 12 or so large drug mergers of the last 30 years led to a sustained increase in the combined market share of the merging firms.²⁶⁵ By contrast, usually "celibate" companies like Merck, Pfizer, Johnson and Johnson, Abbott Laboratories, Schering-Plough, and - until recently - Astra, generally saw their world's market share swell.²⁶⁶ A possible explanation for the post-merger decline in return on investment and market share is that the pre-merger performance of merging companies was already, or bound to, decline prior to the merger. Yet, in a number of cases - notably Wellcome's acquisition by Glaxo - it is difficult to detect such a negative pre-merger trend.²⁶⁷

The point to be made from the foregoing discussion is that motives for drug mergers vary and so is their degree of success. This, of course, comes as no surprise, but the possible implications on the incentive to reduce R&D effort are clear; not only do some mergers actually harm R&D efforts,²⁶⁸ but also there is evidence suggesting that long term efficiency gains are, at best, questionable. As mentioned above, 'short-termism', and the threat of 'cannibalization' of existing profits, among other things, sometimes provide

²⁶⁴ *Id.*; According to AT Kearney Management Consultancy, rationalization is no answer to growing pressures on returns. Companies which took part in the \$100bn-plus M&A spree in the last decade have generally had lower economic returns than those which did not. See, *Drug Makers Need New Prescription for Success*, FT, Jan. 5, 1998, available in 1998 WL 3522901.

²⁶⁵ See, *The Mother*, *supra* note 257, pp. 63-64. Since their 1995 merger Glaxo Wellcome market share fell from 4.87% of world drug sales to 4.6%. See also, SmithKline Beckman and Beecham (from 3.44% in 1988 to 2.9% in 1998).

²⁶⁶ *Id.* at 64. For example, Merck's market share rose from 3.6% in 1990 to 4.5% in 1997 and Pfizer's from 2.1% to 3.3% over the same period.

²⁶⁷ Wellcome's pipeline was considered as one of the strongest in the industry. Note also, ZUCKER AND DARBY, *supra* note 201, at 12, finding that it is precisely those commercially successful dedicated biotech firms (such as Chiron, Genetech and Genetics Institute) that have largely been acquired after their first new biological entities were licensed for US marketing; For a critical analysis of the Glaxo/Wellcome merger see, *Pills, Potions and Promises*, THE ECONOMIST, Feb. 7, 1998, at 18 ("The industry has already seen several mergers in the past, both friendly and hostile, most of which have failed to deliver the promised returns.")

²⁶⁸ For example, because a clash of culture leads to departure of important scientists, or because of the desire to reduce spending as evidenced by the CMR study mentioned above (Drasdo, *supra* note 238).

an incentive to reduce R&D. That reduction, in turn, could be one reason, though by no means the only one, for relatively poor post-merger efficiency gains.

Incentive on its own is not enough to bring about an actual lessening of R&D efforts. In the absence of ability to do so, the merged company is unlikely to reduce its R&D effort even if it strongly wishes to do so. Therefore, the ability of the merging firm to reduce R&D should be addressed.

3. *Ability to Reduce R&D?*

Scherer (1996), argues that drug companies "...seek and win dominant positions in new therapies. Clearly they are out to secure monopolies of new therapies that lead to high prices and substantial profits."²⁶⁹ It appears that, contrary to some views,²⁷⁰ unilateral ability of the merged firm to reduce R&D is not always hard to sustain. A merged firm, thanks to its monopoly over a particular R&D field, may be free of any significant future competition. A dominant position enables the monopolist to reduce its R&D efforts in that field. There are two main factors which make monopolization of unilateral capacity to innovate drugs possible. First, the trend within the industry towards increased specialization means that the independent ability of others to correctly replicate a neglected research track is, at best, questionable.²⁷¹ Second, newcomers are likely to

²⁶⁹ F. M. Scherer, *Commentary on Part Three*, in Helmes ed. (1996), *supra* note 38, at 270.

²⁷⁰ See, *FTC Hearings on Enforcement Policy* (1995), *supra* note 35, at 491, *per* Bloom A. arguing that the necessary components such as scientists and laboratories are readily available on the market, that large number of entities engage in drug research within any targeted area, and even larger number have the capability to do so. Thus, argues Bloom, new entrants will appear if they uncover a new approach; See also, Rapp, *supra* note 122, pp. 36-37; Addanki, *supra* note 130, pp. 221-223; *But see*, Scheffman, *supra* note 116, pp. 725-726.

²⁷¹ See generally, Rebecca Henderson & Iain M. Cockburn, *The Determinants of Research Productivity in Ethical Drug Discovery*, in Helmes ed. (1996), *supra* note 38, at 167; As discussed earlier, the shift to biological basis of research increases the need for specialization, deep pockets and large scale screening of many molecules are not enough. Better understanding of the human body and pathologies as well as specific expertise in a broad range of sciences are essential. Specific knowledge accumulated is of great value.

encounter a number of R&D-related barriers to entry, every one of which might suffice to block entry on its own.²⁷² Even if new entrants will show up, their presence is unlikely to be timely and sufficient because catching up can be forbiddingly laborious and exhausting.²⁷³

All this should not be taken to mean that new entry is always unlikely. Even when only one patent-protected prescription drug, made by only one company, dominates a market, there may be competition. Because different drugs may appear on the market to treat the same medical condition.²⁷⁴ The majority of these drugs are drugs with similar efficacy ("me, too" drugs).²⁷⁵ They use the same biological mechanism as innovative drugs yet they are distinct chemical entities.²⁷⁶ Whether or not the possible rivals comprise of truly innovative drugs, competition may be introduced into a market well

²⁷² Note in particular: a 'minefield' of effective patents, specialized and secretive in-house research, highly regulated development process that is extremely complex, lengthy and expensive, and exceptionally high product failure rate often caused by adverse clinical or toxicological findings; *See generally*, Dahdouh & Mongoven, *supra* note 92, pp. 435-437; One example is Lipids - fatty molecules- technology. As of August 1995 one company, Scotia Holdings PLC, controlled 1500 patents in the field while the handful of other competitors controlled 500 among them. *See*, Clive Cookson and Daniel Green, *Scotia Holdings Seeks Drug-induced Euphoria*, FT, Aug. 31, 1995; SCOTIA HOLDINGS PLC RESEARCH REVIEW 8 (Autumn, 1996); James Buxton, *Innovation in Unusual Location*, FT, June 26, 1996.

²⁷³ A merged firm may also be looked at as having a dominant position as an employer in the market for pharmaceutical research and production in a given geographic area (i.e., as a purchaser of specialized labor). That possibility, though not discussed much in the literature (probably because the market for talented scientists is seen as worldwide market), may justify antitrust inquiry. *See*, Jeremy Lever, *Glaxo-SmithKline Deal Raises Specialist Labour Concerns*, Letters to the Editor, FT, Feb. 4, 1998, available in 1998 WL-3530015, suggesting that a successful Glaxo/SB merger would be a concentration having a Community dimension and create a dominant position in a substantial part of the EU (i.e., ripe for antitrust investigation under EC law), possibly affecting employment opportunities of specialized workers.

²⁷⁴ *See generally*, SCHWEITZER, *supra* note 27, at 107, citing *How Health Care Reform Affects Pharmaceutical Research and Development*, US Congress (Congressional Budget Office, 1994). For instance, when the antidepressant Prozac was introduced in 1988 it was significantly superior to existing treatments. It quickly became a blockbuster with 1992 worldwide sales of \$1bn. Five years after its introduction, three cheaper products using some variant of the same treatment were sold on the US market and several others were introduced or awaited US approval. In result, despite patent protection lasting until after year 2000, significant discounts are offered on the price of antidepressant drugs; *See also*, table in PISANO, *supra* note 20, at 70.

²⁷⁵ Note that only a handful of drugs every year are considered to be truly novel in the sense that they offer a significant improvement compared with existing treatments. *See*, MARSÀ, *supra* note 218, at 264; *See also*, *The Alchemists*, *supra* note 27, at 14.

²⁷⁶ *The Alchemists*, *id.*

before patent expiry and result in lower drug prices. Provided the prospect of returns is high enough, the same logic should apply to monopolization at the innovation level. Knowing that such drugs are developed, a monopolist will find it difficult to reduce R&D efforts. That said, the monopolist will know whether such drugs are being developed²⁷⁷ and, in any case, might have a long lead time because "me, too" drugs also need pre-market approval.

According to one view, the molecular biology revolution "...generated opportunities for entry and intensified competition between incumbents."²⁷⁸ Indeed, in recent years there is evidence to suggest that rational drug design may have facilitated and actually led to some new entry into specific therapeutic categories. Thus, the HHI concentration index dropped between 1989 and 1993 in all five largest therapeutic categories, and the number of brand name competitors increased in all these categories but one.²⁷⁹

Another study, pointing to the same direction, indicates that competition within therapeutic classes is likely to remain strong in the long to medium run.²⁸⁰ According to that study, the change in concentration within therapeutic classes between 1963 and 1982 appear to have been random.²⁸¹ Five classes had higher concentration in 1982 than in

²⁷⁷ Obviously, every research-based drug firm attempts to maximize secrecy as to its in-house and outsourced R&D efforts. However, drug research information is believed to be widely disseminated (*see*, Dahdouh & Mongoven, *supra* note 92, at 421); Drug development is visible and is generally conducted in an open, publishing environment (*FTC Hearings on Enforcement Policy*, *supra* note 35, at 491, per Derek, J. Schaefer). In fact, new products are usually "...well recognized and their potential impact on the market is anticipated well before sales begin" (*FTC Hearings*, *id.*); The filing of patent application is always made before IND application thus the invention becomes public information. Thereafter, every major development (*e.g.*, the results of each clinical trial) will be publicly available through a variety of means (*e.g.*, company reports, FDA, press coverage etc.).

²⁷⁸ PISANO, *supra* note 20, at 64.

²⁷⁹ *See* charts at *id.*, pp. 66-67; "Intensifying product development competition has contributed to downward pressure on prices. In some of the most competitive therapeutic classes, price discounts on second, third, and subsequent entrants averaged 36 per cent." *See id.*, at 68, citing *The Changing Environment for U.S. Pharmaceuticals* (Boston Consulting Group, 1993).

²⁸⁰ *See*, BOGNER AND THOMAS, *supra* note 158, at 28, citing Karel Cool (1985).

²⁸¹ *Id.*

1963, and four lower.²⁸² It must be noted, however, that following more recent drug mergers and in view of the strong impact of biotechnology, this data does not necessarily reflect the realities of concentration within therapeutic classes today .

While biotechnology's long-term competitive impact is difficult to assess, any predictions that entry to barriers will become so low as to cause the downfall of the drug giants, certainly did not materialize.²⁸³ Hence, in some cases, due to the continuing - sometimes increasing, as in the case of regulation and related R&D costs - presence of high barriers to entry, a monopolist's ability to reduce R&D efforts is at least plausible.²⁸⁴

C. Is There a Link Between R&D Input and Innovation? (The Duplication Argument)

The first defect attributed to the innovation market approach is the allegedly weak cause-and-effect connection between concentration and reduction in R&D. The previous section addressed that claim. It will be recalled that the second alleged weakness attributed to the innovation market approach, is the argument that post-merger R&D cuts reflect improved efficiency resulting from the merger, therefore less drug R&D is not analogous to less innovation. In other words, critics may argue that post-merger R&D cuts simply 'prune' excessive or overlapping pre-merger R&D efforts. This section addresses that 'wasteful duplication' or 'rationalization' argument.

To be sure, the display of a sound causal link between concentration and R&D slowdown in a given case is only the starting point. Less R&D input does not necessarily mean less R&D output - innovation - because efficiency and quality factors such as waste

²⁸² *Id.*

²⁸³ PISANO, *supra* note 20, at 69.

²⁸⁴ *See*, the FTC cases discussed below.

and duplication of efforts should be taken into account.²⁸⁵ Accordingly, it has been argued that there is no principled way to isolate the 'bad' cutbacks - those cutbacks posing real threat to innovation.²⁸⁶

In theory, more input implies more output and appropriability of returns varies widely from industry to industry.²⁸⁷ While the high failure rate in drug research may suggest that the larger the number of independent research efforts the better, it is also clear that the greater the duplication - or overlap - among these efforts, the greater the incentive to rationalize research. To the extent that government spending is any indication, it is generally believed, at least at the political level, that basic and applied medical research suffers from too little spending on promising scientific opportunities rather than from too many inefficient efforts.²⁸⁸ Whether there is too little, too much, or just the right amount of drug R&D is a difficult question. As articulated by Scherer (1993):

Could there plausibly be too much (original text) drug R&D? Yes, but the conditions for determining the socially optimal R&D program are too complex to reach a confident judgment as to whether the market has overshoot or undershoot. Strong differentiation of therapeutic effects by disease class and individual consumer sensitivities implies sharply peaked surplus functions and hence large surpluses from product proliferation. That drugs can save lives, improve the quality of life, and make

²⁸⁵ JAMES (1994), *supra* note 29, pp. 46-47, argues:

[T]here is a great reluctance to kill products in development. As a product moves through the process it accumulates more cost, and the larger the cost the more difficult it is to kill. Adding to the problem is the understandable reluctance of scientists to accept that customers do not want to pay for the product of their intellectual output. Management in many pharmaceutical companies has generally taken great pains to avoid killing 'brain babies'.

This, according to James, leads to a growing number of products that are commercially "dead on arrival" when launched.

²⁸⁶ See, Hay, *supra* note 118, at 10; Rapp, *supra* note 122, pp. 33-36.

²⁸⁷ See, Rapp, *supra* note 122, at 33; Gilbert & Sunshine, *supra* note 98, at 577; See also, RICKWOOD, *supra* note 22, pp. 71-72.

