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REPORT *brief*

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R&D returns exceed its costs and risks

Pharmaceutical research and development (R&D) is a costly and risky business, but in recent years the financial rewards from R&D have more than offset its costs and risks, according to a new report from OTA, **PHARMACEUTICAL R&D: COSTS, RISKS AND REWARDS.** OTA examined the costs and returns on R&D and the impact of Federal policies on the pharmaceutical R&D process.

THE COSTS OF R&D

Estimating the full cost of bringing a new drug to market is a way of gauging how much money must be earned from successful drugs to justify the R&D investment. These costs rightly include not only outlays for successful projects but also for projects that are abandoned along the way. Since investors can't predict which projects will succeed and would not knowingly invest in losers, these "dead-end" expenditures are unavoidable and legitimate costs of R&D.

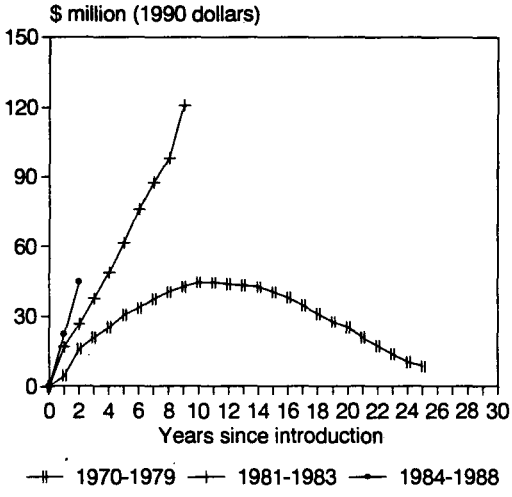


Figure 1. Average U.S. sales of new chemical entities introduced in 1970-79, 1981-83, and 1984-88.

The full cost of R&D also includes an interest payment for the use of the financial capital tied up in R&D. All R&D outlays must therefore be compounded (or capitalized) to their present value on the day of market approval at an appropriate interest rate.

OTA found that the cash outlays (in 1990 constant dollars) required to fund R&D on new drugs increased from about $65 million for drugs entering testing in 1969 to $127 million for drugs entering testing in 1976. The full cost of R&D for drugs introduced to the U.S. market in the 1980s, after including the interest costs of capital and the effect of taxes, was about $194 million.

RETURNS ON R&D

New drugs introduced in the 1980s generated higher revenues for the pharmaceutical industry than ever before. Figure 1 compares the average U.S. sales in 1990 constant dollars for new chemical entities (NCEs) introduced in the United States in

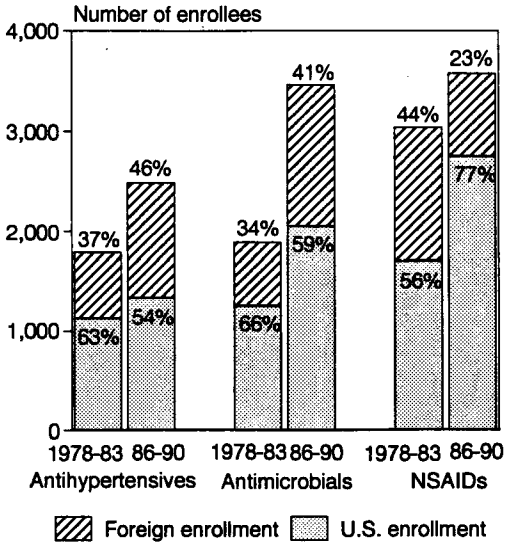


Figure 2. Mean number of subjects enrolled in clinical trials prior to submission of NDA for NCEs approved in 1978-83 and 1986-90.

KEY: NCE = new chemical entity
NDA = new drug application
NSAIDs = non-steroidal anti-inflamatory drugs

the 1970s, early 1980s, and late 1980s. The trend toward higher revenues in the years following market introduction appears to have continued throughout the decade.

OTA estimated the net returns on new drugs introduced to the U.S. market between 1981 and 1983. On average, each new drug will earn at least $36 million more for its investors over its product life than is needed to pay off the R&D investment. This surplus return amounts to about 4.3 percent of the price of each drug over its entire product life.

OTA also commissioned a study of pharmaceutical industry profits. In each year from 1976 through 1987, the economic profits in R&D-intensive pharmaceutical companies were about 2 to 3 percentage points higher than profits of firms in other industries, after differences in risk across industries were taken into account.

VOLATILITY OF RETURNS

Dollar returns on R&D are highly volatile over time. Changes in R&D costs, tax rates, and revenues from new drugs are the most important factors influencing net returns. Drugs approved for marketing in the 1984-88 period had much higher U.S. sales revenues (in constant dollars) in the early years after approval than did drugs approved in the 1981-83 period. Also, drugs introduced since 1984 are enjoying longer patent lives as a result of the Drug Price Competition and Patent Term Expiration Act of 1984 (Public Law 98-417). On the other hand, generic competition could be much stiffer for recently approved drugs after they lose patent protection.