²⁸⁸ See e.g., Robert Pear, *Medical Research to Get More Money from Government*, N.Y. TIMES, Jan. 3, 1998. (1998). President Clinton plans to seek a substantial increase in federal spending on biomedical research and Congress is likely to approve an even bigger increase. Thus, "[s]cience and politics point to the same conclusion..[as lawmakers believe] that researchers can exploit promising scientific opportunities like new advances in cancer treatment." Patients' groups concerned about specific diseases, doctors and medical schools also lobby for the same cause.

expensive surgery unnecessary also implies large surpluses. Large surpluses plus considerable technological and market uncertainty call for multiplication of parallel development paths.²⁸⁹

Where, as is likely to be the case in most cases²⁹⁰, 'loser' R&D projects are dropped, there seems to be no reason for concern. 'Winner' R&D projects may also be justifiably dropped if they constitute the closest R&D overlap to a superior 'winner'.²⁹¹ However, rationalization by merged pharmaceutical companies does not necessarily target 'losers'. There may be cases where a strong incentive to stifle or delay promising R&D projects may be created for it is 'winners' rather than 'losers' that threaten to cannibalize current sales or prospective monopoly profits. It is precisely those, possibly few, cases which should raise antitrust concerns. Similar logic is seen in the 1992 Merger Guidelines' which require a proof that proffered efficiencies of a planned merger cannot be achieved in a less restrictive manner to competition.²⁹²

²⁸⁹ F. M. SCHERER (1993), *supra* note 8, at 40, note 17; Probably the most extensive discussion of that issue is found in SCHERER AND ROSS (1990), pp. 602-604, though no clear-cut answer can be found there; *See also*, MARSA, *supra* note 218, at 264: "...only 12 out of the 348 drugs introduced by the 25 largest pharmaceuticals [added] between 1981 and 1991 were considered therapeutic advances by the FDA. The vast majority - 84 percent - were viewed as having little or no potential of advances in treatment. Research in corporate labs was directed primarily at concocting "copycat" or "me too" drugs to compete with rivals that had already established a market niche, rather than gambling on developing genuinely new drugs that advance medical treatment. In stark contrast, 70 percent of the drugs that have substantial therapeutic gain are produced with government involvement, and up to half of the most promising AIDS and cancer drugs are concocted in government or university labs."; This data suggests that waste of economic resources may exist in the research for "me, too" drugs rather than in the research for truly innovative treatments. It becomes clear from the discussion that follows that the agencies' concern is mainly about the latter. Thus, the innovation market cases discussed below appear to deal with truly innovative drug rather than "me, too" drugs. Moreover, these cases occasionally involve a race for treatments that are so innovative that there is no existing product on the market to "copycat". Such new drugs create a new market not yet in existence.

²⁹⁰ *See*, MARSA, *id.* Certainly, if 84 per cent of approved drug between 1981 and 1991 are "me, too" drugs, then most R&D cuts are most probably justified. However, note that such drugs will create or intensify price competition. "Me too" drugs are therefore not analogous to 'losers'.

²⁹¹ Note the argument, presented below, that straightforward overlap in medical research is unlikely in the first place.

²⁹² *See*, Joseph Kattan, *The Role of Efficiency Considerations in the Federal Trade Commission's Antitrust Analysis*, 64 ANTITRUST L.J. 613, 618-619 (1996). Kattan argues that where the transaction is likely to lead to anti-competitive effect the requirement of proof of existence of merger-specific efficiencies, is a sound policy.

Obviously, it is 'winners' that may be more likely to be targeted for acquisition. Indeed, appropriation of a successful technology may be an important goal of a merger. For example, Zucker and Darby (1996), looking at the 18 companies that obtained the first 21 US licenses for new biological entities, as well as a number of other firms, conclude that of the new dedicated biotech firms, the ones that are lucrative have largely been acquired.²⁹³ The ownership or control of Chiron, Genetech, and Genetics Institute were acquired after their first new biological entities were licensed for US marketing.²⁹⁴ However, the acquisition of 'winners' is not necessarily confined to cases where the acquiring company wishes to bring the new drug to the market as quickly as possible. Scherer and Ross (1990) refer to the "monopoly motive" for mergers,²⁹⁵ namely the idea that some mergers are driven by the desire to achieve or reinforce a monopoly position.²⁹⁶ Reduction of competition may therefore be the very object of certain takeovers. As one Financial Times editorial puts it: "Companies rarely hesitate to buy patents, people or technologies that might challenge their markets - even if this damages the long-term health of research."²⁹⁷

Recent investigations demonstrate that identifying these cases with a reasonably high degree of certainty should not be too difficult in practice.²⁹⁸ For instance, even as early as

²⁹³ ZUCKER AND DARBY, *supra* note 201, at 12.

²⁹⁴ *Id.*; *See also, infra* note 405 (Warner Lambert/Agouron).

²⁹⁵ SCHERER AND ROSS (1990), *supra* note 128, at 160.

²⁹⁶ *Id.*

²⁹⁷ FT. March 13, 1997; A striking example is provided by the January 1999 planned merger of two leading biotechnology companies in cardiovascular diagnostics; Shield Diagnostics Group of the UK and Norway's Axis Biochemicals (the new group will be the world's biggest in homocysteine - a cardiovascular test). The two developed competing tests for assessing the risk of heart disease: "If we had not agreed to merge then we would have been competing against each other which would not have helped either party," said Shield's managing director. Shield, according to one comment, "is paying a small premium [to] remove a leading competitor." *See, Virginia Marsh, Shield: Biotech Company Plans Axis Takeover*, FT, Jan. 19, 1999 <<http://www.ft.com>>.

²⁹⁸ *See, Dahdough & Monogven, supra* note 92, pp. 420-421; Particularly if the drug is already in advanced clinical trials and therefore stands a better chance of eventually reaching the market. *See, Dennis*

the merger negotiation stage, and long before any merger is actually proposed and notified, overlapping and promising R&D projects are quickly identified by the press. One example is the recently announced Zeneca/Astra merger where overlaps in areas such as cardiovascular, anaesthetic, and asthma has been quickly identified.²⁹⁹ Another illustration is provided by American Home Products/SmithKline Beecham failed merger negotiations. For example, the Financial Times quickly declared that, clearly, one of the principal aims was to trim R&D spending.³⁰⁰ Broadly overlapping R&D projects of AHP and SmithKline identified by the press included development of vaccines, antidepressants, antibiotics, headache pills, anxiety and cancer.³⁰¹ It was therefore anticipated that antitrust scrutiny, to assess possible anti-competitive effects in these markets, would be likely had the deal gone ahead.³⁰² Likewise, when SmithKline Beecham and GlaxoWellcome entered merger negotiation it was expected that their overlapping R&D in anti-viral drugs, cancer and ulcer treatments would draw the attention of the US and EU antitrust enforcers.³⁰³

To be sure, where overlaps are detected in the merging firms' R&D portfolios, there is little doubt that R&D cuts are justified. However, while little controversy surrounds R&D cuts in cases of straightforward overlap, the question remains whether true overlap in drug research is likely to exist at all.³⁰⁴ In the pharmaceutical context overlap *per se* is

A. Yao and Susan S. DeSanti, *Innovation Issues Under the 1992 Merger Guidelines*, 61 ANTITRUST L.J. 505, 513 (1993).

²⁹⁹ See, *Aiming for the Stars*, FT, Dec. 9, 1998, the Lex Column (<http://www.ft.com>); See also, Pilling *et al* (1998), *supra* note 6, and chart therein.

³⁰⁰ Daniel Green and William Lewis, *Drugs: SmithKline and AHP in \$125bn Merger Talks*, FT, Jan. 31, 1998, at 1.

³⁰¹ Elyse Tanouye and Steven Lipin (1998).

³⁰² *Id.*; See also, Daniel Green, *Merger Fever Returns to the Drug Industry*, FT, Jan. 21, 1998, at 23, available in 1998 WL 3526519.

³⁰³ Daniel Green *et al.* *SmithKline-Glaxo GBP 100bn Merger Plan*, FT, Jan. 31, 1998, at 1, available in 1998 WL 3529032; More specifically, overlapping activities in which both companies are strong include Herpes medicines and anti-emetics. See, *The UK Drugs Champion*, FT, Feb. 2, 1998, at 17, available in 1998 WL 3529334.

³⁰⁴ One may recall that application of antitrust analysis to industry-specific conditions is the very core of

far from suggesting inefficiency. For one, identical research tracks and matched future efficacy are unlikely.³⁰⁵ The fact that, say, ten companies test drugs for the same type of cancer means, if anything, very little. These 10 projects are likely to involve different research teams, different concepts, ideas and directions, different corporate cultures and other factors affecting the likelihood and degree of eventual success.³⁰⁶ According to Pisano (1997), firms might undertake R&D in the same therapeutic class as an innovator, but their probability of finding, without infringing a patent, another compound with the same therapeutic properties, is quite small.³⁰⁷ Moreover, even similar future uses of drugs aiming at the same disease is rather uncertain.³⁰⁸ Again, this is not to suggest that under no circumstances can excessive drug research exist; rather, it is submitted here that an attempt should be made to isolate the few cases where a truly novel treatment may be delayed or abandoned in order to eliminate its prospective pro-competitive effect.

The existence of wasteful duplication in drug research may be supported by two additional lines of arguments. First, some researchers allege that there is a general over-use of low quality medical technology including, but not only, drugs.³⁰⁹ Second, there

this paper.

³⁰⁵ For example, there are currently at least 3 major approaches for the development of TB drugs: a DNA vaccine, an improved version of an existing drug, and a bacteria-based treatment. All are undergoing clinical trials and all target the same disease. See, Victoria Griffith *Switched-on Defences*, FT, Oct. 10, 1996, at 20. Does this mean that there is an inefficient parallel research? Probably not.

³⁰⁶ *CF.*, Rapp, *supra* note 122, at 36, note 59. Rapp implies that the fact that eight companies had experimental breast cancer drugs in Phase III trials during 1995, might point to unnecessary overlap in research, calling for greater efficiency. However, it is intriguing to see whether the eight different research paths were, from a scientific point of view, identical or even similar. How many of them actually reached the market and are considered effective? Is it not possible that the most effective of them could be lost due to 'efficiency'-driven consolidation at the innovation stage?; It is important to note that even if one believes that duplication does exist, that duplication is not necessary a 'wasteful' one. This is because the existence of drugs with similar efficacy on the market intensifies price competition and is therefore likely to significantly reduce prices for consumers.

³⁰⁷ See, PISANO, *supra* note 20, at 56.

³⁰⁸ See, e.g., Peter S. Arno. *et al.*, *Rare Diseases, Drug Development, and AIDS: The Impact of the Orphan Drug Act*, 72 MILBANK Q. 231 (1995).

³⁰⁹ See e.g., ROBERT H. BLANK, *THE PRICE OF LIFE: THE FUTURE OF AMERICAN HEALTH CARE* 155 (1997), argues that the medical technology has gone through "...unbridled proliferation". Further, it is "...now clear that it will be impossible to control the costs of medical care without taming medical

appears to be a trend towards growing inefficiency in the drug innovation process. One can identify a clear "...long-run decline in innovative productivity in the pharmaceutical industry" suggesting that "...companies are actually getting worse at innovation."³¹⁰ Between 1971 and 1991, there was an increase of over 2300 per cent in R&D spending by the members of the Pharmaceutical Manufacturers Association.³¹¹ While sales have grown approximately in line with that increase, no significance increase in the number of new drugs launched could be seen.³¹²

Does the trend towards decline in innovation productivity mean that drugs firms are becoming less efficient and/or that there is too much wasteful competition over innovation? A study by Henderson and Cockburn (1996), drawn upon data compiled from the internal records of ten major pharmaceutical firms, confirmed the decline in

technology" (p. 156, quoting Riegleman, 1991). There is, goes the argument, "...an incentive structure that rewards overuse of technologies." As a result, many medical innovations "...have never been subjected to objective scrutiny nor assessed as to their contribution to health or their cost-effectiveness" (p. 156, citing Butter, 1993). This, in turn, "...leads to the perpetuation of some illogical, expensive and frequently dangerous practices carried on in the name of modern medicine" (p. 156, quoting Radical Statistics Group, 1976). "Although this proliferation of medical technology means that insured Americans have access to the latest innovations, in many cases the interventions are of unproven benefit and in some cases might be dangerous to the patient"; In similar spirit, the U.S. Dept. of Health, Education, and Welfare (HEW) Task Force on Prescription Drugs observed as early as 1968 that "...much of the drug industry's research and development activities appeared to provide only minor contributions to medical progress." See, Donald T. Rucker, *The HEW Task Force on Prescription Drugs: An Insider's Perspective*, in Smith ed. (1996), *supra* note 51, at 7; On the one hand, such views, if correct, may be taken to mean that there is too much medical technology (included, but not only, drugs) out there. On the other hand, it is possible that there is not enough government regulation and this results in low quality, though sometimes highly profitable, medical products. Arguably, as will be discussed later, the antitrust authorities can play their (limited) part in remedying that problem by ensuring that patients are not deprived, due to narrow profit-motivated interests, of highly effective medical technologies at the later stages of their development.

³¹⁰ See, JAMES (1994), *supra* note 29, pp. 17 (table) and 37. That decline in productivity may be attributed to the somewhat wild pursuit of size. As discussed above, a number of mergers, including Ciba/Geigy and Bristol-Myers/Squibb are believed to have produced little efficiency.

³¹¹ Henderson & Cockburn (1996), *supra* note 271, at 167.

³¹² *Id.*; See also, *The Alchemists*, *supra* note 27, at 14, citing Andersen Consulting: the top ten pharmaceutical companies between 1990 and 1994 delivered only 0.45 truly novel drugs on average each year. Andersen Consulting also estimates that these companies will have to increase their productivity ten-fold and launch five new compounds each year in order to maintain their current revenue-growth rate of 10% (without resorting to yet more one-off cost cutting mergers).

productivity in drug discovery and explored the reasons for that decline.³¹³ The study suggests that the decline in productivity is not a function of a shift to research in more complex research fields or of an increase in the so-called racing behavior in the industry;³¹⁴ instead, the decline is probably attributed to rising R&D real costs reflecting decreasing returns.³¹⁵ Henderson and Cockburn therefore conclude, "with caution":

The presence of several competitors in any given area may increase the social welfare...While it may be tempting to think that one could rationalize the amount of R&D conducted by the industry or set prices on the basis of the research expenditure of a single firm, our analysis suggests that it may be dangerous to think of research costs in terms of some measures of "dollars per drug" deduced from the spending of any single firm. A reduction in the number of firms conducting research in any given area may have significant negative externalities, if R&D spending complements rather than substitutes for rivals' investment. Intuitively, the true cost of a drug may include the costs of those programs in rival firms that apparently failed but that contributed to the industry's common pool of knowledge by spilling information across the boundaries of the firm.³¹⁶

On this reading, drug research races are not straightforward duplicative races and there are significant spillover effects. As a result, "...research productivity may be correlated with competitive investment, and additional entry into the R&D race may enhance welfare."³¹⁷ Scherer (1996), commenting on that study, suggests that the true picture is

³¹³ See, Henderson & Cockburn, *supra* note 271, at 167.

³¹⁴ *Id.*, at 184.

³¹⁵ *Id.* Henderson & Cockburn "...speculate that this probably reflects both a shift to treatment conditions that require more complex clinical trials and increasing regulatory stringency."

³¹⁶ *Id.*, at 185.

³¹⁷ *Id.*, at 181. Henderson and Cockburn tested the presence of spillovers in their data by regressing important patents onto a variety of measures designed to capture competitive activity in a given field. They found that own output and the success of rival firms' efforts are "positively and strongly correlated." Similar results were reached when competitors' discovery spending was used in place of their patents ("competitors' investment has a positive and significant impact on own research productivity.") Likewise, patent output was found to be "significantly correlated" with the flow of important published papers by researchers in the private sector. "[C]ontrolling for that effect *strengthens* the correlation between own research productivity and competitors' output" (p. 183).

Thus, our results are consistent with the idea that there are significant spillovers of knowledge across firms. Important patents per discovery dollar are likely to be significantly higher if competitors have recently obtained a number of important patents in the area, and far from leading to a "mining out" of opportunities, competitors' research appears to be complementary activity to own R&D (p. 184).

more akin to a race to "...horizontally differentiated niches in what economists call product characteristics space."³¹⁸ Hence, it is not an "either he wins or I win" race but an "everybody wins" race in which some win more than others.³¹⁹ Further, Scherer argues that what companies actually do is *not* trying consciously to duplicate the output of one or more known racing partner; but rather, after they fall too far behind in a research race, they seek an unpopulated niche;³²⁰

"None of this means that research and development spending is not endogenous, nor does it imply that rent dissipation cannot occur.³²¹ (footnote added) Especially where there is big uncertainty about who is doing what³²² (footnote added), more than one firm may respond in the same way firms may pursue numerous approaches in the most profitable therapeutic classes."³²³

In such a case, though the firms are not consciously racing, there may well be a substantial, "even total", rent dissipation.³²⁴ Scherer agrees that dissipation can be avoided by "a perfect nominating mechanism." Indeed, one such mechanism has been identified by Henerson and Cockburn who argue that "...individual firms have idiosyncratic capabilities that might lead them to pursue somewhat different leads, perhaps thereby preventing complete dissipation of rents."³²⁵ Despite that, in a horizontally differentiated product model, social returns on investment do not necessarily

³¹⁸ Scherer, *Commentary*, (1996), *supra* note 269, at 270.

³¹⁹ *Id.*; One may be inclined to accept Scherer's argument inasmuch as competition among truly innovative experimental treatments are at issue. Whether that argument necessarily holds in the majority of cases, where the competition involves competing "me, too" drugs, is questionable. That said, "me, too" research may also produce spill over effects and/or enhance price competition thus leading to welfare gains. *See, supra* note 306.

³²⁰ Scherer, *id.*

³²¹ *See id.* at 271-272 and figure therein.

³²² It has been mentioned above that drug innovation information is widely disseminated. That characteristic of drug research appear to "fit" into Scherer's analysis. That is, according to Scherer rent dissipation is more likely to occur "...where there is big uncertainty about who is doing what." In other words, rent dissipation is unlikely to occur in drug innovation races where the players *do* know who is doing what.

³²³ Scherer, *Commentary* (1996), *supra* note 269, at 270.

³²⁴ *Id.*

equal or exceed private returns and it is possible that some "cannibalization" of rivals' rents will occur and lead to excessive R&D.³²⁶

All things considered, confirming the points made at the beginning of the duplication discussion, Scherer agrees that the excessive drug R&D scenario is unlikely "...given the differences among ostensibly similar pharmaceutical entities in therapeutic effects and side effects and the frequently significant consequences of those differences."³²⁷

As of 1994, there were 214 drugs in development for the treatment of cancer, including 48 for breast cancer, 37 for lung cancer, and 30 for colon cancer,³²⁸ It appears that whether that is too little, too much, or just the right amount of research, will remain, as things stand, unknown. There is some support for the propositions that the efficiency resulting from drug mergers is questionable, and that straightforward and wasteful duplication in medical research leading to welfare loss is unlikely. It follows that in cases where no unnecessary duplication exists, a reduction in R&D input can lead to less innovation.

D. Theory and Factual Basis: Overview

The foregoing sections considered the relationship between concentration and drug innovation. It has been shown that a possible link between concentration and post-merger reduction of total R&D input may exist in cases where both incentive and ability to reduce R&D effort are present. Further, it has been argued that since duplication in drug

³²⁵ *Id.*, at 272.

³²⁶ *Id.*, at 273.

³²⁷ *Id.*,

³²⁸ Davis, *supra* note 212, at 80.

innovation is unlikely, there may well be a cause-and-effect connection, in specific cases, between post-merger R&D cuts and the amount of R&D innovation produced.

All in all, reliance on analysis that strives to anticipate harm to drug innovation does not seem unreasonable. A pre-condition for the application of the innovation markets approach in the pharmaceutical industry, in the form of some all-embracing theory linking R&D input to innovation, appears to miss the real issues at stake.³²⁹ Pharmaceutical companies primarily compete to develop novel treatments. The actual competition is over innovation, and some relationship between competition and innovation seems to exist. The next question that logically follows is whether the new concept can be successfully applied in practice? In short, does it work?

E. Does Innovation Market Analysis Work in Practice?

It will be recalled that the main objection to the utilization of the innovation market concept is that its relative lack of sound empirical and theoretical foundation is bound to cause uncertainty and might lead to over-enforcement. The previous sections dealt with the first limb of that argument, namely, the alleged lack of a sound theoretical and empirical foundation. The following discussion questions the second limb; the assertion that when the innovation market analysis is applied in practice, its inadequate basis will inevitably lead to uncertainty and mistakes. This section demonstrates that assertion to be incorrect inasmuch as mergers in the ethical drugs sector are concerned. High percentage of cases alleging innovation markets brought by the FTC concern pharmaceutical or

³²⁹ See, AREEDA & KAPLOW, *supra* note 75, at 5, (in relation to the antitrust laws, economic theory, uncertainty, and the judicial role): "Although economic theory is indispensable to our task, clear-cut answers are often impossible....[H]ow far must we search for economic truth in a particular case when the economic facts may be obscured at best, when the relevant economic understandings may be controversial or indefinite, and when the statute does not give us a clear-cut value choice?"

related medical products,³³⁰ yet those cases neither present insurmountable difficulties nor do they appear to produce an unreasonable degree of uncertainty.

Product Market

The investigation process of a drug merger takes similar form to any other case thus the definition of the product market comes first. Provided the merging firms' overlapping R&D activities are likely to have a significant impact on one or more downstream product markets,³³¹ these markets should be identified. A pharmaceutical product market normally consists of remedies for a specific disease, or even a sub-category of such a remedy.³³² Since entry would be easy in the absence of specific assets and expertise, such assets and expertise are looked for during that phase of the analysis.³³³

Next to be considered are alternative R&D resources in the overlapping R&D areas. It seems that, unlike many other industries, the task of identifying alternatives is relatively easy because applications for patent registration and for IND status, among other sources, disclose a wealth of useful information.³³⁴ Evidence regarding close substitutes and their quality is therefore available and accessible.³³⁵ In addition, drug innovation races

³³⁰ *E.g.*, six out of eight cases brought during 1995, *see*, Dahdouh & Mongoven, *supra* note 92, at 406, note 4.

³³¹ *See*, Gilbert & Sunshine, *supra* note 98, at 595; Dahdouh & Mongoven, *supra* note 92, pp. 420-422.

³³² *See*, Glaxo, *supra* note 39, where one such overlapping activity was R&D of non-injectable migraine drugs.

³³³ *See e.g.*, Ciba-Geigy Ltd, FTC, File No. 961-0055, 12/17/96, where it was assumed that given the parties' patent portfolios, entry into the whole gene therapy market and into specific gene therapy product markets, could take 12 years. It was concluded that new entry was "extremely unlikely".

³³⁴ As described earlier, patent application is normally filed at a very early stage. In addition, effectiveness and safety assessment are conducted, and extensive data collection is required by the FDA in every clinical phase; Another possible source of information (though information provided must be treated with extra caution) are competitors of the merging firms; *See also, supra* note 274; It has been argued that "[new products in clinical trials are usually] well recognized and their potential impact on the market is anticipated well before sales begin." *See, FTC Hearings on Enforcement Policy* (1995), *supra* note 35, at 491, *per* Derek J. Schaefer; Dahdouh & Monogven, *supra* note 92, at 421 (drug development is visible and R&D is conducted in a relatively open, publishing environment); *But* note that in-house drug research can also be very secretive.

³³⁵ It must also be noted that the very decision to move on to the next phase encompasses vast financial

sometimes involve a handful of easily identifiable competitors.³³⁶ Not only overlapping R&D activity, but also competition from downstream products is evaluated.³³⁷ Once the product market is defined, the analysis of an innovation market turns to the definition of a geographic market

Geographic Market

A geographic market must be "economically significant" and "correspond to commercial realities of the industry [in question]."³³⁸ Accordingly, the geographic market for innovation is assumed to be worldwide.³³⁹ The defined product and geographic markets supply the necessary setting against which the substantial issue - anti-competitive effects - can be placed.

Anti-Competitive Effects

The main steps in the assessment of possible anti-competitive effects may be summarized as follows: First, an almost routine appraisal of post-merger increase in R&D

implications and therefore implies a vote of confidence by the company itself.

³³⁶ For example, the merging parties in American Home Products(AHP)/American Cyanamid merger were two out of only three competitors in or near clinical trials of a Rotavirus vaccine. *See*, American Home Products, *supra* note 125.

³³⁷ However, as noted earlier, novel and significantly improved drugs are likely to define new markets that do not yet exist. *See generally*, Gilbert & Sunshine, *supra* note 98, at 596; For example, the product market in the merger of Upjohn/Pharmacia was confined to colorectal drugs based on Topoisomerase I inhibitors expected to significantly increase, compared to existing treatments, the survival rate of sufferers. *See*, Upjohn Co., FTC., File No. 951 0140, 10/27/95; *See also* the Glaxo case, *supra* note 39, where one relevant product market was confined to non-injectable migraine remedies that were, *inter alia*, much easier to administer. Supply side and demand side substitutability indicated that cross-elasticity was low (despite significant price difference) between the superior non-injectable remedies and the inferior injectable remedies. As a result, the latter were left out and non-injectable migraine was held to constitute a separate product market for the purposes of antitrust analysis.

³³⁸ *See*, Brown Shoe Co. v. U.S., 370 U.S. 294 (1962).

³³⁹ *See, e.g.*, the merger of Baxter/Immuno where it was stated that any one of few competitors worldwide could seek FDA approval for the product in question - Fibrin Sealants - biological product used to stop bleeding (Baxter International Inc., FTC, File No. 971-0002, 12/19/96); *See generally*, Joseph F. Brodley, *Antitrust Law and Innovation Competition*, 4 J. ECON. PERSP. 97 (1990); Gilbert & Sunshine, *supra* note 98, pp. 504-595; *CF*: Thomas M. Jorde and David J. Teece, *Competing Through Innovation: Implications for Market Definitions*, 64 CHICAGO-KENT L. REV., 741 (1988).

concentration.³⁴⁰ Second, examination of the effects of the increase in concentration on R&D efforts and, sometimes, on future prices.³⁴¹ As discussed above, the likelihood of a unilateral reduction of total R&D levels generally depends on the ability and incentive to do so. Both primarily depend on the viability of new entrants and the R&D strength of existing competitors. This could be seen in a number of cases.³⁴²

Particularly noticeable is the Hoechst/MMD merger where the FTC plainly stated that "...the merger negotiations affected Hoechst's incentives with respect to the development of Tiazac," thus delaying FDA approval.³⁴³ Tiazac was initially developed by Hoechst to compete with MMD's Cardizem, the dominant hypertension and cardiac drug on the market, and once merger negotiations began Tiazac's progress to the market appears to have slowed.³⁴⁴ In a number of cases, where both innovation market and potential competition arose, innovation market analysis was used to identify future anti-competitive effects not covered by potential competition analysis.³⁴⁵

³⁴⁰ See generally, VISCUSI, ET AL., *supra* note 128, pp. 212-215; See e.g., Roche/Genetech where one product, the Human Growth Hormone, furnished Genetech with a near-monopoly share of the highly concentrated market in therapeutics for certain short stature deficiencies. Roche controlled one of a handful of potentially competing products in advanced clinical trials, Roche Holdings, Ltd., C-3315, Nov. 28, 1990, 113 FTC Decisions 1086 (1990); See also, Hoechst/Marion Merrell-Dow (MMD) where Hoechst marketed the only approved drug for a certain painful leg condition while MMD was developing one of the few potentially competing drugs. Hoechst AG, FTC, File No. 951 0090, 9/18/95.

³⁴¹ Although the focus of this paper is innovation, one should not assume that price competition is a non-issue in innovation markets cases. See, *infra* note 328.

³⁴² See e.g., Baxter, *supra* note 339; "[entry into the Fibrin Sealant market] would require the expenditure of significant resources over a period of many years with no assurance that viable products would result." Since only a few companies sought FDA approval, and because development in that area is generally shielded by broad patents, it was concluded that the merger is likely to lead to R&D cuts; Likewise, the parties in Upjohn, *supra* note 337, were two out of a small number of firms developing a novel colorectal cancer treatment. Upjohn product was the nearest to approval while Pharmacia's lagged behind. Consequently, there was concern about prospective post-merger incentive to develop the latter as quickly as possible; See also, Glaxo where it was stated that the elimination of competition in the innovation market would "...increase Glaxo's ability to reduce unilaterally R&D [for migraine drugs]."