R&D costs are also volatile, but various forces have opposing effects, so it is impossible to tell what the net direction of the effect will be. On the one hand, OTA documented large increases in clinical trial sizes (figure 2) and in the costs of animal research studies, two important inputs to pharmaceutical R&D. On the other hand, companies may be getting better at picking winners, which would lower the R&D cost per success (figure 3).

INDUSTRY RESPONSE TO HIGH RETURNS

The rapid increase in revenues for new drugs throughout the 1980s sent signals that more investment would be rewarded handsomely.

The Office of Technology Assessment (OTA) is an analytical arm of the U.S. Congress. OTA's basic function is to help legislators anticipate and plan for the positive and negative impacts of technological changes.

The pharmaceutical industry responded as expected, by increasing its investment in R&D. Investment in R&D grew at a rate of about 10 percent per year in constant dollars throughout the 1980s. By 1990, U.S.-based pharmaceutical companies were spending about $8 billion on R&D.

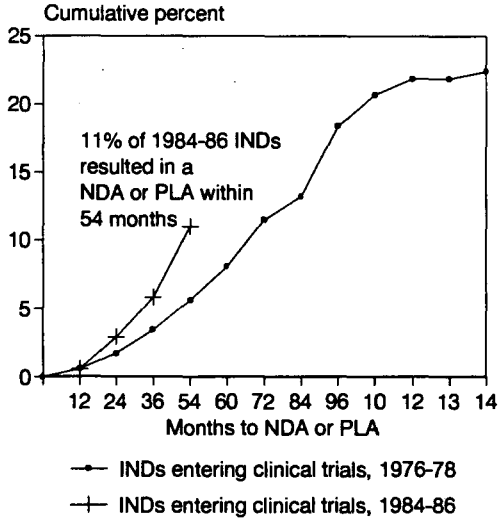
HEALTH INSURANCE

The rapid increase in real revenues from new drugs was made possible in part by expanding health insurance coverage for prescription drugs in the United States through most of the 1980s. The number of people with prescription drug coverage increased, and the quality of coverage improved. Health insurance makes patients and their prescribing physicians relatively insensitive to the price of a drug.

Most private and public health insurers in the United States have little power to restrict physicians' prescribing decisions. FDA approval to market a drug is a *de facto* insurance coverage guideline. If the physician orders a specific drug, the insurer routinely pays its share of the costs.

Pharmaceutical companies can charge different prices to different kinds of buyers, and they have charged lower prices to those insurers and health providers, such as HMOs and hospitals, that are more sensitive to drug prices. These organizations can influence or control physicians' prescribing choices with restrictive formularies (lists of drugs approved for prescribing) or other drug utilization controls. When several similar competing drugs are available to treat a condition, these organizations can use their bargaining clout with manufacturers to exact price concessions.

If the portion of the U.S. market subject to price competition was to expand dramatically in the future, investment in pharmaceutical R&D would change in ways that are difficult to predict. More price competition would probably mean slower increases or even a decline in private pharmaceutical R&D. Much of the decline could come in research on "me-too" drugs--compounds that are similar in their therapeutic effect to others already on the market--but some firms might pull out of



KEY: IND = investigational new drug
NME = new molecular entity
NDA = new drug application
PLA = product license application

Figure 3. Percent of INDs for NMEs entering clinical trials resulting in NDA or PLA, 1976-78 and 1984-86.

the race for new classes of compounds. It is impossible to say whether such changes would be good or bad, because drug prices today tell little about the real value of drugs to patients and the public.

PUBLIC INVESTMENT IN DRUG R&D

The Federal government, mostly through the National Institutes of Health (NIH), is a direct participant in the development of new drugs for important and often life-threatening diseases. Many new drugs invented in Federal laboratories are licensed to private companies for further development or marketing. The number of licenses issued by NIH and other Federal health laboratories increased more than sixfold between 1980 and 1991, and the number of licenses that are granted exclusively to one company also grew.

An exclusive license gives the licensee a monopoly over a valuable product and the power to charge a high price. NIH has adopted a "fair pricing" clause for exclusive licenses, but to date NIH has not set up a mechanism or standards for reviewing the reasonableness of prices and lacks the legal authority to enforce its policy. Without such authority, the public can end up paying for such drugs twice--once through its support for Federal R&D and once again when patients or their insurers pay for the drug in the marketplace.

Copies of the report for congressional use are available by calling 4-9241.

Copies of the report for non-congressional use can be ordered from the Superintendent of Documents, U.S. Government Printing Office, GPO #052-003-01315-1, $18 each, Washington, DC 20402-9325, (202) 785-3238.

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