³⁴³ See, Hoechst, *supra* note 340.

³⁴⁴ See, 8 E.C.L.R R-200 (1996).

³⁴⁵ See, Roche, *supra* note 340, Hoechst, *supra* note 340, Boston Scientific Corp., FTC, File No. 951-0002, Feb. 24, 1995, and Wright Medical Technology, FTC File No. 951-0015, Dec. 8, 1994. These cases highlight the main deficiencies of potential competition (both actual and perceived): First, where the next generation of products is likely to destroy the current market. Second, where current product market does

On the whole, appraisal of anti-competitive effects requires consideration of post-merger increase in R&D concentration, to be followed by assessment of possible effects resulting from that increase. The case law in regard to anti-competitive effects reflects the agencies' awareness that competition in the health-care field is largely about efficacy, fewer side-effects, or other non-price product attributes. Where a significant increase of post-merger R&D concentration could be predicted, innovation market analysis has been used to identify future effects on quality, or to identify a possible loss or delay of potentially superior products.³⁴⁶

Innovation markets analysis concerns adverse impact on innovation and therefore on social welfare; it is not concerned with adverse impact on R&D input in isolation. Accordingly, the next step in the analysis of an innovation market is consideration of possible R&D efficiencies.

*R&D Efficiencies*³⁴⁷

In general, the agencies look for efficiency benefits such as elimination of redundant research projects and exploitation of complementary research assets that are likely to encourage more or better value innovation, while care is taken to prevent loss of

not yet exist. Finally, where future competition in existing market will be harmed by combination of R&D assets today; About the doctrine of potential competition, *see generally*, Joseph F. Brodley, *Potential Competition Under the Merger Guidelines*, 71 CAL. L. REV. 376 (1983); *See also*, Mark D. Whitener, *Potential Competition Theory—Forgotten but not Gone*, 5 ANTITRUST 17 (Summer, 1991).

³⁴⁶. *See e.g.*, AHP, *supra* note 125 (delayed introduction of a Rotavirus vaccine); Note that *price* competition has not been ignored in innovation markets cases. For example, higher prices for future gene therapy products were discussed in Ciba-Geigy, *supra* note 333. *See also*, Oerlikon-Burhle Holding AG, FTC, File No. 941 0054, 10/7/94.

³⁴⁷ On efficiency considerations in merger cases, *see generally*, Pierre-Emmanuel Noël, *Efficiency Considerations in the Assessment of Horizontal Mergers under European and U.S. Antitrust Law*, 18 E.C.L.R. 498 (1997); *See also*, Joseph P. Griffin and Leanne T. Sharp, *Efficiency Issues in Competition Analysis in Australia, the European Union, and the United States*, 64 ANTITRUST L.J. 649 (1996).

significant R&D projects.³⁴⁸ The attitude towards drug research seems to be that competition afforded by separate R&D paths sometimes tends to enhance, rather than decrease, the volume and value of innovation. Possible benefits that may flow from a merger are recognized so there is neither a flood of challenges to mergers, nor an attempt to prevent them altogether. Surgical operations are conducted instead.³⁴⁹ In the vast majority of cases, post-merger elimination of redundant R&D programs appears to proceed with little or no interruption presumably because sound evidence enables the agencies to distinguish between R&D 'winners' and 'losers' and thereafter direct their efforts to preserve the former.³⁵⁰

Where possible post-merger efficiencies do not outweigh the merger's likely detrimental effects on innovation, appropriate remedies are sought.

Remedies

Restoration of competition over innovation requires some creativity.³⁵¹ Consent decrees mostly come under the two broad heads of compulsory licensing and divestiture. These remedies enable the agencies to be flexible in their search for effective solutions in distinct situations. In general, divestiture transfers the whole project to a new entity whereas licensing enables the merged company and the licensee to concurrently continue

³⁴⁸ See, Dahdouh & Mongoven, *supra* note 92, at 421, quoting Commissioner Varney; Gilbert & Sunshine, *supra* note 98, at 597.

³⁴⁹ A typical example is the attempt to preserve a valuable vaccine program in the AHP case, *supra* note 125.

³⁵⁰ See in particular the facts of the Roche, *supra* note 340, and Hoechst, *supra* note 340; Tom K. Willard and Joshua A Newberg, *Antitrust and Intellectual Property: From Separate Spheres to Unified Field*, 66 ANTITRUST L.J. 167, 224 (1997), argues that in each of the FTC's pharmaceutical merger cases, "...the [FDA] approval process...provides a clear measure of the timing and likelihood of market entry for a particular drug. No new drug can be sold in the United States without FDA approval, and the process is highly visible and time-consuming. Thus, if FDA trials place substantial doubt on the safety or efficacy of a particular drug, the FTC will tend to discount that drug's likely impact on competition. Similarly, the closer a drug is to final approval, the more assured the antitrust enforcers will be in their assessment of the competitive significance of the drug."

³⁵¹ See, Dahdouh & Mongoven, *supra* note 92, at 438: "...remedies in innovation market cases have been as innovative as the market in which they sought to restore competition."

the innovation race.³⁵² Broadly speaking, divestiture is perceived to be suitable in cases where the merged company demonstrates a genuine wish to continue R&D. Licensing is believed to expedite R&D if necessary. For example, when other companies already have a product on the market.³⁵³

One kind of situation calling for a specifically tailored remedy is found in the *Hoechst* case where the remedies sought to ensure continuing competition in the cardiac drugs market.³⁵⁴ To that end, an unusual set of remedies was provided for. Hoechst was required to settle certain litigation and drop further litigation that delayed introduction of Tiazak, a hypertension and cardiac drug jointly developed by Hoechst and a third company, Biovail. In addition, Hoechst had to provide Biovail with a toxicology package that was imperative for FDA approval. It was estimated that removal of these barriers would enable Tiazak to compete against the merged firm's Cardizem which was the dominant product on the market, and save consumers between \$15 and \$30 million a year.³⁵⁵

The *American Home Products* settlement required the other party to the merger - American Cyanamid - to divest and license its Rotavirus vaccine project.³⁵⁶ That remedy was criticized for failing to "give competition a shot in the arm,"³⁵⁷ that is, as not being severe enough. However, the facts do not seem to support that contention. First, the order provided for a comprehensive package of technical assistance, training, and

³⁵². See, Commissioner Azcuenaga separate statement in *Ciba-Geigy*, *supra* note 333; See e.g., *Amersham International PLC*, C-3305, Sep. 14, 1990 (*Amersham/Medi-Physics*).

³⁵³. See, *Dahdouh & Mongoven*, *supra* note 92, at 438.

³⁵⁴. See, *Hoechst*, *supra* note 340.

³⁵⁵ See, 69 ANTITRUST 343 (1995).

³⁵⁶ *AHP*, *supra* note 125.

³⁵⁷ *Id. per* Commissioner Mary L. Azcuenaga (dissenting); *Rapp*, *supra* note 122, at 44; 67 ANTITRUST 582 (1994).

intellectual property transfer. Second, AHP successfully spun off, within reasonable time, its Rotavirus and tetanus/diphtheria vaccines assets to FTC-approved buyers.³⁵⁸

In contrast, some cases support the claim that tinkering with innovation can produce undesirable results. One such case was the merger of Institut Merieux and Connaught Bioscience, a potential competition case which illustrates the "...dilemma of well-intentioned remedy later proves impractical to fulfill."³⁵⁹ In that case, a complex settlement required Merieux to lease a rabies vaccine business acquired from the other party, Connaught, for at least 25 years to a Commission approved lessee. In addition, Merieux was ordered to obtain prior approval for future acquisition of any interest in a producer of a competing vaccine.³⁶⁰ Merieux subsequent inability to find a lessee led to a request for removal of the 'bite from the order'. Long negotiations followed, seemingly damaging Connaught's rabies vaccine business at the meantime. What's more, it seemed that a trustee, which was provided for by the order, would be unable to locate a lessee for much the same reasons that Merieux has been unsuccessful in doing so. To put it more simply, not only did the settlement have little chance of serving its purpose, but also some unnecessary damage has been caused to the merged company. The lease obligation was finally terminated in 1994 and the prior approval provision was deleted from the order in 1996.³⁶¹

³⁵⁸. See, FTC release, Oct. 4, 1996, <<http://www.ftc.gov/opa/9610/petapp58.htm>>; 69 ANTITRUST 60 (1995).

³⁵⁹. See, Commissioner Deborah K. Owen's clarification, Institut Merieux S.A., FTC, C-3301, Apr. 29, 1994. Institut Merieux S.A., FTC, C-3301. Aug. 6, 1990;

³⁶⁰. *Id.*

³⁶¹ On the Institut Merieux case, *see generally*: 62 ANTITRUST 538 (1993); (1993) 64 pp. 289,333,493,538; (1994) 66 pp. 22,509; (1995) 69 at 254 and; (1996) 70 at 58; Merieux may be contrasted with the Roche case, *supra* note 340, which was settled approximately at the same time. By 1992 Roche smoothly complied with its obligations under the settlement. (*See*, 62 ANTITRUST 539 (1992); (1992) 63 pp. 235,754; and (1996) 70 at 83). The different outcome can be attributed to the nature of the market in question. Only a handful of companies compete in the vaccines' market in which the Merieux merger took place. One principal reason for the small number of players in that market is the greater safety risks and product liability claims associated with it. *See*, 62 ANTITRUST 539 (1992); (1992) 63 at 235,754; and (1996) 70 at 83. The Merieux saga, though troublesome, does not seem to provide a sound basis for a

The success of R&D divestiture depends on complicated factors such as expertise accumulated by employees.³⁶² The Commission attempts to avoid such 'minefields' but went as far as trying to ensure that employees associated with a specific divested site will actually stay there.³⁶³ Seeking to circumvent another complex issue, the FTC now tries to modify previous decisions - like the one in the Merieux case - that proved unrealistic. For example, where prior FTC approval for certain transactions of the merged company is required by an existing consent order, that requirement may be dropped.³⁶⁴

The FTC also recognizes that R&D efforts can be harmed or destroyed by a short period of neglect or by lack of expertise.³⁶⁵ A number of solutions were employed in order to maintain viable R&D pending and during divestiture. These solutions include fines, the appointment of an interim trustee, and the threat of compulsory divestiture of important products.³⁶⁶ Separate operation of the acquired asset pending divestiture may also be required.³⁶⁷

complete wholesale of the innovation market approach. First, the case was a potential competition case, rather than an innovation market case. It follows that the inherent flaw, if any, exists within the traditional methods of analysis, regardless of the innovation markets analysis. Second, although remedies ordered in innovation market cases can be subject to similar flaws, it is certainly correct that, whatever type of analysis is being used, remedies ought to suit the particular market in question. In retrospective, it may be right to argue that the unique conditions prevailing in the vaccine market called for different remedies. Yet, that is true in all cases regardless of the analysis initially used to identify possible anti-competitive effects; On the effects of antitrust decrees, *see generally*, SCHERER (1984), *supra* note 134, pp. 207-221.

³⁶². *See*, Dahdouh & Mongoven, *supra* note 92, at 439; Rapp, *supra* note 122, at 44; Montedison, S.p.A., FTC, C-3586 (1995).

³⁶³. *See*, Montedison, *id.*

³⁶⁴. *See e.g.*, 70 ANTITRUST 83 (1996).

³⁶⁵. *See*, Dahdouh & Mongoven, *supra* note 92, at 440.

³⁶⁶. *See, e.g.*, AHP, *supra* note 125; Glaxo, *supra* note 39; Dahdouh & Mongoven, *id.*

³⁶⁷ *See e.g.*, Roche Holding Ltd., FTC, File No. 941 0085, 8/30/94 (Roche Holdings/Syntex).

F. Innovation Markets and Pharmaceutical Mergers: Overview

The innovation market approach reflects the antitrust enforcers' recognition that rapid technological advance calls for future-oriented ideas that can assist static merger analysis in identifying anti-competitive effects. It proposes to supply such a tool and seems to have done so successfully. The principal concerns about innovation markets focus on the allegedly uncertain cause-and-effect connections between market structure, harm to innovation, and eventual welfare loss. However, as shown above, that alleged weakness does not preclude utilization of the new concept in relation to drug innovation. Unlike many other industries, the characteristics of drug innovation enable the agencies to predict likely harm to innovation of beneficial future products. This can be done with a sufficient degree of certainty, in specific cases, on the basis of, *inter alia*, relatively clear post-merger ability and incentive to reduce R&D efforts, and the availability of extensive data collected in clinical trials or other publicly available sources such as the Patent Office.³⁶⁸

There is no flood of litigation and experience so far suggests that innovation market analysis is only used where R&D concentration is very high and where solid evidence clearly points to likely future harm to particular R&D projects.³⁶⁹ Furthermore, the

³⁶⁸ See, *Anticipating the 21st Century: Competition Policy in the New High-Tech, Global Marketplace* (Office of Policy Planning, Federal Trade Commission, 1996), at 37-39 <<http://www.ftc.gov/opp/global/report/global>>; Chin (1998), *supra* note 138, at 125, citing the FTC Report states:

[In innovation market cases] the FTC has focused on industries such as biotechnology and pharmaceuticals, "where regulatory processes permitted identification of the potential entrants and relatively secure conclusions that they would be unable to constrain anticompetitive conduct [and] in industries (e.g., biotechnology) where R&D efforts are well-publicized through issued patents and scientific journals, the FTC may have a factual basis for identifying firms with the ability and incentive to enter innovation markets.

The widespread public interest in clinical trials also results in Websites dedicated to information on clinical trials. See e.g., <<http://www.centerwatch.org/>> which follows "...trials in all of the major disease areas." See, Matt Villano, *The Word on Clinical Trials*, BOSTON GLOBE, June, 1, 1998. This should allow the agencies to detect not only overlapping R&D projects of the merging firms, but also potential competitors and their proximity to the market; See also, Willard and Newberg, *supra* note 350.

³⁶⁹ See, Joseph Kattan, *Antitrust Considerations in Innovation-Driven Markets*, 21 CAN.-U.S. L.J. 115, 118-119 (1995): "Virtually all of the cases that the government has brought in the area of innovation

current attitude of the enforcement agencies does not seem to keep pharmaceutical firms from being competitive.³⁷⁰ In other words, the occasional use of the new concept does not appear to cause any significant harm to the ethical pharmaceutical industry in the US or elsewhere.

IV. AN EXTRA MILE NEEDED? MERGERS INVOLVING SMALL ETHICAL DRUG FIRMS

A. General

From the discussion so far it can be seen that mergers involving large pharmaceutical companies are adequately covered by the law as developed since the endorsement of functional merger analysis by the Supreme Court. Utilization of the more recent, and somewhat controversial, innovation market analysis, helps the enforcement agencies respond more effectively to the present realities of the pharmaceutical industry. It enables them to identify and prevent post-merger harm to social welfare resulting from the possible loss or delay of beneficial treatments. To repeat, it helps them do their job.

All told, whether the law and agencies' practice satisfactorily responds to all the concerns associated with these effects depends on whether all mergers giving rise to similar concerns, not only those involving large and well established pharmaceutical firms, are caught. The coherence of the antitrust analysis of drug mergers therefore

competition have been mergers in areas in which only two or three firms were engaged in a particular type of research and the transaction therefore would have reduced the number of independent research efforts from three to two or two to one." These cases involved "...either a combination of one company that was already selling a product and another that was close behind it in an advanced stage of R&D or two companies in advanced stages, near commercialization, of R&D."; *See also*, Calvani, *supra* note 15, at 233: "A party able to identify four other independent players in the R&D market...may have escaped a market for innovation problem."

³⁷⁰ *See, e.g., FTC Hearings on Enforcement Policy, supra* note 35, pp. 490-491, *per* Charles Cooney and Derek J. Shaefer, *but cf.*, remarks by William R. Green.

depends on whether anti-competitive mergers involving two small pharmaceutical companies, or a small pharmaceutical company and a big one, are captured.³⁷¹

A 1980 study by the Securities and Exchange Commission (hereinafter SEC) indicates that small technology-based firms are;

"...party to an increasing proportion of the completed acquisitions reported by U.S. corporations. Data from the Federal Trade Commission suggests that these firms, particularly those with assets in the \$10m range, appear to be unusually attractive targets for larger acquisition-minded companies."³⁷²

Data from the 1972-1977 period showed a six-fold increase in the number of technology-based firm acquisitions, and the ratio of these acquisitions to all completed acquisitions increased 1,840% over the same period.³⁷³ This led the SEC to conclude:

"[T]he magnitude of the increases raises serious concerns about the reasons for such mergers and their possible implications for regulatory policy with regard to competition and efficient resource allocation in both product and capital markets."³⁷⁴

It is submitted here that the magnitude and quality of drug innovation originated in relatively small companies suggests that they should not be ignored by the antitrust enforcement authorities. Small, often loss-making, drug firms may have a very large share of the innovation market for a particular product or disease.³⁷⁵ It has been suggested that, unlike the past, the developments in biotechnology since the late 1970s afforded opportunity for new and small firms to successfully operate and compete over

³⁷¹ The recent \$20m acquisition by UK's Peptide Therapeutics of OraVex of the US - the two being small pharmaceutical companies active in the highly concentrated vaccines' research market - may be an interesting example. See, Virginia Marsh, *Peptide: PMC Stake and Extends Alliance*, FT, Jan. 30, 1999 <<http://www.ft.com>>; For an interesting hypothetical merger involving two small pharmaceutical companies, see, Calvani, *supra* note 15, pp. 225-228.

³⁷² RETURNS TO SHAREHOLDERS, *supra* note 244, at 1.

³⁷³ *Id.*

³⁷⁴ *Id.*

³⁷⁵ *E.g.*, the recently announced merger between two relatively small biotech firms, Shield Diagnostics Group of the UK, and Norway's Axis Biochemicals, which creates the world's leader in homocystein (a

research thus the shake out of small firms in the market has beneficial and pro-competitive effects.³⁷⁶

In any event, small biotech companies and large firms often engage in research races. For example, the discovery of the genetic structure of platelet receptors has prompted intensive research efforts for super aspirin in both large established firms such as Merck and Smithkline-Beecham, and in small biotech companies such as Cor Therapeutics and Centocor.³⁷⁷ Similarly, small biopharmaceutical firms, Apollon, Cubist, and Pathogenesis, currently compete with the pharmaceutical giant Merck for the introduction of an effective TB treatment.³⁷⁸ Another small biotech, - Ariad - developed a new form of gene therapy that offers a “key advantage” over current protein therapies, including Amgen’s and Johnson and Johnson’s best-selling anaemia drugs.³⁷⁹ Arguably, “[e]ach company, whether large or small, hopes to be the first to produce an important breakthrough.”³⁸⁰ Thanks to the emergence of combinatorial chemistry, small biotech firms are increasingly able “...to challenge big pharma on its own turf.”³⁸¹

cardiovascular) test. *See, supra* note 297.

³⁷⁶ *See*, HOWELLS AND NEARY, *supra* note 75, 70-71. This is, the argument goes, because a sufficiently competitive environment that encourages innovation has been created.

³⁷⁷ *See*, GAMBARDELLA, *supra* note 11, at 172; Competition between very small and very large firms is clearly the case in the plant biotech area. *See*, Rotman, *supra* note 236.

³⁷⁸ *See*, Griffith (1996), *supra* note 305, at 20; Chiroscience, a small UK biotech firm recently received a Swedish regulatory approval for a long-acting local anaesthetic - Chirocaine. The product’s future, however, is threatened because of the Zeneca/Astra merger. While Zeneca has exclusive worldwide marketing rights for Chirocaine, Astra is the world’s leading seller of the generic best-selling local anaesthetic (bupivacaine) and is also marketing its own version of bupivacain - the main compound of Chirocaine (called Naropin). “Analysts said it was unlikely there was room for three rival drugs in the AstraZeneca stable.” *See, Contrasting Fortunes, supra* note 287.

³⁷⁹ *See*, Victoria Griffith, *Ariad: Anaemia Therapy Lifts Drugs Firm*, FT, Jan, 5, 1998 <<http://www.ft.com>>; Another small biotech start-up, Tularik, is on its way to compete with pharmaceutical giants Merck and Warner-Lamberts in cholesterol-reducing drugs. *See*, Hall (1997), *supra* note 167, at 67(Ariad, a small US biotech, developed a new form of gene therapy that offers a “key advantage” over current protein therapies, including Amgen’s and Johnson and Johnson’s best-selling anaemia drugs).

³⁸⁰ GAMBARDELLA, *supra* note 11, at 172, note 17. As discussed earlier, a significant breakthrough, offering significant improvements compared with competing treatments, is likely to guarantee premium prices and commercial success.

³⁸¹ *The Alchemists, supra* note 27, at 9; At least as far as cash-rich small pharmaceuticals companies are

When the size of merging companies does not exceed the merger pre-notification thresholds³⁸², small mergers are likely to go unnoticed whatever the merger's potential to harm consumers. Consequently, they are most likely not to be investigated.³⁸³ In cases that fall within the compulsory notification thresholds, the agencies' practice³⁸⁴ suggests that the involvement of relatively small drug companies with little or no sales, practically precludes any serious antitrust investigation.

It is difficult to see why the use of the innovation market doctrine does not extend to all mergers in the ethical drug sector, whatever their size, where R&D concentration is high and a sufficiently important effect on one or more down-stream existing, or future, markets can be shown. An apparent inconsistency exists between the agencies' actual use of the innovation markets approach and their reliance on its underlying rationale on the one hand, and the fact that only very large mergers are actually considered on the other.³⁸⁵

concerned, competition with big-pharma is not necessarily limited to the pre-clinical research phase. This is because they can afford to outsource the management of clinical trials to specialist companies thus avoiding the otherwise competitive disadvantage of having little or no experience in the conduct of such trials; The logical consequence of these overall pro-competitive developments is that in markets where there is still high concentration, small firms should be treated just like any other firm. Simply put, lower (than in the past) barriers to entry (as a result of combinatorial chemistry and other developments) must not obscure the fact that antitrust concerns will continue to exist in specific therapeutic markets.

³⁸² See, the Hart-Scott-Rodino Antitrust Improvement Act, 15 U.S.C. § 18a (1994). See also, 16 C.F.R. §§ 801-803 (1995) which lists regulations regarding pre-merger notifications; See generally, STEPHEN M. AXINN ET AL., ACQUISITIONS UNDER THE HART-SCOTT RODINO ANTITRUST IMPROVEMENTS ACT (Second ed. 1988).

³⁸³ There is still the remote possibility that such a merger will be challenged under a State antitrust laws, or by the merging firms' consumers, employees, or competitors. However, this is unlikely unless a particularly strong impact is felt within a state or a particular antitrust injury is inflicted on the plaintiff (see the discussion below). It must also be noted that many mergers involve foreign companies thus raising international aspects and jurisdiction issues.

³⁸⁴ Both the FTC and the DOJ appear to refrain from intervening in cases involving small drug firms.

³⁸⁵ After presenting the details of a hypothetical merger involving two small pharmaceutical companies, Calvani, *supra* note 15, pp. 226-227 argues: "Given the new focus by the enforcement agencies on "markets for innovation", it is imperative to review both companies' research and development agenda."

The innovation market analysis assumes that, under modern commercial realities, innovation should be sometimes looked at separately. It is a separate market, concentration in which merits a unique method of investigation. If so, the fact that the determining factor for pre-notification is the current size of the merging firms, does not seem consistent as a matter of policy. Where the main focus of the investigation is innovation, current assets and sales should not matter all that much. The determining factor ought to be the merging firms' share and strength in the total R&D within a defined market and thereafter the probability of substantial lessening of competition in that market.

That claim may be demonstrated with a hypothetical. Assume that small company A which has no drugs on the market is taken over by small company B. Given are the *overlapping* products in the merging parties' portfolios. For simplicity sake, no reference is made as to the quality of the experimental drugs at issue, or as to the stage of clinical trials these drugs are in.

Small Pharmaceutical Company A: Drug R&D Portfolio

DRUGS	INDICATION	MARKET SHARE*	# COMPETITORS
Experimental XA	Diabetes	10%	10
Experimental YA	High Blood Pressure	33.3%	3
Experimental ZA	Cervical Cancer	50%	2

* Market share is calculated on the basis of the number of existing and pipeline drugs in the narrow therapeutic market.

Small Pharmaceutical Company B: Drug R&D Portfolio

DRUGS	INDICATION	MARKET SHARE	# COMPETITORS
Experimental XB	Diabetes	10%	10
Experimental YB	High blood pressure	33.3%	3
Experimental ZB	Cervical cancer	50%	2

From the tables above it may be inferred that the market for diabetes is not highly concentrated and therefore does not seem to give rise to antitrust concerns. However, it

may also be seen that A’s pipeline drugs YA and ZA directly compete with B’s YB and ZB experimental drugs in concentrated narrow therapeutic markets. The fact that both A and B are small firms does not change the fact that they respectively possess large market shares in products that, although not yet sold, are nevertheless of immense value to patients suffering from high blood pressure or cervical cancer. The merger of A and B therefore seems to raise prima facie antitrust concerns regarding potential harm to competition and ensuing harm to consumers in the high blood pressure and cervical cancer therapeutic markets.

Now assume that company B does not exist and A’s R&D portfolio overlaps with that of a much larger company C. Here the assumption is that A’s experimental drugs are superior to C’s on-market drugs but not necessarily superior to C’s experimental drug.

Large Pharmaceutical Company C: Drugs on the Market and R&D Portfolio

DRUGS	INDICATION	MARKET SHARE	# COMPETITORS
On-market XC	Diabetes	10%	10
On-market YC	High blood pressure	33.3%	3
Experimental ZC	Cervical cancer	50%	2

A takeover of A by C may give rise to antitrust concerns because the merging company AC will control two thirds of the high blood pressure market (a monopoly or near monopoly situation) and 100% of the cervical cancer market (a monopoly situation). Again, the fact that company A is small, with no products on the market and perhaps even loss-making, and the fact that no drugs for cervical cancer are yet sold, is immaterial. A’s acquisition by C may be seen either as a combination “substantially lessening competition” under section 7 of the Clayton Act or as an attempt to monopolize under section 2 of the Sherman Act.

Hypothetical aside, a random review of small pharmaceutical companies M&A activity between October 30th and November 18th, 1997, shows that at least thirteen relatively small medical-technology combinations were announced during that short period.³⁸⁶ These combinations involved treatments for, *inter alia*, serious Viral Diseases, Cancer, Alzheimer, Obesity, Asthma, and Respiratory Disorders.³⁸⁷ Those combinations, whether or not falling within the merger notification thresholds, embraced relatively small companies and therefore did not appear to trigger any government investigation. Obviously, this is far from suggesting that any of them raised anti-competitive concerns, most probably not, but shouldn't they at least be looked at? What if, as a result, even a single future important treatment, say, for Alzheimer, is lost every couple of years or so?

In sum, if as argued here, innovation market analysis is about identifying future downstream effects resulting from concentration in the R&D up-stream market today, then current sales and assets of the merging companies are not the correct points of reference for drawing the agencies' attention and subsequent intervention. It is clear from cases such as *AHP*, *Ciba-Geigy*, and *Upjohn* that the concerns raised in them would remain sufficiently serious regardless of the merging parties' current size, and whether or not

³⁸⁶ See, PR Newswire - *Pharmaceuticals, Biotechnology & Healthcare* (Nov. 18, 1997) <ehl@prwire.com>, Stories # 40145, Chiron Diagnostics acquisition, announced Oct. 31, 1997; # 28948, harrier, Inc. acquisition, announced Nov. 4, 1997; # 29144, Thermo Electron/Bear Medical, announced Nov. 4, 1997; # 27730, Boehringer Ingelheim/Ben Venne Labs, announced Nov. 5, 1997; # 40590, Arris/Sequana, announced Nov. 5, 1997 (ongoing research include Asthma, Diabetes, Obesity, Schizophrenia, Alzheimer); # 30396, Intercardia/Transcell Technologies, announced Nov. 6, 1997 (products include a Phase III Congestive Heart Failure treatment); # 32799, Zila/Oxycal Labs, announced Nov. 10, 1997 (products include enhanced forms of Vitamin C and other Dietary Supplements); # 33577 & # 41181, Respiroics/Heathdyne Technologies, announced Nov. 11, 1997 (products include monitoring devices for newborns, diagnostic and therapeutic devices for respiratory disorders); # 33929, Intracel/Biomira, announced Nov. 12, 1997 (products include Biotechnology and Diagnostics products for serious viral diseases and cancer); # 37277, Akorn/Solos Ophthalmology, announced Nov. 14, 1997 (products include Surgical Medical Devices); # 37374, Cellex Biosciences/UNISYN, announced Nov. 18, 1997 (Cell Culture products and services); # 37768, Chiral/Cambrex Corp., announced Nov. 18, 1997 (Chirally pure pharmaceuticals and agrochemical products); # 37814, Tripos/Peceptor Research Ltd., announced Nov. 18, 1997 (New Compound discovery)

³⁸⁷ *Id.*

their current sales and assets would exceed the pre-notification thresholds. In other words, logic dictates that the outcome in these cases would be the same even if these companies were small, perhaps even loss-making. The question remains whether they would be noticed in the first place.

B. Mergers Involving Small Companies: Are There Alternatives to Government Action?

Section 4 of the Clayton Act provides a powerful incentive for private enforcement in the form of treble damages. The plaintiff must show actual injury to her business or property, caused by the alleged antitrust violation. Section 16 of the Clayton Act confers standing on private persons seeking injunctive relief, provided sufficient threat of injury is demonstrated. Private suits are independent of any government action though a decree to the effect that a defendant has violated the antitrust laws shall be prima facie evidence against them. What then is the position of consumers?

According to the UK's National Consumer Council (1991):

When it comes to the supply of prescription drugs, the consumer is like the person at the end of the line in Chinese whispers. In between is a vast chain of decision makers - manufacturers, governments and regulatory committees, NHS³⁸⁸ (footnote added) policy makers and managers, GPs, hospital doctors and pharmacists - who often give the impression that the person who actually takes the medicine is best kept in the dark.³⁸⁹

As far as drug mergers are concerned, this description is not far from the truth. Private action by a patient or direct buyers for treble damages is unlikely primarily because she has never used the experimental product, therefore injury as a result of the merger will be

³⁸⁸ The NHS is the UK's National Health Service.

³⁸⁹ National Consumer Council (NCC)1991, at (ii), per Lady Wilcox, Chairman of the NCC. Lady Wilcox stresses the important of communication between the various groups involved in the area of prescription medicines. The NCC discussion paper concentrates on various issues from the consumers' perspective.

difficult, if not impossible, to show.³⁹⁰ According to Areeda and Kaplow, consumers are unlikely to score better even where the merger involve products that are already on the market:

Customers or suppliers who object to a horizontal merger have the standing to seek an injunction against the threatened injury...[but because] that injury is prospective and problematic in most merger cases, there would be no present damage to be trebled."³⁹¹ (footnote added). "Government enforcement is [therefore] critical in the merger area because few private parties have the incentive and standing to sue."³⁹²

³⁹⁰ Unless the patient herself participated in clinical trials - an interesting possibility in itself; In Illinois Brick the Supreme Court adopted the "indirect purchaser" doctrine holding that persons or entities, not dealing themselves directly with the defendant, lack standing to sue for treble damages because of the risk of double recovery and because of the cost and complexity associated with such suits, *Illinois Brick Co. v. Illinois*, 431 U.S. 720 (1977); *CF: AREEDA & KAPLOW, supra* note 75, at 84: "...there is no reason to deny private cause of action where the threat has ripened into injury."; Also, once a merger takes place, unilateral suppression of technology by the merging firm of its own technology is outside the scope of the US antitrust (and the patent) laws. Even non-merger suppression of technology cases such as *McDonald v. J&J and Alling v. Universal MFG. Corp, supra* note 236, left plaintiffs without standing; For a discussion of antitrust injury in private cases *see*, Jonathan M. Jacobson and Tracy Greer, *Twenty-One Years of Antitrust Injury: Down the Alley with Brunswick v. Pueblo Bowl-O-Mat*, 66 ANTITRUST L.J. 273 (1998) (generally supporting the current restrictive approach to standing in private antitrust cases).

³⁹¹ AREEDA AND KAPLOW, *supra* note 75, at 852; *See also*, Joseph F. Brodley, *Antitrust Standing in Private Merger Cases: Reconciling Private Incentive and Public Enforcement Goals*, 94 MICH. L. REV. 1,106-107 (1995) ("Effective private merger enforcement is threatened because the courts have focused on a single input into the private enforcement system – the incentive incompatibility of private enforcers."); Joseph F. Brodley, *Antitrust Law and Innovation Cooperation*, 4 J. ECON. PERSPECTIVES 97, 102 (1990) ("...restrictive judicial decisions have significantly reduced the threat of private antitrust litigation. The courts have imposed procedural barriers that severely limit the standing of private litigants to bring suit and increase suit.")

³⁹² AREEDA AND KAPLOW, *id.* The Government's role in merger cases is referred to by Areeda and Kaplow as "paramount."; *See also*, *National Consumer Council* (1991), *supra* note 26 at 49 (referring to the consumers' interest in safety, price, information and redress): "It is anomalous that consumers have so little market power over such an influential sector, and one so vital to their personal health."; By analogy, the same consumers' interests. should apply to pipeline drugs gradually making their way to the market; Even if consumers could bring a suit against the merging companies under the antitrust laws there is still the problem of information. At present, consumers hardly have information about the medicines they take, let alone medicines to be approved in the future. "[P]atients themselves have little choice but to trust that the information given [to them] is both adequate and correct." *See*, *National Consumer Council* (1991), *supra* note 26, at 73. In the US, the FDA publishes some information about new drugs. *See*, <<http://www.fda.gov>>. However, getting hold of information about experimental drugs undergoing clinical trials will be difficult, if not impossible for individual consumers. Possible sources will include company reports or general press releases. Note, however, that the position of patients' interest groups in regard to information maybe somewhat better than that of the individual patient.

Indeed, a 1977-1990 survey of private merger cases reveals that during that period only 2 such cases involved consumers.³⁹³

Once a merger took place, a successful challenge to unilateral suppression of technology - motivated by profit considerations such as the fear of cannibalization - becomes even less likely:

If an acquisition was lawful at the time it occurred, it would be difficult to argue that a subsequent decision not to use the property should render the original acquisition illegal. Thereafter, in light of the precedents governing unilateral suppression, it would be difficult to challenge...subsequent non-use as an independent violation of the antitrust laws.³⁹⁴

C. Mergers Involving Small Pharmaceutical Companies: Government Enforcement

In practice, mergers falling outside the pre-notification thresholds are not likely to be investigated by the federal antitrust enforcement agencies. A possible explanation for the agencies' attitude is found in the majority opinion of the Supreme Court in *Brown Shoe* where it was stated that the legislators did not intend for section 7, Clayton Act, to impede a merger between two small companies which will enable the combination to compete more effectively with large corporations.³⁹⁵ However, in the same case the Court stated that "[c]ongress indicated plainly that a merger had to be functionally viewed, in the context of its particular industry."³⁹⁶

³⁹³ Brodley (1995), *supra* note 391, at Appendix.

³⁹⁴ Cohen (1998), *supra* note 113, at 433; *See generally*, C. Douglas Floyd, *Antitrust Victims Without Antitrust Remedies: The Narrowing of Standing in Private Antitrust Actions*, 82 MINN. L. REV. 1 (1997), and Brodley (1995), *supra* note 391; For a critical analysis of the "unique problems with private antitrust litigation alleging technology suppression", *see*, Flynn, *supra* note 86, pp. 514-525.

³⁹⁵ *Brown Shoe Co. v. U.S.*, 370 U.S. 294 (1962), §§ 312 -323; A similar approach appears to have been taken by the European Commission in a number of pharmaceutical merger cases involving firms of various sizes. *See e.g.*, Upjohn/Pharmacia, Decision IV/M631, 28.09.95. (Soaring R&D costs "are becoming very heavy to bear" and the merger will enable the merged entity to compete "on the world R&D markets"). *See also*, Rhone-Poulenc Rorer/Fisons, Decision IV/M.632, 21/09/95.

³⁹⁶ *Id.*

Another explanation could be that intervention in business decisions is generally seen as undesirable. If small companies decide to merge, the argument goes, they must know what they are doing. There is little doubt that a company's board of directors and shareholders are in a better position to know what is best for them, particularly at times when raising capital for biotech start-ups is difficult and the only alternative for a merger may be insolvency; yet their interest does not always correspond to that of consumers. That is precisely why the antitrust laws, and the 'failing firm' defense, exist in the first place. That logic applies to mergers involving small companies as much as it applies to big mergers.

It is also possible that the controversy surrounding the innovation market analysis prevents the agencies from stretching out its application. If so, such an approach is difficult to justify in light of the evidence that application of the innovation market analysis to drug mergers has been relatively successful.

By omitting to consider mergers involving small research-based pharmaceutical companies, the agencies appear to treat them, due to their current size, as not significant enough. This approach may be seen as preserving the traditional static merger analysis under which innovation markets are ignored and competition, actual or potential, in existing product markets is the only concern. On this reading, drug innovation and, say, steel, are treated much in the same way. From the consumer perspective, whose interests the antitrust laws are suppose to safeguard, medicines are among the most important products consumed. They don't only "...hold sway between life and death," but also "...dramatically influence the quality of our lives."³⁹⁷ Yet, in the absence of government action, private consumers are practically powerless.³⁹⁸

³⁹⁷ National Consumer Council (1991), *supra* note 26, at 49; *See also*, Robert A. Freeman and Rachel F. Tasch, *The Technology Trust Fund: Paying for Medical technology*, in Smite ed. (1996), *supra* note 51, at

40: "The role of consumers in technology adoption and diffusion is less definitive because consumers generally do not have access to adequate information related to the availability and clinical efficacy of specific new technologies." The results from a consumer survey (Jennett, 1988, cited by Freeman and Tasch, at 40), "...suggest that consumers demand access to and availability of the latest technological advances. Evidence also suggests that consumers are willing to pay for unfettered access and availability and are unwilling to accept rationing of or other restrictions on access to technology" (Ginzberg, 1990, cited by Freeman and Tasch, at 40).

³⁹⁸ Although outside the scope of this paper, it is interesting to note that the recent move towards "Consumer (or Patient) Bill of Rights" endorsed by the Clinton Administration may signal that a new direction is taken in which consumers will have more of a say in matters affecting their health. As one consumer group activist put it: this is "a good beginning." See, Laurie McGinley, *Clinton Panel's Health-Care Proposals Reignite Battle on the Political Front*, WALL ST. J. Nov. 21, 1997, at B20, available in 1997 WL-WSJ 3483509. See also, Laurie McGinley, *Clinton to Order Patients' Rights Be Part of Federal Health Plans*, WALL ST. J. Feb. 20, 1998, at B4, available in 1998 WL-WSJ 3483509; A sort of 'duty' to consumers (or society as a whole) can be advanced on two different levels:

(1) On the moral or ethical level, mergers, acquisitions, takeovers, leveraged buy-outs, spin-offs and the like raise a number of considerations. It would be beyond the scope of this paper to consider these considerations in length but, in summary, the following issues have been mentioned (see, ETHICAL CONSIDERATIONS IN CORPORATE TAKEOVERS 1-8 (Woodstock Theological Center, Seminar in Business Ethics, Georgetown University Press, 1990): "At the level of process, questions have been raised about the appropriateness and fairness of the behavior of parties involved in the transaction itself...At the level of outcomes, questions have been raised about the harm or benefits of the transaction to all parties directly and indirectly affected and about the fairness or social desirability of these outcomes." In particular, "[d]o customers who buy and use products made by the firm have as valid a right to low-cost, high-quality products as shareholders have to profits from the sale of those products? Should we as a nation be allowed to insist that corporations make investments which may not be profitable to them, or avoid certain lucrative activities, because it is in the national interest for them to do so?"; More specifically in relation to antitrust enforcement, it has been argued that the shift from protecting the weak (or the small) against the powerful "...to helping even the powerful to become efficient brings with it a responsibility to safeguard the values that footless capitalism might destroy." See, Eleanor M. Fox, *Mergers 'R Us; Has Antitrust Gone the Way of the 5 & 10?*, WASH. POST, March 30, 1997, at C1, available in 1997 WL 10009958.

(2) Moral duties aside, a strong case can be made for the existence of ethical drug firms' duty towards consumers as tax payers. For one, federal support for biomedical research is "as important as it is enormous" (SCHWEITZER, *supra* note 27, at 31). According to Schweitzer, as of 1990 the federal government and the industry each funded 45% (\$9.9bn) of US health R&D. Schweitzer cites the US Dept. of Health and Human Services, Public Health Service, National Institutes of Health, Data Book 1990: "Sixty-two percent of National Institutes of Health (NIH) funding for R&D and 53% of all federal health R&D money went to colleges and universities, which rely almost solely on federal funds for research training."; The role of the federal government is not limited to basic research but also supports applied work including the testing of cancer drugs. See, Scherer, (1997 Revision), *supra* note 4, at 9. According to Scherer, the National Institute of Health research spending and grants in fields germane to pharmaceuticals totaled as much as 4.8\$bn. Those funds are supplemented by appreciable additional sums from other federal agencies such as the National Science Foundation. Mansfield (1991), cited by Scherer, learned that 56% of the new products in his sample could not have been developed without, or were "significantly facilitated" by, underlying academic research. Mansfield also found that academic research was more important to pharmaceutical innovation than in the computer, instruments, electrical equipment, and metal industries; An important source of government support is its investment in education of prospective scientists. Arguably, it is federal investment in R&D that develops much of the fundamental knowledge and technology that is the basis for drug discovery (see, SCHWEITZER, *supra* note 2, at 31); A recent article (Gerard O'Neill *et al.*, *Public Research/Private Profits: Public Handouts Enrich Drug Makers, Scientists'* BOSTON SUNDAY GLOBE, April 5, 1998, at A1, and A32), investigated the pattern of companies, scientists and universities "...cashing in on government-funded inventions." The investigation team traced a number of government-funded private medical R&D projects worth \$1bn in public subsidy and claimed that the taxpayer often ends up "...paying onerous prices for medicines their tax dollar helped to create." (See in

Given the potentially serious implications of overlooking the loss or delay of new and improved medical treatments as a result of a merger, it is submitted that the law should specifically empower³⁹⁹ and require the antitrust enforcement agencies to review and respond to concerns arising from combinations in the ethical pharmaceutical industry, whatever the current size of the merging companies happens to be. The following sections therefore deal with possible ways of doing just that.

V. PHARMACEUTICAL MERGERS AND CONSUMER WELFARE: COVERING THE GAPS

A. General

The purpose of the following sections is to point to possible schemes the utilization of which may help remedy the defects of antitrust merger enforcement as applied to the ethical drug industry. The ensuing discussion is by no means comprehensive, and merely intends to outline some thoughts for further research. Any consideration of possible action should begin with, and take into account, possible present and future trends currently transforming the drug sector.

particular the table on page A33 therein); *But cf. Figure 15. Share of Industrial R&D Funding, by Source and Industry: 1993*, in SCIENCE AND TECHNOLOGY POCKET DATA BOOK 20 (Division of Science Resources Studies, National Science Foundation, 1996), showing that Federal industrial R&D funding to the “Drugs and Medicines” industry in 1993 was by far the smallest among the 8 industries compared, and was matched only by the “Machinery” industry. Industrial R&D funding in the “Drugs and Medicines” industry was therefore the highest among the 8 industries compared, matched only by the “Machinery” industry.

³⁹⁹ The wording of the Clayton Act seems to enable the agencies to investigate mergers falling outside the pre-notification thresholds in section 18A, but there appears to be no specific provision in the federal antitrust laws requiring such investigation.

B. Future Prospect

Industry structure

It is possible that the biotechnology sector will ultimately dwarf the traditional chemical-oriented firms.⁴⁰⁰ As a result, the pharmaceutical industry is unlikely to look the same. Governments must acknowledge the new reality. Schweitzer (1997) argues that:

Surprisingly, little concern about the antitrust implications of [mergers of major firms with biotech firms or among major firms] has been raised. Perhaps this is because the activities of the constituent organizations are thought to be more complimentary to one another and not directly competing. If two firms have different product portfolios (say, one emphasizing cardiac drugs and the other, antibiotics) the market concentration in any single drug class will not increase following a merger. Substantial room for capitalizing on economies of scale may still exist, especially in the areas of research, marketing, finance, and administration, and consumers are not made worse off by the merger. This certainly is the scenario that would be expected in the case of acquisitions of biotechnology firms. But even if this does describe past mergers in the industry, there is no assurance that continued consolidation would be similarly innocuous. In fact, one would expect that eventually the degree of complementarity among merging firms would lessen, and firms with competing products (or potentially competing products in the pipeline) would consider merging, with the result of fewer products competing within a drug class. Vigilance against anticompetitive developments will have to be exercised in the future.⁴⁰¹

To be sure, a tendency towards industry concentration may be seen in recent years.⁴⁰² In 1988, 24% of the world pharmaceutical market was held by the top ten firms compared to 37% in 1995.⁴⁰³ One prediction places the figure at 60 to 70% by the year 2000.⁴⁰⁴ Indeed, the 1995 figure pre-dates pharmaceutical mega mergers such as Sandoz/Ciba-Geigy, Rhone Poulenc/Hoechst, and Zeneca/Astra. Pharmaceutical companies also “try to lower the level of competition by joint ventures and strategic alliances.”⁴⁰⁵ The relevant

⁴⁰⁰ SCHWEITZER, *supra* note 27, at 226.

⁴⁰¹ *Id.*

⁴⁰² *See*, OMTA, *supra* note 10, at 33.

⁴⁰³ SCHWEITZER, *supra* note 27, at 226.

⁴⁰⁴ *Id.*

⁴⁰⁵ *Id.*; *See also*, National Consumer Council (1991), *supra* note 26, at 23:

Despite the dominance of multinationals and their affiliates, smaller concerns are able to survive, usually through niche specialisation. Many of the companies operating high risk/high potential gain biotechnology research fall into this category. They are, however, increasingly vulnerable

implication of this development is that despite the possible pro-competitive impact of the biotech revolution and related technologies such as computerized drug design, overall increase in concentration indicates that anti-competitive concerns will continue to exist in specific cases.

*Patent protection and drug approval*⁴⁰⁶

A 1995 WTO Treaty has lengthened the maximum protection from 17 to 20 years. Nevertheless, since the patent period starts to run from the day of filing rather than the day patent issuance, the duration of patent protection is likely to continue to be a debated issue. It has been argued that consolidation of drug approval at the trade-block and the international levels, just like that of patent protection, is inevitable.⁴⁰⁷ Continuing internal changes at the FDA are also possible. Acceleration of the review process may follow as a result. Global consolidation of drug approval and patent protection can contribute to reduction in R&D time and expenses. In result, duplication in drug R&D could be of less significance than it is now, but so are barriers to entry.

to takeover. This is particularly important in Europe, where large pharmaceutical companies are often the largest chemical companies, and therefore have wider R&D portfolios.

Similarly, de Wolf (1994), *supra* note 175, surveyed 783 mergers and acquisitions in the pharmaceutical industry between 1980 and 1990 and divided them into acquiring and acquired companies. He concludes (p. 301) that European acquisitions in the US were largely driven by the wish to access biotechnology; It is important to note that while, in the short term, big-pharma companies can pick up development rights of promising compounds from small firms fairly cheaply, in the longer run some of these small concerns are being nurtured into powerful rivals developing their own drugs following the steps of Amgen, Genzyme and others. *See, The Alchemists, supra* note 27, at 14. The fact, mentioned earlier, that the successful biotech firms are being taken over by big-pharma (*e.g.*, Roche now owns 69% of Genetech, Novartis controls just under 50% of Chiron, and Genetics Institute has been swallowed by American Home Products), is therefore a food for thought for the antitrust authorities. This concern goes beyond the narrow issue of overlapping R&D of merging firms discussed here. Rather, it is about the future structure of the industry and whether every potential entrant to the big pharma league will be allowed to be swallowed. For a recent acquisition of a potential entrant to the big pharma league *see, Agouron: Warner-Lambert to Acquire Agouron for \$2.1 Billion in Stock*, M2 PRESSWIRE, Jan. 30, 1999, available in 1999 WL 7551154.

⁴⁰⁶ *See generally*, SCHWEITZER, *supra* note 27, pp. 229-230.

⁴⁰⁷ *Id.*

Healthcare reforms, the trend towards managed care, and drug prices

Whatever the form of government-led changes, managed care will probably continue to develop and so is competition among health plans over product differentiation as well as information associated with it.⁴⁰⁸ Product differentiation will concentrate on the quality and prices of plans, and demand for a wide variety of drugs ranging from inexpensive generic products, through "me, too" drugs, to breakthrough innovative drugs, is likely to continue.⁴⁰⁹ Pharmaceutical R&D investment decisions will continue to be directed by demand considerations.⁴¹⁰ Consequently, highly demanded innovative drugs will continue to sustain higher prices. For consumers, the movement towards managed healthcare plans means that potentially less effective drugs may be authorized. This is because when choosing a health plan, consumers will know which treatments are offered by that plan.⁴¹¹ The availability of less effective and less expensive drugs will therefore depend on the level of consumer demand for health plans offering such products. Access to quality service offering superior treatments, will ultimately depend on the consumer willingness to pay more.⁴¹² For drug manufacturers that trend means that allowable prices of new drugs will be increasingly tied to their superior product attributes.⁴¹³ The transformation of customer-led marketplace will affect innovation because it presents "...challenges to many pharmaceutical companies which are managed and staffed to produce modest, low-risk improvements to existing drugs which gained yesterday's easy profits."⁴¹⁴ The relevant implication of these developments is that product attributes will

⁴⁰⁸ See generally SCHWEITZER, *supra* note 27, pp. 227-228.

⁴⁰⁹ *Id.*

⁴¹⁰ *Id.*

⁴¹¹ Note that one of the most important goals of any health-care reform is to improve the amount and quality of information given to consumers and improve their choice of products. However, in any scenario, consumers will continue to face the uncertainty as to which plan they actually need.

⁴¹² SCHWEITZER., *supra* note 27, at 231.

⁴¹³ *Id.*

⁴¹⁴ JAMES (1994), *supra* note 29, at 15.

continue to be a major source of competition but increasing price competition will result from the competition among health plans trying to differentiate the plan they offer.

Rethinking Innovation

The general decline in the number of new products and the emergence of new technologies largely or wholly outside the traditional pharmaceutical industry,⁴¹⁵ make companies begin "...to question the concept of size, value, and cost which accompany pharmaceutical innovation."⁴¹⁶ Arguably, "...the center of innovation may have already shifted from the traditional pharmaceutical industry to the biotechnology industry."⁴¹⁷ Hence, the role of small drug firms in innovation will continue to grow and so is their importance for competition in drug innovation markets.

Growth

According to James (1994), "...all three components of growth - price, volume and new products - will be under pressure as a result of the increasing competitiveness in the healthcare market as well as the application of sophisticated demand and supply regulators by cost-conscious customers."⁴¹⁸ The current wave for consolidation is therefore expected to continue partly because the above-mentioned sources of organic growth will be hard to sustain.⁴¹⁹

⁴¹⁵ According to one researcher, "all" genetic engineering and new technologies originated outside the traditional pharmaceutical industry. *See*, JAMES (1994), at 70.

⁴¹⁶ *Id.*

⁴¹⁷ *Id.*

⁴¹⁸ *Id.*, at 10 (chart).

⁴¹⁹ According to JAMES, (1994), *supra* note 29, large and established pharmaceutical firms will probably aim at becoming holding companies for smaller firms providing specialized research, development, marketing, and health plans.

C. Industry-Specific Pre-notification Provisions⁴²⁰

As discussed earlier, mergers above a certain size thresholds must be reported. About 5% of reported mergers trigger a demand by the agencies for more information.⁴²¹ In general, regulation of mergers, particularly takeovers, in the US, the UK, and other countries seeks to protect the rights of shareholders in the target companies, ensure fair conduct of takeover bids, and prevent harm to competition.⁴²² In substance, protection of shareholders and ensuring fair conduct is not about net social costs or benefits and intervention on competition grounds is kept to a minimum.⁴²³ In some cases, the relatively fast conduct of takeovers may be regarded "as a vice rather than a virtue" and it is thought that "it will be useful to 'throw some sand' in the takeover mechanism."⁴²⁴

One possible solution to the risk of overlooking serious harm to consumers arising from loss or delayed introduction of new and improved treatments, is the introduction of a provision under which all mergers involving research-based pharmaceutical firms, regardless of their size, must be pre-notified and examined, at least briefly, by the antitrust agencies.⁴²⁵ In order to facilitate and speed-up the investigation, notifications ought to include a statement of all the R&D overlaps, of which the merging firms are aware, within particular therapeutic fields. The administrative burden associated with such a solution appears pale compared to the burden associated with the usual "2nd

⁴²⁰ Note that industry-specific merger notification requirements already exist in the airline industry.

⁴²¹ See generally, Janet D. Steiger *et al.*, *FTC Premerger Notification: A Model '2nd Request' for Information (II)*, ANTITRUST L. & ECON. REV. 91 (1995).

⁴²² See, COSH ET AL., *supra* note 241, at 18.

⁴²³ *Id.*; In 1996, the government (DOJ) received 3094 pre-merger notifications, initiated 186 investigations and filed complaint in 9. See, AREEDA AND KAPLOW, *supra* note 75, at 806; In the UK, the number of referrals by the Office of Fair Trading (OFT) to the Monopolies and Mergers Commission (the MMC mandate is similar to the FTC's) of proposed bids is also very small (about 2-3 per cent). See, COSH ET AL., *supra* note 241, at 18.

⁴²⁴ COSH ET AL., *supra* note 241, at 19.

⁴²⁵ Examination may be conducted by a special body of experts but not necessarily so (as noted above, identification of anti-competitive concerns is not necessarily a difficult task).

Request" form.⁴²⁶ Perhaps even more so when balanced against consumer interests which the antitrust law aim to protect and the public policy objective of preserving and improving public health.⁴²⁷ A complementary approach could be to offer a reward to those who confidentially notify the agencies of the merging firms' possible R&D overlaps.

D. How to assess Overlapping R&D Activities Revealed by Notifications⁴²⁸

1. Initial Assessment

The first phase in any analysis of mergers involving merging firms' overlapping drug R&D projects should ensure that government intervention is kept at minimum and that only those, possibly few, mergers raising sufficiently serious consumer welfare issues are investigated. To that end, three interrelated steps may be taken;

⁴²⁶ See, Steiger *et al.*, *supra* note 421. The FTC's "2nd Request" model form requests many detailed documents dealing with plant replacement costs, pricing policies and anti-competitive complaints and practices, entry and scale requirements, expansion plans and import barriers and more.

⁴²⁷ There are other public policy issues which come to mind. For instance, the improved treatments may reduce hospital stays and consequently reduce the overall expenditure on health care. However, lengthy discussion of this point and other similar issues, is beyond the limited scope of this paper.

⁴²⁸ See, Calvani, *supra* note 15, 231, note 14: "There are transactions where the acquired party's documents reflect a strong commitment to developing a cure for a particular disease, but where the acquirer's scientists rightly thought that it was sheer fantasy and that the acquired party was light years away from a marketable drug."

*Pharmacoeconomics: Economic evaluation of the experimental drugs*⁴²⁹

At present, socioeconomic evaluations of health care technologies are increasingly important tools in assessing the personal, social, and economic effects of new technologies.⁴³⁰ Although the use of economic analysis is not without problems,⁴³¹ there

⁴²⁹ See, SCHWEITZER, *supra* note 27, at 207. In general, three methodologies are used to make economic evaluation of new drugs (in order to optimize the production of health): cost-benefit (hereinafter C-B) analysis, cost-effectiveness (hereinafter C-E) analysis, and cost-utility (hereinafter C-U) analysis. C-B analysis compares the cost of treatment to the expected monetary value of its benefits, C-E analysis assesses the expected benefits in non-monetary terms (e.g., lives saved, lives prolonged etc.), and C-U analysis looks at the benefit of the intervention measured by the amount of utility produced (e.g., the quality of life resulting from a treatment) (p. 210). C-E is the most frequently used analysis to evaluate new drugs for policy purposes (p. 219). In particular, both public and private health plans use C-E analysis to evaluate a new drug against existing drugs in the same therapeutic class. The FDA is primarily, if not exclusively, concerned with efficacy and safety of new drugs, and therefore does not generally require economic studies as part of the approval process. *CF: Supra* note 431 (some countries such as France and Australia do require economic analysis for new drugs); According to Schweitzer, at 222, "[i]t is relatively easy to identify medical interventions which are known to be ineffective." Medical science recognizes that on the one end of the effectiveness scale are previously utilized treatments that have not been effective, while on the other side of the scale are clearly effective treatments for which there are no substitutes. A large number of treatments, varying in effectiveness and costs, are in the middle; In shorthand, pharmacoeconomics is "...a set of potentially useful approaches for making more rational decisions for selecting drugs." JAMES (1994), *supra* note 29, at 20.

⁴³⁰ See, Bryan R. Luce and Anne Elixhauser, *Socioeconomic Evaluation and Health Care Industry*, in Smith ed. (1996), *supra* note 51.

⁴³¹ The use of economic research in public health issues can be vulnerable to abuse and inconsistencies flowing from the fact that it is largely motivated by the product-specific business objectives of pharmaceutical firms (*see generally*, Robert A. Freeman, *Health Policy Initiatives and the Utility of Economic Research*, in Smith ed. (1996), *supra* note 51. *See also*, *Will Health Care Economic Information Lead to Therapeutic-Class Warfare or Welfare?*, 111, HARV. L. REV. 2384 (1998); Darren E. Zinner *et al.*, *The FDA and Regulation of Cost-Effectiveness Claims*, HEALTH AFFAIRS., (Fall 1996, at 54); However, researchers conducting socioeconomic evaluations face the problem of gathering data in the real world all the time and such evaluations can assist in conducting a balanced and fair appraisal of the relative cost and efficacy of new medical technologies (*see*, Robert A. Freeman and A. Elixhauser, in Smith ed. (1996), *supra* note 51, at 191); For a discussion of possible methodologies for economic analysis of approved and unapproved drugs *see* Freeman (1996), *supra* note 431; Note also that a 'value of life' analysis may be necessary in order to assess the merits of the new pre-notification requirement and thereafter the justification for intervention in any given case. For example, the number of lives affected by the drugs in question is clearly relevant. It is submitted here that the cost (to society) of intervention should not exceed the benefit (to society). *See generally*, VISCUSI ET AL., *supra* note 128, pp. 699-670; The pharmaceutical companies themselves use pharmacoeconomics to demonstrate value-for-money and for R&D project selection (SCHWEITZER, *supra* note 27, at 222). The main problem with such an approach is the uncertainty surrounding eventual success, but that uncertainty is not necessarily fatal. Drug firms, knowing that insurers are concerned with cost-effectiveness, now devote much effort to the study of the economic measurement of drug effectiveness. In other words, much information can be obtained from the companies themselves; For a discussion of the information sources, including the FDA and the drug companies themselves, available for C-E analysis purposes *see*, Howard J. Beales III, *New Uses for Old Drugs*, in Helmes ed. (1996), *supra* note 38, at 281, John E. Calfee, *The Leverage Principle in the FDA's Regulation of Information* (1996), in Helmes ed. (1996), *supra* note 38, at 306, Ronald W. Hansen, *Cost and Benefits of Cost-Benefit Analysis in Pharmaceutical Promotion and Utilization Decisions*, in Helmes ed. (1996), *supra* note 38, at 322, and

appears to be no principled reason why economic analysis should not be employed by the antitrust agencies in their initial analysis of overlapping experimental drugs. Such an approach does not seem to require any radical departure from existing practice. For example, in the *Hoechst* case it was estimated that removal, by the consent order, of certain barriers to the introduction of a new hypertension and cardiac drug - Tiazak - may save consumers between \$15 and \$30m a year.⁴³² Although such calculations should not be confused with C-E/B/U analysis that compares the cost of a given treatment to its expected monetary value, non-monetary value such as lives saved, and the amount of utility such as quality of life it produces, it is not essentially different inasmuch as the overall purpose is to facilitate more rational decisions for drug selection. In this case, the selection is made by the antitrust agencies that decide which experimental drugs are worth protecting. Said that, because there are many plausible alternatives for applying any pharmacoeconomics analysis to an implicated experimental drug, rigid standardization of analysis methods will probably be counterproductive.⁴³³

Appraisal of the overlapping projects' probability of success

The second method to be used is relatively straightforward; the more advanced the experimental drug in the approval process the higher the chances of success. As discussed earlier, the general likelihood of success is broadly known at every stage of the clinical trials. The probability of success - as is generally the case in other fields of innovation - gradually and significantly improve at every new stage. According to Guthrie (1998), "...[a]s a rule of thumb, the chances are 10 per cent at Phase I, 10-50 per

William C. Macleod *et al.* *Commentary on Part Four*, in Helmes ed. (1996), *supra* note 38, at 37; Even where the merging companies did not analyze that information for FDA approval purposes they may well have done so for the purposes of approval in other countries that do require C-E analysis (*E.g.*, Australia and France). SCHWEITZER., *supra* note 27, pp. 220-221; For an example of C-E analysis in a UK submission for approval *see* SCOTIA HOLDINGS, *supra* note 272, at 1.

⁴³² *Hoechst*, *supra* note 340.

⁴³³ *See*, FRANK A. SLOAN (ed.), *VALUING HEALTH CARE: COSTS, BENEFITS, AND EFFECTIVENESS OF PHARMACEUTICALS AND OTHER MEDICAL TECHNOLOGIES* 2-3 (1995) (discussing the problems facing health care policymakers in general).

cent at Phase II and above 50 per cent at Phase III.”⁴³⁴ Every new stage is also significantly more expensive than the one before therefore the decision to move on to the next stage implies a vote of confidence in the slowly progressing drug. The antitrust agencies can include that information in their appraisal of overlapping activities.

Resort to competitors

A third method that can be used to ensure that antitrust intervention focuses on the right targets, is to ask other firms to provide an evaluation of the technology in question, and to assess their prospective willingness, assuming a divestiture will eventually be required, to purchase it. Obviously, that approach is not without problems, especially problems relating to possible bias and trade secrets, but a cautious use of outside assessment in specific cases will help isolate, and thereafter preserve, promising medical technologies for which patients may be desperately waiting.⁴³⁵ Of course, the antitrust authorities are in no better position than the merging companies to assess the true value of a given technology. But what about requiring the merging firm to put the technology on the market for interested buyers or licensees? It may be that other drug firms are in a position to evaluate a given R&D project that is likely to be lost as a result of a merger. To that end, prospective interested third parties should be asked for their evaluation and future

⁴³⁴ Guthrie, *supra* note 187, at 22; *See also, supra* notes 57 and 350; For a more detailed presentation of the likelihood of success in every clinical phase *see*: Jackson, *supra* note 51, at 368, Shelley, *supra* note 51, at 13, James (1994), *supra* note 29, at 15, and *The Alchemists, supra* note 27.

⁴³⁵ Interestingly, one study of British firms (*See, ALICE M. SAPIENZA, CREATING TECHNOLOGY STRATEGIES: HOW TO BUILD COMPETITIVE BIOMEDICAL R&D* (1997)), citing Clarke *et al.* (1989)) found that only a few managers were able to assess the technological assets and strengths of their organization or even to understand the nature of the organization technology position. If true, two somewhat contrasting conclusions may be drawn. It may be asked how is an antitrust agency to assess the value of a given technology while those who possess it can hardly do so? In other words, the task of evaluating overlapping R&D activities is not an easy one. In contrast, there may be a good reason for concern about "good" technologies being lost not only because of profit-making considerations but also due to misjudgment on the part of the merging companies themselves as to the real value of their "overlapping" technologies. If the merging firms believe that an important drug R&D project is a 'loser', why should they not be made to put it on the market so that others will be able to purchase it?

willingness to purchase the technology that is considered by the merging firm to be an overlapping R&D activity.⁴³⁶

To sum up, the emerging customer-driven market will require the antitrust authorities to increase their role in serving consumer interests. Healthcare has become an "information highway" along which products and services flow,⁴³⁷ and the proposed pre-notification requirements outlined above are in line with that trend.

2. Appraisal of Effects on Competition

Even if, following a C-E/B/U analysis, the agency is convinced that a particular experimental drug justifies antitrust intervention, that, if pursued, it has good chances of reaching the market, and that other companies show interest in it, once investigation takes place, there remains the problem of assessing the degree of competition in the innovation market in question and the likelihood of post-merger harm to that competition.⁴³⁸

While the basic qualitative evaluation of an experimental drug's future prospect primarily depends on its distance from the market, evaluation of the intensity of competition primarily depends on the number and relative strength of competitors in the same R&D niche. One way of assessing the degree of competition in a given R&D market, is to look at the key components at the microeconomics dimension.⁴³⁹ Such an

⁴³⁶ It must be emphasized that the risk of biased responses by competitors is evident here.

⁴³⁷ See, JAMES (1994), *supra* note 29, at 25 and 54 (chart).

⁴³⁸ . For a detailed, interesting and useful proposal for "probabilistic construction of innovation markets" ("addressing various propositions about the relationship between market structure and innovation [by requiring quantification of allegations] in terms of pre- and post-innovation market structures and the pre- and post-merger probabilities of successful innovation by each firm"), see, Chin (1998), *supra* note 138, pp. 129-145; See also, Chin (1997), *supra* note 139.

⁴³⁹ On the key components of the microeconomics dimension of the biomedical industry environment see,

approach is not essentially different from the assessment of the big drug merger cases discussed earlier.

In assessing the intensity of competition one should first look at possible rivals.⁴⁴⁰ "How does one determine who else is investigating the disease?." ⁴⁴¹ As a rough guideline, "[a]ll firms providing medicines for, and conducting R&D in, the same diseases constitute rivals."⁴⁴² The next step is appraisal of substitutes including the option of no consumption of the future down stream product at all.⁴⁴³ Vulnerability to potential entrants depends on the size of the barriers to entry; the higher the barrier, the greater the protection from entrants.⁴⁴⁴ Barriers to entry include the cost of entry and the absolute cost advantage associated with established access to important inputs, including human capital, regulation,⁴⁴⁵ patent protection, access to distribution channels, and membership in the relevant knowledge network.⁴⁴⁶ As shown by the drug merger cases discussed above, those components are not always difficult to assess and much information can be obtained from readily available sources such as the Patent Office and the FDA.⁴⁴⁷

SAPIENZA (1997), *supra* note 435, pp. 41-47

⁴⁴⁰ *Id.*, at 41.

⁴⁴¹ Calvani, *supra* note 15, at 230. According to Calvani "[t]his practical problem may be insurmountable." All the same, Calvani concedes that "[s]ometimes patent applications, the scientific literature, academic references, personnel movements, and the like provide valuable information in this regard." In our context, one should also add the wealth of information submitted to the FDA as well as pharmaceutical companies' press releases, quarterly reports and so on. Calvani, *supra* note 15, at 233, note 21, correctly points out to a possible bias in characterization by competitors of their own R&D programs aimed at minimizing their competitive positions: "Yes, we have a project investigating a vaccine for Pillsburitus, but frankly we are having great difficulty and may be light years away from even beginning clinical trials."

⁴⁴² See, SAPIENZA, *supra* note 435, pp. 41-42. Suppliers and buyers are also key components of the competitive environment thus their strength should be assessed in any comprehensive market analysis.

⁴⁴³ *Id.*, at 43.

⁴⁴⁴ *Id.*, pp. 43-44.

⁴⁴⁵ As discussed earlier, regulatory demands may constitute a competitive advantage for experienced and cash-rich pharmaceutical firms over inexperienced young firms., *Id.*, at 44.

⁴⁴⁶ E.g., access to university research, and access to research in other institutions. *Id.*, at 46.

⁴⁴⁷ For a hypothetical illustration of analysis of competition within a given biomedical R&D market see, *id.* 109-122; Note that a number of information exchange agreements among government agencies, FTC

3. Covering the Gaps: Overview

An agency seeking to isolate an anti-competitive merger may take three main steps: First, on the basis of the merging firms' specific pre-notification statements, identify overlapping R&D activities that are at a sufficiently advanced stage. Second, assess the value of the future product in question in reliance of a flexible economic analysis, the drug's chance of eventually reaching the market, and outsiders' observations. Finally, look at the number of competitors and assess the level and intensity of competition. That basic scheme does not seem to be too burdensome. It is based, for the most part, on accessible data and can be made relatively fast. Once, probably infrequently, a determination is made to investigate a particular drug merger, merger analysis should be essentially similar to that used by the FTC in the innovation market cases discussed earlier.

CONCLUSION

Combinations within the ethical pharmaceutical sector present a serious challenge for the antitrust agencies. It has been argued here that, under certain circumstances, antitrust merger enforcement in that sector can and should concentrate on innovation markets. Competition in the ethical drug industry largely focuses on novel innovative treatments, and the characteristics of the industry allow for a sufficiently sound application of the innovation market analysis. The new approach proved capable of capturing prospective anti-competitive effects that are likely to harm consumer welfare. In cases where anti-competitive effects were anticipated, utilization of the innovation market analysis facilitated the design of suitable remedies.

and FDA included, are already in place.

The current law and practice only accommodate such concerns inasmuch as large mergers are concerned. That state of affairs raises questions as to the coherence of the policy, if any, underlying the treatment of pharmaceutical mergers. Since private antitrust action against merger law violations is weak, enforcement is left to the Government. Accordingly, the introduction of mandatory industry-specific pre-notification provisions to reinforce Government merger control in that area should be considered. Three complementary methodologies have been proposed in order to ensure that any decision to investigate a notified drug merger is based on sufficiently sound ground. Once a decision in favor of antitrust scrutiny of a merger - whatever its size - is made, antitrust analysis should generally follow the analysis used by the FTC in its recent drug innovation market cases.